Episode 6: Starting Up the Space Station

November 2018

@NASAKennedy
#NASARocketRanch

New episodes every month!

1
00:00:00,440 --> 00:00:03,200
We looked down on Earth, not as citizens of any one

2
00:00:03,200 --> 00:00:05,600
country, but citizens of Planet Earth.

3
00:00:05,600 --> 00:00:06,600
[Eagle screeches]

4
00:00:06,600 --> 00:00:09,190
EGS Program Chief Engineer, verify no constraints
to launch.

5
00:00:09,190 --> 00:00:13,230
EGS Chief Engineer team has no constraints.

6
00:00:13,230 --> 00:00:15,619
I copy that.

7
00:00:15,619 --> 00:00:19,620
You are clear to launch.

8
00:00:19,620 --> 00:00:25,210
Five, four, three, two, one, and lift-off.

9
00:00:25,210 --> 00:00:26,800
All clear.

10
00:00:26,800 --> 00:00:30,500
Now passing through max q, maximum dynamic
pressure.

11
00:00:30,500 --> 00:00:32,820
Welcome to space.

12
00:00:34,780 --> 00:00:41,120
Since the year 2000, there have been humans
in space non-stop, every day.

13
00:00:41,120 --> 00:00:45,320
The International Space Station has been an
engineering marvel, research laboratory, and

14
00:00:45,329 --> 00:00:48,010
platform for unparalleled exploration.

15
00:00:48,010 --> 00:00:51,769
This month, we celebrate the 20th anniversary
of the launch of the first element of the

16
00:00:51,769 --> 00:00:53,730
International Space Station to lower earth
orbit.

17
00:00:53,730 --> 00:00:58,030
In this episode, we sit down with the Space
Shuttle commander who officially began construction

18
00:00:58,030 --> 00:00:59,679
of the ISS in space.

19
00:00:59,679 --> 00:01:04,500
Former astronaut Bob Cabana recounts his experiences
in being the first American on station and

20
00:01:04,500 --> 00:01:06,020
turning on the lights.

21
00:01:06,020 --> 00:01:10,520
All right, so I am in the booth this morning
with Bob Cabana.

22
00:01:10,520 --> 00:01:12,190
Bob, thanks for being here this morning.

23
00:01:12,190 --> 00:01:13,190
Absolutely, Josh.

24
00:01:13,190 --> 00:01:14,190
My pleasure.

25
00:01:14,190 --> 00:01:19,330
So, that's the most simple introduction possible
for you, but the longer introduction is -- let

26
00:01:19,330 --> 00:01:25,330
me see if I can get this right -- Naval Academy
graduate, Colonel in the Marine Corps...

27
00:01:25,330 --> 00:01:26,330
Yep.

28
00:01:26,330 --> 00:01:31,890
astronaut, test pilot, Kennedy Space Center
center director, and four-time Space Shuttle

29
00:01:31,890 --> 00:01:32,890
astronaut.

30
00:01:32,890 --> 00:01:33,890
Yeah, that sums it up.

31
00:01:33,890 --> 00:01:40,970
We also have a biking enthusiast, as well
as a recreational pilot, mud-runner, and I

32
00:01:40,970 --> 00:01:44,680
think the only things we're missing are juggler
and ballet in there.

33
00:01:44,680 --> 00:01:46,490
I'm a lousy juggler.

34
00:01:46,490 --> 00:01:50,570
But I'm doing a 100-mile bike ride on Sunday.

35
00:01:50,570 --> 00:01:52,270
I'm gonna do the Space Coast Century.

36
00:01:52,270 --> 00:01:53,460
Oh, very good, very good.

37
00:01:53,460 --> 00:01:54,460
That's awesome.

38
00:01:54,460 --> 00:01:58,410
But we have you here today to talk about the
International Space Station.

39
00:01:58,410 --> 00:02:04,710
It is very arguably the greatest engineering
accomplishment of humanity's history, and

40
00:02:04,710 --> 00:02:08,300
you had the privilege of being there when
we started the space station.

41
00:02:08,300 --> 00:02:13,260
What a phenomenal accomplishment the space
station is.

42
00:02:13,260 --> 00:02:19,310
Superb engineering test bed to prove the systems
that we need or long-duration space flight

43
00:02:19,310 --> 00:02:23,880
and establishing a presence beyond our home
planet and our solar system.

44
00:02:23,880 --> 00:02:29,760
Just a model of international and commercial
partnership, you know, as we move forward.

45
00:02:29,760 --> 00:02:36,760
But, I mean, when you consider that we've

got the United States, Russia, Canada, Japan,

46
00:02:36,760 --> 00:02:42,010
the European Space Agency and all its partners,
and we've been working together as one up

47
00:02:42,010 --> 00:02:46,010
there for now 20 years, I mean, that is amazing.

48
00:02:46,010 --> 00:02:52,390
In spite of all our political differences,
the crews on the space station and the crews

49
00:02:52,390 --> 00:02:56,180
on the ground in Mission Control, we work
together as one.

50
00:02:56,180 --> 00:03:04,299
And I think it's a model for how we move forward
as we return to the moon and we go on to Mars.

51
00:03:04,299 --> 00:03:06,570
[music]

52
00:03:06,570 --> 00:03:10,770
I want to kind of take people back to, like
you mentioned, 20 years ago.

53
00:03:10,770 --> 00:03:15,100
Can you give us a picture of what's happening
in the world and in the NASA world?

54
00:03:15,100 --> 00:03:18,600
Because obviously, like, this is a huge moment.

55
00:03:18,600 --> 00:03:20,210
It's a pivotal moment in our history.

56
00:03:20,210 --> 00:03:22,020

So, set a scene for me here.

57
00:03:22,020 --> 00:03:24,800
I'll go back a little bit further.

58
00:03:24,800 --> 00:03:33,090
As we were doing the International Space Station,
at the time, I'd gotten back off my third

59
00:03:33,090 --> 00:03:39,260
flight, my first command, and I was asked
to be the chief of NASA's Astronaut Office,

60
00:03:39,260 --> 00:03:43,380
and that was August 1994.

61
00:03:43,380 --> 00:03:48,800
And this is the time that we had just agreed
to do the Shuttle-Mir Program with our Russian

62
00:03:48,800 --> 00:03:49,800
partners.

63
00:03:49,800 --> 00:03:53,520
And we would not have been successful on the
International Space Station had we not first

64
00:03:53,520 --> 00:03:55,270
done Shuttle-Mir with the Russians.

65
00:03:55,270 --> 00:04:02,900
So, my first trip to Russia was in January
of 1995, not long after the wall had come

66
00:04:02,900 --> 00:04:03,900
down.

67
00:04:03,900 --> 00:04:08,100
And I went over to see how Norm Thagard and

Bonnie Dunbar were doing.

68
00:04:08,100 --> 00:04:13,520
They were the two astronauts priming back-up
training to fly that first Shuttle-Mir mission.

69
00:04:13,520 --> 00:04:21,220
And also to see what kind of accommodations
were in Star City for Shannon Lucid, who was

70
00:04:21,220 --> 00:04:24,400
also going up on Mir.

71
00:04:24,400 --> 00:04:27,680
And to me, it was really kind of surreal.

72
00:04:27,680 --> 00:04:36,300
I remember it was 11:00, 12:00 at night, and
I went cross-country skiing with Swedish astronaut

73
00:04:36,300 --> 00:04:41,480
Christer Fuglesang, who was over there training,
and here I am, an active-duty Colonel in the

74
00:04:41,480 --> 00:04:46,180
United States Marine Corps, cross-country
skiing with this Swede in the middle of the

75
00:04:46,180 --> 00:04:49,560
night on what was a secret base, going through
holes in fences.

76
00:04:49,560 --> 00:04:52,530
It was just really unique.

77
00:04:52,530 --> 00:04:53,530
Wow.

78
00:04:53,530 --> 00:04:59,500

But anyway, so, the Shuttle-Mir Program allowed
us to work with the Russians to do the International

79
00:04:59,500 --> 00:05:01,530
Space Station.

80
00:05:01,530 --> 00:05:09,000
The docking adaptor that we put -- STS-71
Atlantis was the first mission to dock with

81
00:05:09,000 --> 00:05:10,430
the Mir Space Station.

82
00:05:10,430 --> 00:05:13,410
After 20 years, our spacecraft are docked
in orbit again.

83
00:05:13,410 --> 00:05:16,699
Our new era of space exploration has begun.

84
00:05:16,699 --> 00:05:21,320
And we had moved the airlock out of the middeck
into the payload bay, and then we put the

85
00:05:21,320 --> 00:05:24,000
Russian docking adaptor on it.

86
00:05:24,000 --> 00:05:28,430
The systems that we actually docked with Mir,
and it's the same system that we docked with

87
00:05:28,430 --> 00:05:34,729
the International Space Station, was a Russian
design, and it was based on essentially the

88
00:05:34,729 --> 00:05:38,830
same docking mechanism that was on the Apollo-Soyuz
spacecraft.

