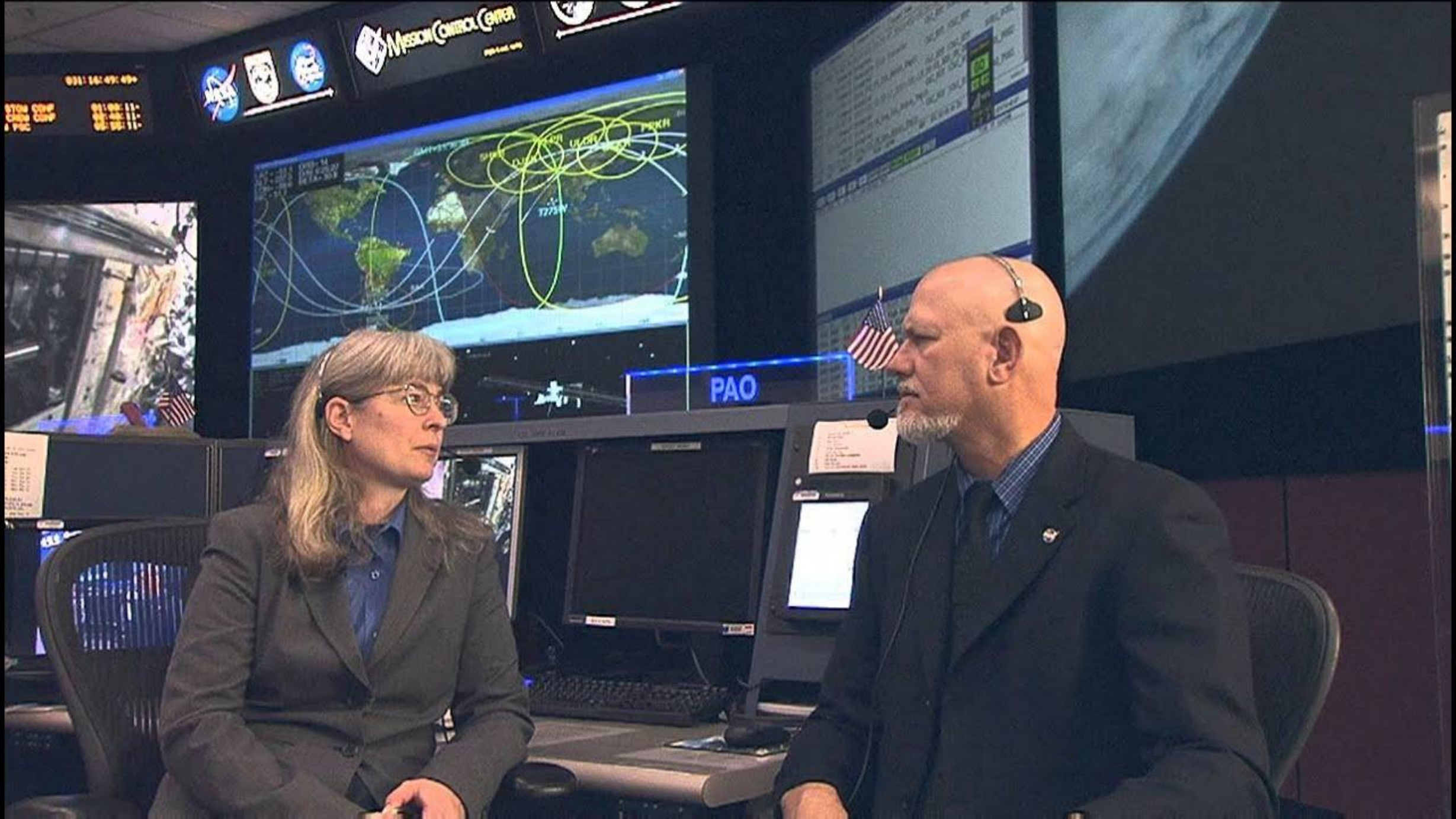
MISSION CONTROL CENTER
PAO

1
00:00:00,296 --> 00:00:02,286
>> We have Sandy
Fletcher joining us.

2
00:00:02,286 --> 00:00:07,616
Sandy is the lead for EVA,
or space walking systems

3
00:00:07,616 --> 00:00:10,906
for Expedition 34, and we're
really happy to have her here.

4
00:00:10,906 --> 00:00:11,356
Welcome.

5
00:00:12,116 --> 00:00:12,596
>> Good morning.

6
00:00:12,596 --> 00:00:14,146
Thank you for having me.

7
00:00:14,146 --> 00:00:17,296
>> Sandy, you've been working
this week with the crew on orbit

8
00:00:17,296 --> 00:00:21,176
as they did some
preplanned procedures

9
00:00:21,176 --> 00:00:24,346
on cleaning the spacesuits,
or getting them ready

10
00:00:24,346 --> 00:00:26,256
so that they're always
at the ready.

11
00:00:26,296 --> 00:00:29,346
It's part of something called

the International Space Station

12
00:00:30,766 --> 00:00:33,116
Testbed for Analog Research.

13
00:00:33,466 --> 00:00:34,946
Can you explain a little bit

14
00:00:34,946 --> 00:00:36,496
about what that's
all about for us?

15
00:00:37,106 --> 00:00:40,626
>> Sure. It's learning what we
can do for our next generation

16
00:00:40,626 --> 00:00:44,406
in space, and right now, the
ISS is a great environment

17
00:00:44,776 --> 00:00:47,546
where we have a crew in orbit
working and living in space,

18
00:00:48,156 --> 00:00:50,136
and we can learn
from that experience.