89

00:05:38,830 --> 00:05:46,990
So, you know, it was really interesting building
that relationship, working with the Russians,

90
00:05:46,990 --> 00:05:50,800
and setting the stage for that first space
station assembly mission.

91
00:05:50,800 --> 00:05:57,110
So, I'd been chief of the Astronaut Office
for three years, and I really wanted to go

92
00:05:57,110 --> 00:06:00,139
fly in space again.

93
00:06:00,139 --> 00:06:04,980
And I got assigned to fly that first space
station assembly mission.

94
00:06:04,980 --> 00:06:09,479
From the Kennedy Space Center in Florida,
this is Space Shuttle Endeavour launch control.

95
00:06:09,479 --> 00:06:13,450
This mission will mark the beginning of a
five-year orbital assembly of the space station

96
00:06:13,450 --> 00:06:18,699
and kick off a new era of international space
exploration using the resources and expertise

97
00:06:18,699 --> 00:06:21,070
of 16 nations.

98
00:06:21,070 --> 00:06:22,070
What's that moment like?

99
00:06:22,070 --> 00:06:24,680
I mean, that's got to feel, like, really special.

100
00:06:24,680 --> 00:06:25,970
Well, it was just cool.

101
00:06:25,970 --> 00:06:30,990
I mean, it's always cool to fly at first,
but it was great to be back in the training

102
00:06:30,990 --> 00:06:32,759
flow for another mission.

103
00:06:32,759 --> 00:06:38,850
So, if I look back on, you know, that time
while I was chief of the Astronaut Office,

104
00:06:38,850 --> 00:06:41,110
we established our relationship with the Russians.

105
00:06:41,110 --> 00:06:46,220
I developed a relationship with the Russians
that I worked with in Star City.

106
00:06:46,220 --> 00:06:49,070
We had crews flying on the Mir Space Station.

107
00:06:49,070 --> 00:06:56,370
And I started assigning the crews for the
future International Space Station missions

108
00:06:56,370 --> 00:07:01,740
and had assigned crews to the first three
missions, essentially.

109
00:07:01,740 --> 00:07:08,389
And folks didn't necessarily want to be assigned
to space station missions at that time because

110
00:07:08,389 --> 00:07:10,610
the program had been delayed.

111
00:07:10,610 --> 00:07:15,440
We were flying eight to nine shuttle missions
a year, and you could fly a lot more frequently

112
00:07:15,440 --> 00:07:17,930
or fly a shuttle mission, you know.

113
00:07:17,930 --> 00:07:23,030
Committing to fly on a space station mission
meant training in Russia.

114
00:07:23,030 --> 00:07:24,630
It meant learning Russian.

115
00:07:24,630 --> 00:07:31,191
It meant being assigned at least two years
ahead of time to train to go fly on a space

116
00:07:31,191 --> 00:07:32,191
station.

117
00:07:32,191 --> 00:07:33,191
Wow.

118
00:07:33,191 --> 00:07:34,191
It was very challenging.

119
00:07:34,191 --> 00:07:39,830
It was not something that was easy, and our
method of training astronauts to fly in a

120
00:07:39,830 --> 00:07:43,940
space station and working with our international
partners has changed over time.

121
00:07:43,940 --> 00:07:49,460
It's still a two-year training flow for a
specific flight, but I think we have a better

122
00:07:49,460 --> 00:07:52,300
understanding of what's required and we have
a better understanding how to work with our

123
00:07:52,300 --> 00:07:56,770
Russian partners in learning the Soyuz systems
and the Russian systems on the space station

124
00:07:56,770 --> 00:07:57,850
and so on.

125
00:07:57,850 --> 00:08:03,290
So, bottom line, it was a challenge for those
folks on those first missions.

126
00:08:03,290 --> 00:08:10,699
Now, the assembly mission, that was run just
like a standard NASA Space Shuttle mission.

127
00:08:10,699 --> 00:08:14,240
And we were assigned as a crew a year ahead
of time.

128
00:08:14,240 --> 00:08:20,210
We ended up flying about a year late from
when we were supposed to because of delays

129
00:08:20,210 --> 00:08:21,229
that were encountered.

130
00:08:21,229 --> 00:08:26,819
But I remember it was November of 1998.

131
00:08:26,819 --> 00:08:33,409
I had the entire crew over to my house, and
we watched the FGB launch on a Proton rocket

132
00:08:33,409 --> 00:08:39,539
from the Baikonur Cosmodrome in Kazakhstan,

and that was a successful launch, and we knew

133
00:08:39,539 --> 00:08:40,930
we had a mission.

134
00:08:40,930 --> 00:08:43,660
And the FGB was the Russian portion, the first piece?

135
00:08:43,660 --> 00:08:44,660
The first segment.

136
00:08:44,660 --> 00:08:54,220
And that was actually -- if you look at the designation of that, that was Assembly Mission

137
00:08:54,220 --> 00:08:56,680
1 A/R -- American/Russian.

138
00:08:56,680 --> 00:09:04,070
And that's because the FGB was built in Russia, but we paid for it through Boeing -- on a

139
00:09:04,070 --> 00:09:08,560
contract with Boeing -- and it was a US-paid-for module built by the Russians.

140
00:09:08,560 --> 00:09:09,560
Hm.

141
00:09:09,560 --> 00:09:10,560
Wow.

142
00:09:10,560 --> 00:09:15,100
So, and the FGB -- Functional Cargo Block -- was named "Zarya", which means "sunrise"

143
00:09:15,100 --> 00:09:16,680
in Russian.

144
00:09:16,680 --> 00:09:19,630
And once that launched, we knew we had a mission.

145
00:09:19,630 --> 00:09:20,630
Yeah.

146
00:09:20,630 --> 00:09:26,330
And two weeks later, we were definitely going
to space with Node 1, the Unity node.

147
00:09:26,330 --> 00:09:27,330
So, we were STS-88.

148
00:09:27,330 --> 00:09:30,600
That was a Space Shuttle designation.

149
00:09:30,600 --> 00:09:36,790
But from an ISS point of view, we were flight
2A -- the second American assembly flight

150
00:09:36,790 --> 00:09:38,070
to ISS.

151
00:09:38,070 --> 00:09:39,990
But it was the first assembly mission.

152
00:09:39,990 --> 00:09:43,920
So, I had an awesome crew, you know.

153
00:09:43,920 --> 00:09:49,410
My pilot, Rick Sturckow, a Marine, that was
his first flight.

154
00:09:49,410 --> 00:09:56,210
Rick is now one of the test pilots for Virgin
Galactic, flying his rocket plane, you know.

155

00:09:56,210 --> 00:09:57,210
Oh, very cool.

156
00:09:57,210 --> 00:09:58,210
Oh, man.

157
00:09:58,210 --> 00:10:03,050
And he went on to fly four Space Shuttle missions,
commanding two of them.

158
00:10:03,050 --> 00:10:10,200
Jerry Ross was doing -- he was lead for the
EVAs, an EVA expert.

159
00:10:10,200 --> 00:10:16,230
Nancy Currie was my flight engineer and prime
arm operator.

160
00:10:16,230 --> 00:10:22,690
Nancy has a PhD in industrial engineering
and had been a helicopter pilot before coming

161
00:10:22,690 --> 00:10:23,690
to NASA.

162
00:10:23,690 --> 00:10:25,410
Jim Newman.

163
00:10:25,410 --> 00:10:31,110
Jim is an expert in rendezvous and proximity
operations.

164
00:10:31,110 --> 00:10:35,040
He was on the crew and also one of my EVA
members.

165
00:10:35,040 --> 00:10:38,480
And then we had Sergei Krikalev added to our
crew.

166
00:10:38,480 --> 00:10:47,300
Sergei had flown on the Space Shuttle back
when Vladimir Titov also flew on a Space Shuttle

167
00:10:47,300 --> 00:10:51,750
mission and had trained in the United States
as part of our exchanges.

168
00:10:51,750 --> 00:10:57,250
And he got added on to have Russian experience
as we went up.

169
00:10:57,250 --> 00:11:01,880
Sergei has just been a real asset on this
flight.

170
00:11:01,880 --> 00:11:07,060
I don't think we'd have hardly any pictures
or any time to do anything if we didn't have

171
00:11:07,060 --> 00:11:09,160
him helping out.

172
00:11:09,160 --> 00:11:12,816
He's super at helping us with EVA, and he's
super with just about everything.

173
00:11:12,816 --> 00:11:14,880
And so that was the crew.

174
00:11:14,880 --> 00:11:22,709
And on December 4th, we launched on the Space
Shuttle Endeavour off with the Node 1 tucked

175
00:11:22,709 --> 00:11:27,310
away in the payload bay to begin assembly
of the International Space Station.

176
00:11:27,310 --> 00:11:34,190

And we tried to launch on December 3rd, but
we were unable to.

177
00:11:34,190 --> 00:11:35,760
Things didn't go right in the launch count.

178
00:11:35,760 --> 00:11:37,250
It just wasn't real smooth.

179
00:11:37,250 --> 00:11:38,250
Sure.

180
00:11:38,250 --> 00:11:40,310
And the weather wasn't all that great.

181
00:11:40,310 --> 00:11:47,750
But we had an issue starting one of the auxiliary
power units, and by the time figured out that

182
00:11:47,750 --> 00:11:53,180
everything was okay, we counted down to 18
seconds and didn't go.

183
00:11:53,180 --> 00:11:54,180
Oh, man.

184
00:11:54,180 --> 00:11:55,180
This is ST.

185
00:11:55,180 --> 00:11:56,180
I copy.

186
00:11:56,180 --> 00:11:57,180
[Radio chatter]

187
00:11:57,180 --> 00:11:58,180
Is that an LCC hold for you Ray?

188

00:11:58,180 --> 00:11:59,180
Hold on.

189
00:11:59,180 --> 00:12:00,180
I don't know if we can explain it.

190
00:12:00,180 --> 00:12:04,040
We have an LCC violation.

191
00:12:04,040 --> 00:12:09,920
All right, last time, the pick up is 858:0101.

192
00:12:09,920 --> 00:12:10,920
Copy.

193
00:12:10,920 --> 00:12:11,920
And we concur.

194
00:12:11,920 --> 00:12:13,780
Heat com, everything looking okay on your
side?

195
00:12:13,780 --> 00:12:15,220
They're sitting right at 14-7.

196
00:12:15,220 --> 00:12:16,120
That's correct.

197
00:12:16,120 --> 00:12:18,320
Everything looks great.

198
00:12:18,320 --> 00:12:21,200
Anybody else?

199
00:12:21,200 --> 00:12:23,000
…Look closer, folks.

200
00:12:23,060 --> 00:12:23,920

You still a go?

201
00:12:24,040 --> 00:12:24,820
No, sir.

202
00:12:24,880 --> 00:12:25,940
On your mark.

203
00:12:25,940 --> 00:12:27,200
NTD flight.

204
00:12:27,200 --> 00:12:28,220
We are no-go for launch.

205
00:12:28,220 --> 00:12:30,240
Copy that.

206
00:12:30,240 --> 00:12:30,960
Yes, sir, we've picked up the count.

207
00:12:30,960 --> 00:12:32,520
We're at 24 seconds.

208
00:12:32,540 --> 00:12:34,240
Request to cut off.

209
00:12:34,280 --> 00:12:35,180
Please cut off.

210
00:12:35,190 --> 00:12:36,860
Yes, sir.

211
00:12:36,860 --> 00:12:42,399
And it was because of the time that it took
to determine whether or not, you know, everything

212
00:12:42,399 --> 00:12:47,360
was okay to launch, and then they realized

we didn't have -- we delayed enough that we

213
00:12:47,360 --> 00:12:50,300
didn't have enough propellant in order to
do the rendezvous.

214
00:12:50,300 --> 00:12:52,560
So, we scrubbed 18 seconds from launch.

215
00:12:52,560 --> 00:12:53,560
Oh.

216
00:12:53,560 --> 00:12:54,560
Close call there, Ed.

217
00:12:54,560 --> 00:12:55,560
Good job.

218
00:12:55,560 --> 00:12:58,080
Yeah, it was a close call.

219
00:12:58,080 --> 00:12:59,440
And it was okay, you know,

220
00:12:59,440 --> 00:13:00,440
Sure.

221
00:13:00,440 --> 00:13:04,790
We went back, and then the next night, we
went out, and it was absolutely perfect.

222
00:13:04,790 --> 00:13:08,510
It was one of the smoothest launch counts
I've seen.

223
00:13:08,510 --> 00:13:11,019
Everything continues to look good, and we
are cleared for launch today.

224
00:13:11,019 --> 00:13:13,450
No problems are being reported from the vehicle
or the crew.

225
00:13:13,450 --> 00:13:14,779
Hello Bruce, let's go do this tonight.

226
00:13:14,779 --> 00:13:15,779
Amen.

227
00:13:15,779 --> 00:13:16,779
We're gonna do it tonight.

228
00:13:16,779 --> 00:13:23,550
You have a very exciting mission ahead of
you, and we wish you maximum success.

229
00:13:23,550 --> 00:13:26,820
Endeavour Roger, thanks a lot.

230
00:13:26,820 --> 00:13:28,779
Ten, nine, eight.

231
00:13:28,779 --> 00:13:33,310
We have a go for main engine start.

232
00:13:33,310 --> 00:13:34,550
We have main engine start.

233
00:13:34,550 --> 00:13:35,760
Four, three, two, one.

234
00:13:35,760 --> 00:13:40,600
We have booster ignition and liftoff of the
Space Shuttle Endeavour with the first American

235
00:13:40,600 --> 00:13:44,860
element of the International Space Station

uniting our efforts in space to achieve our

236
00:13:44,860 --> 00:13:45,860
common goals.

237
00:13:45,860 --> 00:13:49,649
My daughter and I are real "Wizard of Oz"
aficionados.

238
00:13:49,649 --> 00:13:50,649
Okay.

239
00:13:50,649 --> 00:13:56,540
And they had re-released the "Wizard of Oz"
all color-corrected and up to date and everything

240
00:13:56,540 --> 00:13:57,950
right before my launch.

241
00:13:57,950 --> 00:13:58,950
Right.

242
00:13:58,950 --> 00:14:03,540
And so my daughter and I went to see it, and
it was awesome.

243
00:14:03,540 --> 00:14:08,950
So, the night we didn't launch, the next day,
there was a picture on the front page of the

244
00:14:08,950 --> 00:14:11,600
Orlando Sentinel.

245
00:14:11,600 --> 00:14:16,240
And it had Endeavour on the launch pad with
this huge rainbow, and Red Huber took the

246
00:14:16,240 --> 00:14:17,240
picture.

247
00:14:17,240 --> 00:14:20,149
I have it framed in my office, and Red signed
it for me.

248
00:14:20,149 --> 00:14:26,820
And like I said, everything went perfect,
and the first wake-up music that we had on

249
00:14:26,820 --> 00:14:31,730
orbit the day after launch was Judy Garland
singing "Somewhere Over the Rainbow."

250
00:14:31,730 --> 00:14:33,149
Awesome.

251
00:14:33,149 --> 00:14:43,130
Somewhere over the rainbow, way up high.

252
00:14:43,130 --> 00:14:44,700
I mean, I had tears coming down.

253
00:14:44,700 --> 00:14:45,700
It was emotional.

254
00:14:45,700 --> 00:14:46,700
Yeah.

255
00:14:46,700 --> 00:14:50,610
And, you know, it just -- it all came together.

256
00:14:50,610 --> 00:14:56,040
And so what I tell folks is that somewhere
over the rainbow, dreams really do come true

257
00:14:56,040 --> 00:15:01,060
because we launched over that rainbow, and
we had an absolutely dream flight from start

258
00:15:01,060 --> 00:15:05,400
to finish, Josh.

259
00:15:06,980 --> 00:15:12,000
There’s a dream that you dare to dream.

260
00:15:12,000 --> 00:15:15,540
Dreams really do come true.

261
00:15:15,540 --> 00:15:20,540
Endeavour Houston, good morning, and that
long distance dedication was to Bob from Sarah.

262
00:15:20,540 --> 00:15:21,540
Great.

263
00:15:21,540 --> 00:15:25,820
So, getting into kind of this mission, obviously,
like, there was a design for the space station,

264
00:15:25,820 --> 00:15:30,820
there was a plan for the space station, but
did you really kind of grasp the magnitude

265
00:15:30,820 --> 00:15:32,399
of what you all were beginning?

266
00:15:32,399 --> 00:15:33,399
Oh, absolutely.

267
00:15:33,399 --> 00:15:35,199
'Cause the implications have been tremendous.

268
00:15:35,199 --> 00:15:40,380
I think so, and we knew the criticality of
being successful on that very first flight.

269
00:15:40,380 --> 00:15:42,980

I mean, we trained really hard.

270
00:15:42,980 --> 00:15:46,470
It was -- You know, one of the things that
we talked about in building the International

271
00:15:46,470 --> 00:15:52,089
Space Station -- it was called the wall of
EVA, all the space walks that we had to do

272
00:15:52,089 --> 00:15:55,339
in order to be successful building this space
station.

273
00:15:55,339 --> 00:15:57,610
We had three of them on my flight.

274
00:15:57,610 --> 00:16:06,760
And, you know, what we showed was we know
how to do this, and we were extremely successful.

275
00:16:06,760 --> 00:16:13,220
I can't think of how it could've gone better
from start to finish.

276
00:16:13,220 --> 00:16:17,279
When you talk about the impact, did we know
what we were doing, I wish I'd have brought

277
00:16:17,279 --> 00:16:18,279
it with me.

278
00:16:18,279 --> 00:16:20,199
I can't remember it verbatim.

279
00:16:20,199 --> 00:16:24,330
But when we were inside the space station
for the first time -- and I'll come back to

280

00:16:24,330 --> 00:16:27,900
more of that -- but we made the first log
entry in the log book of the International

281
00:16:27,900 --> 00:16:32,829
Space Station, and I wrote -- I was sitting
there thinking about what I wanted to say,

282
00:16:32,829 --> 00:16:35,459
and I wrote it all down, and then the entire
crew signed it.

283
00:16:35,459 --> 00:16:36,459
Cool.

284
00:16:36,459 --> 00:16:40,750
But the bottom line was that we recognized
the importance of what we were doing.

285
00:16:40,750 --> 00:16:47,240
And the one line that I remember distinctly
was "From small beginnings, great things come."

286
00:16:47,240 --> 00:16:48,240
Awesome.

287
00:16:48,240 --> 00:16:52,140
And when I look back on that small beginning
on the International Space Station, just those

288
00:16:52,140 --> 00:16:57,420
two modules, a Unity mode -- and what an appropriate
name, Unity binding us all together as one

289
00:16:57,420 --> 00:17:03,899
-- and Zarya, sunrise, a new beginning, the
size of the International Space Station then

290
00:17:03,899 --> 00:17:08,759
and what it is today and all that we have

accomplished and learned on it and have yet

291
00:17:08,759 --> 00:17:11,659
to learn on it and what it is still capable
of doing.

292
00:17:11,659 --> 00:17:15,240
You know, it truly is just a phenomenal facility.

293
00:17:15,240 --> 00:17:17,630
So, you mentioned this log book.

294
00:17:17,630 --> 00:17:21,051
So, is this a document that every commander
that goes up writes in?

295
00:17:21,051 --> 00:17:22,949
Yeah, and the crew -- absolutely.

296
00:17:22,949 --> 00:17:24,059
It's up on orbit right now.

297
00:17:24,059 --> 00:17:26,449
It's the International Space Station log book.

298
00:17:26,449 --> 00:17:29,779
And hopefully on the last flight of the space
station, somebody's gonna bring it home.

299
00:17:29,779 --> 00:17:30,779
Yeah.

300
00:17:30,779 --> 00:17:33,330
So, is it just, like –

301
00:17:33,330 --> 00:17:35,320
It's like the ship's log, you know.

302

00:17:35,320 --> 00:17:36,700
"Captain Kirk, stardate."

303
00:17:36,700 --> 00:17:40,769
So, is it light-hearted?

304
00:17:40,769 --> 00:17:42,159
Is it very professional?

305
00:17:42,159 --> 00:17:45,919
Obviously yours was a very, like, important
milestone of, like, "We're doing this for

306
00:17:45,919 --> 00:17:47,720
the future".

307
00:17:47,720 --> 00:17:49,240
It's a takeoff on ship's logs.

308
00:17:49,240 --> 00:17:50,240
Okay.

309
00:17:50,240 --> 00:17:51,799
And there are special entries that get made.

310
00:17:51,799 --> 00:17:56,629
I mean, on New Year's Eve, there's always
a special entry that the officer of the deck

311
00:17:56,629 --> 00:18:00,289
has to put in the ship's log -- on special
occasions and stuff like that.

312
00:18:00,289 --> 00:18:05,519
So, it's a document that crews have signed,
that crews have made special entries in.

313
00:18:05,519 --> 00:18:11,109
It's not so much an exact "This is everything

that's gone on on the space station," but

314
00:18:11,109 --> 00:18:16,100
it kind of takes after, you know, the history
of log books on ships.

315
00:18:16,100 --> 00:18:19,979
So, kind of take us through this moment.

316
00:18:19,979 --> 00:18:22,649
Obviously, like, you have a mission on orbit.

317
00:18:22,649 --> 00:18:27,609
You're preparing your -- You've captured the
Russian portion.

318
00:18:27,609 --> 00:18:28,830
You're getting ready.

319
00:18:28,830 --> 00:18:33,049
Kind of talk us through -- like, what's this
like to finally, like, join these two and

320
00:18:33,049 --> 00:18:35,820
then allow it to become one, essentially?

321
00:18:35,820 --> 00:18:40,790
Well, you know, first off, watching Nancy
lift the node out of the payload bay, she

322
00:18:40,790 --> 00:18:46,510
had an inch or less of clearance on each side,
and she just -- I didn't know you could move

323
00:18:46,510 --> 00:18:47,510
the arm that slow.

324
00:18:47,510 --> 00:18:49,389
But, I mean, she did it so precisely.

325
00:18:49,389 --> 00:18:52,580
Had him take a shot where the camera was moving
because Nancy was moving it so slow that it

326
00:18:52,580 --> 00:19:00,039
looked like a still photo every time I tried
to take something.

327
00:19:00,039 --> 00:19:05,629
And then we lifted it up -- She lifted it
up and positioned it over the docking station,

328
00:19:05,629 --> 00:19:08,919
and I fired the thrusters to bring the two
pieces together.

329
00:19:08,919 --> 00:19:15,649
And then we used the docking system to drive
them close and close the latches, and that

330
00:19:15,649 --> 00:19:18,000
mated Unity to the Orbiter.

331
00:19:18,000 --> 00:19:21,549
Then, we did the rendezvous with the FGB.

332
00:19:21,549 --> 00:19:23,840
And it was a flawless rendezvous.

333
00:19:23,840 --> 00:19:29,299
And we have all kinds of tools during the
rendezvous -- the Ku band antenna on the Orbiter

334
00:19:29,299 --> 00:19:31,580
provides range and range rate.

335
00:19:31,580 --> 00:19:36,989
We had handheld lasers when we got in closer,

shooting it to get range and range rate.

336
00:19:36,989 --> 00:19:43,840
The Orbiter, the computers on it, even after
we upgraded, only had 256k of memory in each

337
00:19:43,840 --> 00:19:51,809
one, so you're limited as to the -- They're
very radiation-hardened computers, very reliable,

338
00:19:51,809 --> 00:19:56,239
and run extremely well, but we had to load
software depending on which phase of the mission

339
00:19:56,239 --> 00:19:59,149
we were in because it wasn't all in the computer's
capability.

340
00:19:59,149 --> 00:20:08,059
So, what we used to do to get more information
available to us is we'd bring IBM 760 laptop

341
00:20:08,059 --> 00:20:14,159
-- 760XD computers onboard -- and we set up
our own local area network pulling data off

342
00:20:14,159 --> 00:20:16,470
the PCMMU from the Orbiter.

343
00:20:16,470 --> 00:20:22,479
And one of the programs that we ran was called
RPOP -- Rendezvous Proximity Operations Program.

344
00:20:22,479 --> 00:20:27,099
And Jim Newman, prior to being selected as
an astronaut, used to train Rendezvous Proximity

345
00:20:27,099 --> 00:20:28,099
Operations.

346
00:20:28,099 --> 00:20:29,750
He was one of our trainers.

347
00:20:29,750 --> 00:20:32,259
And he actually wrote the programs for RPOP.

348
00:20:32,259 --> 00:20:36,499
So, I had that running, and that, it shows
your rendezvous profile.

349
00:20:36,499 --> 00:20:40,909
It predicts where you're gonna go so you kind
of know based on the jet firings, you know,

350
00:20:40,909 --> 00:20:41,909
how you're falling.

351
00:20:41,909 --> 00:20:45,899
And, of course, you've got guidance from the
Orbiter itself.

352
00:20:45,899 --> 00:20:51,309
And then I got Jim Newman, who has trained
people on all of this, you know, in my ear,

353
00:20:51,309 --> 00:20:52,659
"What do you think about a couple of ops?

354
00:20:52,659 --> 00:20:53,659
How about an in?”

355
00:20:53,659 --> 00:20:54,999
You know, so...

356
00:20:54,999 --> 00:20:58,340
Just suggestions, 'cause obviously you're
in charge at this point.

357

00:20:58,340 --> 00:20:59,340
I'm in charge.

358
00:20:59,340 --> 00:21:04,889
So, I'm using my onboard internal Coleman
filter to filter all this data that I have

359
00:21:04,889 --> 00:21:06,450
to do what I think is right for the rendezvous.

360
00:21:06,450 --> 00:21:08,070
And it went perfect.

361
00:21:08,070 --> 00:21:14,720
So, I flew the FGB right down into the payload
bay, and I couldn't see out the windows because

362
00:21:14,720 --> 00:21:15,929
the Node was in the way.

363
00:21:15,929 --> 00:21:19,940
After a certain point, I'm bringing it into
the payload bay just relying on cameras.

364
00:21:19,940 --> 00:21:24,019
I had a center-line camera looking up at it
and one on the end of the arm looking across

365
00:21:24,019 --> 00:21:25,359
at it.

366
00:21:25,359 --> 00:21:29,580
And flew it down so it was stopped perfectly
stable.

367
00:21:29,580 --> 00:21:32,889
The grapple fixture was three feet from the
end of the arm.

368

00:21:32,889 --> 00:21:36,519
All Nancy Currie had to do was move that arm
three feet and grab it, right?

369
00:21:36,519 --> 00:21:42,130
But we had to wait until we were over a Russian
ground site to confirm that the FGB was in

370
00:21:42,130 --> 00:21:43,991
free drift before we grabbed it.

371
00:21:43,991 --> 00:21:48,330
'Cause you wouldn't want to grab ahold of
it and have its flight control system still

372
00:21:48,330 --> 00:21:49,599
on, fighting the arm, right?

373
00:21:49,599 --> 00:21:50,599
Sure.

374
00:21:50,599 --> 00:21:58,119
And breaking the arm.

375
00:21:58,119 --> 00:22:02,159
Got drift?

376
00:22:02,159 --> 00:22:12,769
We were wondering -- we seem to be moving
pretty good here -- what the first ground

377
00:22:12,769 --> 00:22:13,769
site was over Russia where we could verify...and
make sure everything's good.

378
00:22:13,769 --> 00:22:14,769
Bob, good question.

379
00:22:14,769 --> 00:22:15,769

Sally says we're verifying it as we speak.

380
00:22:15,769 --> 00:22:17,389
So, it's all stable, it's right there, and
we're waiting to grab it.

381
00:22:17,389 --> 00:22:22,099
The orbiter -- It's hard to fly six degrees
of Frenet at once.

382
00:22:22,099 --> 00:22:27,390
Pitch, roll, and yaw as well as the translations,
you know, X, Y, and Z.

383
00:22:27,390 --> 00:22:32,409
So, we programmed the auto-pilot to maintain
the attitude, pitch, roll, and yaw, and then

384
00:22:32,409 --> 00:22:37,549
all you have to worry about are the translations.

385
00:22:37,549 --> 00:22:38,549
Sure.

386
00:22:38,549 --> 00:22:42,149
So, it drifts slightly, and there's a deadband
that it operates within, and when it reaches

387
00:22:42,149 --> 00:22:46,349
the edge of that deadband, the jets fire to
center it back up again.

388
00:22:46,349 --> 00:22:52,450
When the jets fire, you don't always get a
pure pitch, roll, and yaw.

389
00:22:52,450 --> 00:22:54,389
You get a roll-yaw coupling.

390

00:22:54,389 --> 00:22:55,389
Sure.

391
00:22:55,389 --> 00:22:56,389
Inertial coupling.

392
00:22:56,389 --> 00:22:59,820
Obviously, like, it's not like you're flying
through the air.

393
00:22:59,820 --> 00:23:01,440
It's a very different game.

394
00:23:01,440 --> 00:23:04,179
Yeah, but -- similar but different.

395
00:23:04,179 --> 00:23:10,289
So, what happens when you get this inertial
coupling is instead of getting a pure pitch,

396
00:23:10,289 --> 00:23:13,960
roll, or yaw, you get a translation, also.

397
00:23:13,960 --> 00:23:15,609
And we hit a deadband, and this happened.

398
00:23:15,609 --> 00:23:19,479
All right, well, everything was stable, and
we were just waiting to grab it.

399
00:23:19,479 --> 00:23:26,229
And so all of a sudden, this 45,000-pound
mass FGB is moving into the payload bay and

400
00:23:26,229 --> 00:23:27,229
toward the arm.

401
00:23:27,229 --> 00:23:28,470
It's gonna hit us.

402
00:23:28,470 --> 00:23:31,929
And so I fired the jets to back away from
it, and nothing happened.

403
00:23:31,929 --> 00:23:33,909
It's still coming to hit us.

404
00:23:33,909 --> 00:23:39,960
And you program the digital auto-pilot depending
on the phase of the mission, and we were in

405
00:23:39,960 --> 00:23:41,369
a very fine control.

406
00:23:41,369 --> 00:23:45,629
There's an A digital auto-pilot and a B that
you've programmed, and I was in the B DAP

407
00:23:45,629 --> 00:23:47,309
for very fine control.

408
00:23:47,309 --> 00:23:52,049
Fortunately, I had enough sense to select
the A DAP, get some more control power.

409
00:23:52,049 --> 00:23:54,379
And we were able to back away from it.

410
00:23:54,379 --> 00:24:01,919
And, you know, then that saved us there, and
move back in, got all stable again, and we're

411
00:24:01,919 --> 00:24:04,360
ready to grab it once it was in free drift.

412
00:24:04,360 --> 00:24:08,929
So, while all this was happening, you know,
Jim, who had been very vocal throughout the

413
00:24:08,929 --> 00:24:13,460
entire rendezvous offering advice -- it was
just dead silence in the cockpit, right?

414
00:24:13,460 --> 00:24:14,460
Nobody said anything.

415
00:24:14,460 --> 00:24:16,570
So, I'm assuming everybody's seeing this happen
in real time.

416
00:24:16,570 --> 00:24:17,570
Oh, yeah, yeah.

417
00:24:17,570 --> 00:24:18,570
So everyone knows what's going on.

418
00:24:18,570 --> 00:24:24,080
When it was all over, I said, "Jim," I said,
"...how come you didn't offer me any advice

419
00:24:24,080 --> 00:24:25,080
when that happened?”

420
00:24:25,080 --> 00:24:26,700
He said, "Ohh, I know when to keep my mouth
shut.”

421
00:24:26,700 --> 00:24:33,969
But that, you know, that was probably -- For
me, that was the most challenging part of

422
00:24:33,969 --> 00:24:39,149
the whole mission, you know, being able to
react to that and do the right thing.

423
00:24:39,149 --> 00:24:44,059
But once it was all stable again, we got over

a Russian ground site, they said, "You're

424
00:24:44,059 --> 00:24:45,549
clear to grapple."

425
00:24:45,549 --> 00:24:54,629
Nancy grabbed it, we lifted it up, positioned
it over the top of the Node on the other pressurized

426
00:24:54,629 --> 00:24:57,460
mating adaptor -- PMA2.

427
00:24:57,460 --> 00:25:02,929
And this was a blind -- We didn't have anything
where we could see precisely how we were aligned.

428
00:25:02,929 --> 00:25:08,269
We had a visual system that had dots that
was supposed to help us, and we had camera

429
00:25:08,269 --> 00:25:15,809
views and stuff that we'd practiced a lot
in the simulator, which is not always as exact

430
00:25:15,809 --> 00:25:17,620
as actually being in real life.

431
00:25:17,620 --> 00:25:18,620
Sure.

432
00:25:18,620 --> 00:25:22,719
We were able to position it, make sure it
was in the right spot, fired the thrusters

433
00:25:22,719 --> 00:25:26,869
again, brought those two pieces together,
and drove it tight.

434
00:25:26,869 --> 00:25:31,799

And at that point, we had the beginnings of
the International Space Station.

435
00:25:31,799 --> 00:25:33,419
[music]

436
00:25:33,419 --> 00:25:40,419
Jim and Jerry went out subsequently on a couple
of space walks connecting power and data connectors

437
00:25:40,419 --> 00:25:45,779
on the ISS, and then it came time for ingress.

438
00:25:45,779 --> 00:25:49,750
Prior to ingressing, Sergei and I activated
the space station.

439
00:25:49,750 --> 00:25:58,759
We had another set of 760XD computers back
on the aft flight deck where we sent the commands

440
00:25:58,759 --> 00:26:04,590
to power up and activate the International
Space Station and get its systems working.

441
00:26:04,590 --> 00:26:14,130
And we'd spent hours in the software development
facility in Houston -- Boeing, out at Sonny

442
00:26:14,130 --> 00:26:17,679
Carter -- testing the software.

443
00:26:17,679 --> 00:26:20,240
We found errors that were corrected.

444
00:26:20,240 --> 00:26:22,940
We did mission-essential integration tests
at KSC.

445

00:26:22,940 --> 00:26:30,309
We spent hours down here at the Cape testing
the Node software, hooked up to an emulator

446
00:26:30,309 --> 00:26:34,729
FGB, where we found more problems and corrected
them.

447
00:26:34,729 --> 00:26:40,450
And when we got on orbit and sent those commands,
I'm telling you, nobody was more surprised

448
00:26:40,450 --> 00:26:43,039
than me that everything worked perfect.

449
00:26:43,039 --> 00:26:44,109
Not one anomaly.

450
00:26:44,109 --> 00:26:49,309
I mean, it just -- every procedure that we
went through -- We powered it up, and everything

451
00:26:49,309 --> 00:26:50,309
worked perfectly.

452
00:26:50,309 --> 00:26:59,600
But this is our goal -- it's building a space
station and setting the pace for the future.

453
00:26:59,600 --> 00:27:02,840
We're sure enjoying it up here.

454
00:27:02,840 --> 00:27:07,159
It's extremely challenging, but it's also
extremely rewarding.

455
00:27:07,159 --> 00:27:12,669
And when you get to look out the window and
Zarya and Unity joined together and knowing

456
00:27:12,669 --> 00:27:13,669
that you get to go inside tomorrow, it's pretty
awesome.

457
00:27:13,669 --> 00:27:20,480
And that set the stage for ingress into the
FGB, which was on December 10, 1998.

458
00:27:20,480 --> 00:27:29,409
And when it came time to enter the space station
for the first time, I'd gotten a lot of questions

459
00:27:29,409 --> 00:27:31,230
from the media -- who's gonna be the first
one inside?

460
00:27:31,230 --> 00:27:32,230
And I didn't tell anybody.

461
00:27:32,230 --> 00:27:33,899
I didn't even tell the crew.

462
00:27:33,899 --> 00:27:37,899
And when it came time to open the hatch, I
said, "Sergei, get up here."

463
00:27:37,899 --> 00:27:43,009
Cabana and Sergei Krikalev enter the module.

464
00:27:43,009 --> 00:27:45,320
Yeah, and there's video of this out there.

465
00:27:45,320 --> 00:27:50,289
So, I mean, you can see literally, like, you're
there at the passageway between these two

466
00:27:50,289 --> 00:27:51,289
modules...

467
00:27:51,289 --> 00:27:56,940
Commander Bob Cabana and Sergei Krikalev entering
the module together.

468
00:27:56,940 --> 00:28:01,309
The first astronauts aboard the International
Space Station in orbit.

469
00:28:01,309 --> 00:28:05,590
...and you grab Sergei, and walk us through
what happens.

470
00:28:05,590 --> 00:28:08,950
So, I believe that this is an international
space station.

471
00:28:08,950 --> 00:28:12,320
We need to enter as an international crew.

472
00:28:12,320 --> 00:28:19,289
So, every hatch we opened as we went from
the airlock through the docking station into

473
00:28:19,289 --> 00:28:26,339
the pressurized mating adaptor into the Node,
into PMA2, into the FGB, Sergei and I enter

474
00:28:26,339 --> 00:28:27,499
each one side-by-side.

475
00:28:27,499 --> 00:28:31,830
So, there was no first person in the International
Space Station.

476
00:28:31,830 --> 00:28:34,499
I got to be the first American, and Sergei
was the first Russian.

477
00:28:34,499 --> 00:28:39,229

But I thought that really important that we
make that statement, that we enter as a international

478
00:28:39,229 --> 00:28:40,229
crew.

479
00:28:40,229 --> 00:28:45,279
And then when we'd finally ingressed through
all the modules and we were into the FGB,

480
00:28:45,279 --> 00:28:51,099
we set up and we did a press conference from
inside the FGB -- the first press conference

481
00:28:51,099 --> 00:28:52,989
from the International Space Station with
the entire crew.

482
00:28:52,989 --> 00:28:53,989
It's unbelievable.

483
00:28:53,989 --> 00:28:54,989
If you've got live coverage, look at the volume
Sergei is floating around in.

484
00:28:54,989 --> 00:29:05,789
We are so pleased and excited and proud to
be a part of the team that made this happen.

485
00:29:05,789 --> 00:29:17,149
And our special thanks to all the hours, all
the hard work.

486
00:29:17,149 --> 00:29:25,749
We remember when Unity was just an aluminum
shell, and it is a truly fine piece of hardware.

487
00:29:25,749 --> 00:29:26,749
And just thanks to everybody in the Space
Station program for all their hard work.

488
00:29:26,749 --> 00:29:30,109
And, man, we had a lot of work to do to get
it ready.

489
00:29:30,109 --> 00:29:37,119
And Sergei, in addition to being on that flight,
was also on the first crew to actually live

490
00:29:37,119 --> 00:29:39,879
on the International Space Station.

491
00:29:39,879 --> 00:29:45,529
The first crew that launched the space station
-- that was in October of 2000.

492
00:29:45,529 --> 00:29:52,019
And Commander of the Soyuz was Yuri Gidzenko,
and the commander of the space station was

493
00:29:52,019 --> 00:29:53,539
Bill Shepherd.

494
00:29:53,539 --> 00:29:58,249
And Sergei was the engineer on that flight.

495
00:29:58,249 --> 00:30:03,390
And we wanted to make sure that we got as
much done to have it ready for when the crew

496
00:30:03,390 --> 00:30:06,200
arrived so that they wouldn't have as much
work to do.

497
00:30:06,200 --> 00:30:13,339
So, we did everything that we had to do -- and
most of what we were doing was removing launch

498
00:30:13,339 --> 00:30:14,340

constraint bolts.

499
00:30:14,340 --> 00:30:19,950
There were extra bolts and panels put in to
make it strong enough to survive the launch,

500
00:30:19,950 --> 00:30:23,309
but were not required once it was on orbit,
and they had to come out.

501
00:30:23,309 --> 00:30:28,330
So, we were moving all the launch restraint
bolts and panels.

502
00:30:28,330 --> 00:30:30,969
We went into the FGB, and we cleaned all the
filters.

503
00:30:30,969 --> 00:30:31,969
We opened up.

504
00:30:31,969 --> 00:30:34,660
You know, once the system started running
and the fans were running to scrub the air

505
00:30:34,660 --> 00:30:40,849
and everything, any debris that didn't get
caught on the ground was now on all the filters,

506
00:30:40,849 --> 00:30:45,989
so we cleaned all the filters in the modules
and just continued to get stuff set up and

507
00:30:45,989 --> 00:30:48,789
ready for the crew.

508
00:30:48,789 --> 00:30:53,799
That night -- I had a rule that -- I had a
couple crew members that really needed eight

509
00:30:53,799 --> 00:30:55,479
hours of sleep.

510
00:30:55,479 --> 00:31:01,529
So, on the middeck of the Orbiter, my rule
was we're gonna darken ship on the middeck

511
00:31:01,529 --> 00:31:03,909
when it's sleep time, and you can stay up.

512
00:31:03,909 --> 00:31:05,269
You don't have to go to bed if you don't want
to.

513
00:31:05,269 --> 00:31:12,029
You can sit up on the flight deck, look out
the window, you know, send e-mails home, whatever,

514
00:31:12,029 --> 00:31:14,970
but you got to be quiet.

515
00:31:14,970 --> 00:31:17,759
And Jim Newman stayed up late.

516
00:31:17,759 --> 00:31:19,119
He was up on the flight deck.

517
00:31:19,119 --> 00:31:23,840
And this was when, you know, the crew had
gone to bed.

518
00:31:23,840 --> 00:31:25,200
We're docked to the space station.

519
00:31:25,200 --> 00:31:27,619
The hatch is open and everything.

520
00:31:27,619 --> 00:31:29,719

And we slept on the Orbiter.

521
00:31:29,719 --> 00:31:34,830
And he wants to go look in the space station
one more time before he goes to sleep.

522
00:31:34,830 --> 00:31:40,259
So, he goes down on the middeck, and he's
being really quiet, you know, and where I

523
00:31:40,259 --> 00:31:44,309
was sleeping and Nancy Currie was sleeping,
it was where the airlock used to be, and we

524
00:31:44,309 --> 00:31:45,599
had these big bags in there.

525
00:31:45,599 --> 00:31:49,039
We called them refrigerator bags, but it had
all the stuff that we were taking up to space

526
00:31:49,039 --> 00:31:52,549
for the space station, leaving stuff on it
and everything.

527
00:31:52,549 --> 00:31:56,659
And I was snuggled between two of them and
she between two others, and he went between

528
00:31:56,659 --> 00:32:00,029
them in the middle, and he doesn't want to
wake me, you know.

529
00:32:00,029 --> 00:32:04,380
And he goes into the airlock, turns the corner,
and goes up into the space station, and who

530
00:32:04,380 --> 00:32:10,179
does he find but me and Sergei Krikalev in
the space station.

531
00:32:10,179 --> 00:32:11,539
Hard to leave?

532
00:32:11,539 --> 00:32:12,539
It was.

533
00:32:12,539 --> 00:32:13,629
So, we were just doing work.

534
00:32:13,629 --> 00:32:17,469
We were just doing more -- and we were just
talking about "What does this mean?

535
00:32:17,469 --> 00:32:21,210
What is the future of what we have done here?”

536
00:32:21,210 --> 00:32:22,289
And he joined us.

537
00:32:22,289 --> 00:32:28,749
And if you were on a -- We set up sleep shifts
on the Orbiter, so it was like eight hours

538
00:32:28,749 --> 00:32:29,749
of sleep.

539
00:32:29,749 --> 00:32:34,339
So, think of it as I'm going to bed at 11:00
at night, and I'm getting up at 7:00 in the

540
00:32:34,339 --> 00:32:36,350
morning, all right?

541
00:32:36,350 --> 00:32:38,669
That's my eight hours of sleep.

542
00:32:38,669 --> 00:32:47,129

And I think it was finally about 4:00 in the morning, and I turned to Jim and Sergei and

543
00:32:47,129 --> 00:32:49,929
I said, "That's it, you know.

544
00:32:49,929 --> 00:32:50,929
We're done.

545
00:32:50,929 --> 00:32:51,929
We got to get some sleep.

546
00:32:51,929 --> 00:32:53,309
We got a really busy day tomorrow.

547
00:32:53,309 --> 00:32:57,960
We're gonna close things up, you know, and get ready for another EVA".

548
00:32:57,960 --> 00:33:00,980
And so I made the three of us go to sleep.

549
00:33:00,980 --> 00:33:03,529
But that was a special night.

550
00:33:03,529 --> 00:33:10,269
I mean, it was just -- Just to be in the space station, spending all that time in there,

551
00:33:10,269 --> 00:33:15,869
making the log book entry, talking about what the future of this was, what it meant to be

552
00:33:15,869 --> 00:33:19,940
working together to lay the groundwork to establish a presence.

553
00:33:19,940 --> 00:33:27,769
And, you know, I look back now, and anybody

that is 18 years old or younger in the world

554
00:33:27,769 --> 00:33:30,659
has never known a time that there weren't
humans in space.

555
00:33:30,659 --> 00:33:35,429
Since October 2000, we've had a permanent
crew on the International Space Station, and

556
00:33:35,429 --> 00:33:40,459
that's our destiny, is to establish that presence,
to learn, to explore, to go beyond our home

557
00:33:40,459 --> 00:33:41,459
planet.

558
00:33:41,459 --> 00:33:42,459
Now, I just, you know -- It was pretty special.

559
00:33:42,459 --> 00:33:43,459
Words can't express it.

560
00:33:43,459 --> 00:33:47,629
It's unbelievable to be part of such a great
program bringing all these counties together,

561
00:33:47,629 --> 00:34:05,999
working together in space for everybody's
betterment, and just, you know, it's really

562
00:34:05,999 --> 00:34:09,579
outstanding hardware.

563
00:34:09,579 --> 00:34:14,619
It's just so nice inside.

564
00:34:14,619 --> 00:34:19,889
It's really nice to be in a new home.

565
00:34:19,889 --> 00:34:20,889
[music]

566
00:34:20,889 --> 00:34:23,460
We're celebrating 20 years of the International
Space Station.

567
00:34:23,460 --> 00:34:29,740
So, looking ahead, more years of the space
station, more years of NASA, what do the next

568
00:34:29,740 --> 00:34:31,450
20 to 60 years look like for us?

569
00:34:31,450 --> 00:34:32,450
What's the future?

570
00:34:32,450 --> 00:34:35,899
I look back on -- Our first 60 years were
pretty darn amazing.

571
00:34:35,899 --> 00:34:36,899
Yeah.

572
00:34:36,899 --> 00:34:37,899
Right?

573
00:34:37,899 --> 00:34:38,980
And we have accomplished so much.

574
00:34:38,980 --> 00:34:41,210
But our next 60 years are gonna be better.

575
00:34:41,210 --> 00:34:46,879
You know, as amazing as the first 60 were,
the next 60 are gonna be phenomenal.

576

00:34:46,879 --> 00:34:53,659
I mean, look at the changes just here at the
Kennedy Space Center, how our multi-years

577
00:34:53,659 --> 00:34:55,919
of space board has grown and come to be.

578
00:34:55,919 --> 00:35:00,350
You know, and it's only gonna continue to
grow.

579
00:35:00,350 --> 00:35:05,119
The gateway, the platform we're gonna put
in orbit around the moon, it allows access

580
00:35:05,119 --> 00:35:07,230
to anywhere on the lunar surface.

581
00:35:07,230 --> 00:35:09,180
It'll be an international partnership.

582
00:35:09,180 --> 00:35:11,299
It's gonna be a commercial partnership.

583
00:35:11,299 --> 00:35:17,349
You know, people talk about commercial space
and government space and new space and old

584
00:35:17,349 --> 00:35:20,550
space, and there's only one space, you know?

585
00:35:20,550 --> 00:35:26,740
And if we as a nation are gonna be successful,
we need them all integrated together as one.

586
00:35:26,740 --> 00:35:33,700
And I just look forward to how we are working
together and what we are accomplishing.

587

00:35:33,700 --> 00:35:35,410
And it's gonna be phenomenal.

588
00:35:35,410 --> 00:35:39,099
And then going on to Mars.

589
00:35:39,099 --> 00:35:42,650
I think we have an absolutely outstanding
future in front of us, and we just need to

590
00:35:42,650 --> 00:35:47,339
continue to apply ourselves, and great things
are gonna come.

591
00:35:47,339 --> 00:35:48,450
It's gonna be better.

592
00:35:48,450 --> 00:35:51,359
The next 60 are gonna be far better than the
first.

593
00:35:51,359 --> 00:35:54,280
You often wonder, "Was I born too soon or
too late?

594
00:35:54,280 --> 00:35:57,380
Man, if I'd have been born sooner, maybe I
could've gone to the moon" or "Man, if I were

595
00:35:57,380 --> 00:35:58,910
born later, maybe I could go to Mars."

596
00:35:58,910 --> 00:36:04,039
But the bottom line is, we were all born for
the right time for us in this life that we

597
00:36:04,039 --> 00:36:10,670
live, and I can't imagine not being here at
the Kennedy Space Center right now, being

598
00:36:10,670 --> 00:36:14,500
part of this amazing team that is making history.

599
00:36:14,500 --> 00:36:20,069
And we're gonna look back years from now and
say, "Wow, wasn't that an amazing time?

600
00:36:20,069 --> 00:36:21,650
Look what we put in place.

601
00:36:21,650 --> 00:36:23,859
Look what we made happen and where we are
now".

602
00:36:23,859 --> 00:36:28,380
And that, to me, it's one of the most rewarding
things ever.

603
00:36:28,380 --> 00:36:33,269
I don't want to overlook the fact that you
are the Kennedy Space Center director.

604
00:36:33,269 --> 00:36:38,170
You are now actually the second longest-serving
center director.

605
00:36:38,170 --> 00:36:44,240
I got a couple more years to go, and I'll
be up there with Dr. Debus, but yeah, it's

606
00:36:44,240 --> 00:36:45,460
been a while.

607
00:36:45,460 --> 00:36:47,410
It's rewarding to me to see what we've accomplished.

608
00:36:47,410 --> 00:36:50,330
I got asked the other day, "Hey, what motivates
you, Bob?”

609
00:36:50,330 --> 00:36:54,780
I challenged somebody that was in first, I
said, "Well, what motivates you?”

610
00:36:54,780 --> 00:37:00,299
They were working on a project, and I was
trying to get them to use what motivates them

611
00:37:00,299 --> 00:37:03,760
to be able to use for part of this project
and build on it.

612
00:37:03,760 --> 00:37:08,750
And they asked me the next day out of curiosity,
"Well, what motivates you?”

613
00:37:08,750 --> 00:37:16,310
And I said, "What motivates me is being privileged
to lead this awesome KSC team, to be able

614
00:37:16,310 --> 00:37:23,670
to walk into a space and see the smile on
someone's face when you ask them what they're

615
00:37:23,670 --> 00:37:29,480
doing and they explain it to you and they
share the joy and the work that they have.”

616
00:37:29,480 --> 00:37:31,190
That motivates me, you know.

617
00:37:31,190 --> 00:37:37,549
It's the success that we have had in our transition
from shuttle to establish ourselves as this

618
00:37:37,549 --> 00:37:39,510
multi-user space port today.

619

00:37:39,510 --> 00:37:43,609
That success motivates me to want to do better
and to even do more.

620
00:37:43,609 --> 00:37:49,900
You know, I'm motivated just driving over
the Indian River Lagoon in the morning, seeing

621
00:37:49,900 --> 00:37:56,880
the sun come up over the Atlantic Ocean and
being part of this amazing team at this beautiful

622
00:37:56,880 --> 00:38:02,700
wildlife preserve that's the Kennedy Space
Center.

623
00:38:02,700 --> 00:38:04,029
Very good.

624
00:38:04,029 --> 00:38:08,109
Thinking about the coming year, if you had
to pick the one thing you're looking forward

625
00:38:08,109 --> 00:38:09,109
to the most –

626
00:38:09,109 --> 00:38:10,109
Commercial crew.

627
00:38:10,109 --> 00:38:11,109
No doubt.

628
00:38:11,109 --> 00:38:12,109
This is number-one priority.

629
00:38:12,109 --> 00:38:15,609
You know, everybody gets disappointed when
they're not the number-one priority.

630

00:38:15,609 --> 00:38:17,779
'Cause everybody feels they're number-one.

631
00:38:17,779 --> 00:38:22,531
And programs feel slighted when you don't
mention them, but the bottom line is, it's

632
00:38:22,531 --> 00:38:27,529
crucial to us to get a crew flying to the
International Space Station on a US rocket

633
00:38:27,529 --> 00:38:28,720
from US soil.

634
00:38:28,720 --> 00:38:30,079
And I want to see that happen.

635
00:38:30,079 --> 00:38:34,630
And we've got -- right now, we're on track,
you know.

636
00:38:34,630 --> 00:38:35,790
It can change.

637
00:38:35,790 --> 00:38:40,539
We're not gonna fly till we're ready to fly,
but SpaceX is looking at an un-crewed demo

638
00:38:40,539 --> 00:38:45,829
flight in January with a crewed flight in
June of next year, and Boeing is looking at

639
00:38:45,829 --> 00:38:49,730
an un-crewed flight in April with a crewed
flight in August.

640
00:38:49,730 --> 00:38:55,789
I got asked, "Well, is there more pressure
now that the Soyuz had the anomaly and the

641
00:38:55,789 --> 00:38:57,240
crew had to abort?”

642
00:38:57,240 --> 00:38:58,490
And the answer is no.

643
00:38:58,490 --> 00:39:01,270
The pressure was always on the commercial
crew team.

644
00:39:01,270 --> 00:39:06,970
We can't work any harder or faster than we're
already working, and we are not gonna do anything

645
00:39:06,970 --> 00:39:08,170
that is unsafe.

646
00:39:08,170 --> 00:39:11,130
We have procedures that we need to follow.

647
00:39:11,130 --> 00:39:17,849
We have criteria that need to be met, and
we're are gonna ensure that as we work through

648
00:39:17,849 --> 00:39:21,869
the processes, that we meet those criteria,
that we can certify this vehicle, and that

649
00:39:21,869 --> 00:39:26,130
when we fly, it's gonna be safe to fly and
we understand the risk that we're taking.

650
00:39:26,130 --> 00:39:27,490
It will never be without risk.

651
00:39:27,490 --> 00:39:28,830
We are in a risky business.

652

00:39:28,830 --> 00:39:33,241
But we need to understand what the risk is,
mitigate is as best as possible, and make

653
00:39:33,241 --> 00:39:36,660
sure that we're not taking undue risk.

654
00:39:36,660 --> 00:39:41,450
And I will feel a lot more comfortable on
both of these vehicles when we have shown

655
00:39:41,450 --> 00:39:44,000
that we have a proven abort capability.

656
00:39:44,000 --> 00:39:52,560
And as the Soyuz has shown, you know, capsules
are very robust in an abort situation, much

657
00:39:52,560 --> 00:39:54,350
more so than a winged vehicle.

658
00:39:54,350 --> 00:39:59,869
And I just want to make sure that, you know,
if we don't always have mission success, we

659
00:39:59,869 --> 00:40:01,549
ensure that we take care of the crew.

660
00:40:01,549 --> 00:40:04,960
I don't want ever want to have to have another
Challenger or Columbia.

661
00:40:04,960 --> 00:40:10,369
Yeah, and you mentioned that Soyuz mission,
seeing the two crew members back on Earth,

662
00:40:10,369 --> 00:40:11,710
hugging family.

663

00:40:11,710 --> 00:40:15,099
That's a priceless moment, when you're like,
"Man, this didn't go like we planned, but

664
00:40:15,099 --> 00:40:16,099
everybody's home".

665
00:40:16,099 --> 00:40:17,099
Amen.

666
00:40:17,099 --> 00:40:21,190
So, thinking about just the nature of this
international partnership, I think something

667
00:40:21,190 --> 00:40:28,290
that people -- if they're aware of -- have
no clue the full magnitude of how much we

668
00:40:28,290 --> 00:40:31,150
cooperate, especially when we're in space
like that.

669
00:40:31,150 --> 00:40:34,529
And I think that especially now with kind
of the way things are politically in the world,

670
00:40:34,529 --> 00:40:36,750
there's lots of tumultuous things, obviously.

671
00:40:36,750 --> 00:40:41,509
Just recently, we had an issue with the Soyuz
launch where we had an American and a Russian

672
00:40:41,509 --> 00:40:42,509
on board.

673
00:40:42,509 --> 00:40:50,390
Both safe, but certainly, like, this very
amazing bond that holds us together that really,

674
00:40:50,390 --> 00:40:54,150
from my perspective, there is no division
when we're in space.

675
00:40:54,150 --> 00:40:56,099
Can you speak to -- Is that the reality?

676
00:40:56,099 --> 00:40:57,520
How does that happen?

677
00:40:57,520 --> 00:41:01,470
Like, how do you leave Earth and, like, everything
becomes better?

678
00:41:01,470 --> 00:41:06,190
Because we have a common goal, and we depend
on one another for our health and welfare.

679
00:41:06,190 --> 00:41:11,520
We're in a very harsh environment where everybody
has to work together as a team to be successful.

680
00:41:11,520 --> 00:41:14,090
And you can't have division.

681
00:41:14,090 --> 00:41:15,280
You have to have a common purpose.

682
00:41:15,280 --> 00:41:17,550
You have to perform as a team.

683
00:41:17,550 --> 00:41:23,599
And, you know, more astronauts than I have
said it -- when you look down on the Earth

684
00:41:23,599 --> 00:41:28,930
from 200 miles high, there are very few boundaries
that you see.

685
00:41:28,930 --> 00:41:33,599
What you see is this beautiful blue jewel
of a planet with its amazing continents and

686
00:41:33,599 --> 00:41:40,319
colors and thin little hazy line that's our
atmosphere over the top of it.

687
00:41:40,319 --> 00:41:45,720
That's all that's protecting us from that
harsh void of space with its ultraviolet radiation

688
00:41:45,720 --> 00:41:50,420
and extreme temperatures and hostility, if
you will.

689
00:41:50,420 --> 00:41:54,610
And space is the darkest, blackest void you
can possibly imagine.

690
00:41:54,610 --> 00:41:59,250
No black on Earth does it justice when you're
on the sunlit side of the Earth.

691
00:41:59,250 --> 00:42:04,500
And so I think, you know, we look down on
Earth and we see ourselves as humanity, not

692
00:42:04,500 --> 00:42:09,400
as citizens of any one country, but citizens
of Planet Earth.

693
00:42:09,400 --> 00:42:10,579
And so we work together.

694
00:42:10,579 --> 00:42:17,369
We have a common goal, a common purpose, and
it's larger than anything on Earth.

695

00:42:17,369 --> 00:42:22,769
As a pilot in the Marine Corps and as an astronaut,
I've had the privilege of traveling all over

696
00:42:22,769 --> 00:42:28,240
the world and seeing a lot of different cultures
and places and talking to a lot of different

697
00:42:28,240 --> 00:42:31,890
people, and we all want the same things, Josh.

698
00:42:31,890 --> 00:42:37,589
We want good things for our children, we want
to provide for our families, we want health

699
00:42:37,589 --> 00:42:45,569
and happiness, and you know, I think in many
ways, many, many ways, we are more alike than

700
00:42:45,569 --> 00:42:46,569
we are different.

701
00:42:46,569 --> 00:42:52,500
And what we need to focus on more is our alikeness
and not our differences.

702
00:42:52,500 --> 00:42:59,500
Well, Bob, from your military service to then
your service here with NASA for a very long

703
00:42:59,500 --> 00:43:02,380
time -- Bob, thanks for being here today.

704
00:43:02,380 --> 00:43:04,119
Absolutely my pleasure, Josh.

705
00:43:04,119 --> 00:43:07,530
Thanks for having me on the show.

706

00:43:07,530 --> 00:43:11,820
As Bob mentioned at the top of the show, from
small beginnings, great things come.

707
00:43:11,820 --> 00:43:15,140
I'm Joshua Santora, and that's our show.

708
00:43:15,140 --> 00:43:16,890
Thanks for stopping by the Rocket Ranch.

709
00:43:16,890 --> 00:43:21,230
And special thanks to our guest -- Marine,
pilot, astronaut, and center director Bob

710
00:43:21,230 --> 00:43:22,230
Cabana.

711
00:43:22,230 --> 00:43:28,049
To learn more about the International Space
Station, go to nasa.gov/ISS.

712
00:43:28,049 --> 00:43:31,630
And please check out our other NASA podcast
to learn more about what's happening at all

713
00:43:31,630 --> 00:43:35,880
of our NASA centers at nasa.gov/podcasts.

714
00:43:35,880 --> 00:43:41,309
A special shout-out to my colleagues -- our
producer, John Sackman, sound man, Lorne Mathre,

715
00:43:41,309 --> 00:43:45,670
editor, Michelle Stone, and our production
manager, Amanda Griffin.