19
00:00:50,136 --> 00:00:51,826
You know, we used to
do shuttle flights,

20
00:00:51,826 --> 00:00:53,436
which we are a couple
of weeks long.

21
00:00:53,546 --> 00:00:56,646
You know, they were very
hectic, very fast paced.

22
00:00:57,536 --> 00:00:59,186
You know, the crew had
a lot of things to do

23
00:00:59,816 --> 00:01:01,096
and a short time to do them in.

24
00:01:01,096 --> 00:01:03,946
And now we have guys living
on orbit, men and women,

25
00:01:04,016 --> 00:01:06,476
for six months at a
time, and we've got

26
00:01:06,476 --> 00:01:07,666
to learn how to do that.

27
00:01:08,236 --> 00:01:11,306
And what's nice is, we have
immediate comm with these guys.

28
00:01:11,306 --> 00:01:14,676
So if they have a question,
they can call down right away,

29
00:01:14,676 --> 00:01:17,546
and we can answer them right
away, and we have data most

30
00:01:17,546 --> 00:01:19,496
of the time, so we can
watch over their shoulder.

31
00:01:20,226 --> 00:01:23,796
But when we start going out into
further reaches, so when we go

32
00:01:23,796 --> 00:01:27,576

to the moon and Mars and maybe
even asteroids, there's going

33
00:01:27,576 --> 00:01:31,206
to be a comm delay, and that
means not only will they have

34
00:01:31,236 --> 00:01:34,126
to wait for answers via
comm, but we won't be able

35
00:01:34,126 --> 00:01:35,666
to watch the data in realtime.

36
00:01:36,206 --> 00:01:38,566
So just like the guys who
drive the rovers on Mars,

37
00:01:38,986 --> 00:01:40,896
they have to send up a
whole bunch of commands

38
00:01:40,896 --> 00:01:42,136
and then hope that they work.

39
00:01:42,846 --> 00:01:45,196
We have to rely on our
astronauts to make sure

40
00:01:45,196 --> 00:01:47,596
that they can handle
whatever happens nominally

41
00:01:47,596 --> 00:01:49,966
and off nominally
without as much help

42
00:01:50,106 --> 00:01:51,746
as we've been giving
them in the past.

43
00:01:52,346 --> 00:01:56,386
So iSTAR, which is this ISS
Testbed for Analog Research,

44
00:01:57,136 --> 00:01:59,286
is trying to do that and mimic

45
00:01:59,286 --> 00:02:02,706
that so we can learn lessons
while we still have data in comm

46
00:02:02,706 --> 00:02:05,216
with the crew, but see
how they're going to react

47
00:02:05,216 --> 00:02:06,646
when they don't have
us to talk with.

48
00:02:07,486 --> 00:02:10,096
>> Okay. You mentioned
communications delays.

49
00:02:10,096 --> 00:02:12,126
How long would those
be if you're going

50
00:02:12,126 --> 00:02:13,566
to Mars or an asteroid?

51
00:02:14,336 --> 00:02:17,176
>> They can be several
minutes long, so we do need

52
00:02:17,176 --> 00:02:19,806
to have people being able
to make a quick decision.

53

00:02:20,346 --> 00:02:23,696
If something goes wrong, do
we have to save the system,

54
00:02:23,926 --> 00:02:26,396
do we have to wait until
somebody takes a look at it,

55
00:02:26,876 --> 00:02:29,116
or is it a minor enough
problem that they can handle it

56
00:02:29,276 --> 00:02:31,856
without any communication
and assistance from us.

57
00:02:32,146 --> 00:02:34,686
And, of course, these people
are very smart and we train them

58
00:02:34,686 --> 00:02:38,116
for two years before
they fly, so, you know,

59
00:02:38,116 --> 00:02:40,676
they really don't need
us for most things.

60
00:02:41,366 --> 00:02:46,086
>> Well, so, what specifically
are you looking at in terms

61
00:02:46,086 --> 00:02:48,216
of these procedures
for the spacesuits?

62
00:02:49,116 --> 00:02:50,836
>> Normally when we
write procedures,

63

00:02:51,476 --> 00:02:54,086
we have the understanding that
we'll be watching the data

64
00:02:54,376 --> 00:02:57,666
and have communications with
them if they have questions.

65
00:02:57,666 --> 00:02:59,836
So a lot of the notes
that we write

66
00:02:59,836 --> 00:03:02,146
in the procedures are
really actually for us

67
00:03:02,146 --> 00:03:04,396
on Mission Control to
remind us to do things.

68
00:03:05,296 --> 00:03:09,536
Now we're -- and we're the
systems experts, so you know,

69
00:03:09,536 --> 00:03:11,016
whereas they study for two years

70
00:03:11,016 --> 00:03:13,556
to learn every system
fairly well,

71
00:03:14,176 --> 00:03:16,306
we have the in-depth
knowledge to understand,

72
00:03:16,306 --> 00:03:19,446
so we can be shorthanded with
ourselves and our comments

73
00:03:20,026 --> 00:03:21,366

and know what we mean by them.

74
00:03:22,276 --> 00:03:24,666
Now, imagine we hand these
procedures to somebody who's not

75
00:03:24,666 --> 00:03:25,566
as familiar with them.

76
00:03:25,986 --> 00:03:29,186
We need to give them a little
bit more depth and the ability

77
00:03:29,186 --> 00:03:32,286
to understand what's the
next thing they need to do

78
00:03:32,286 --> 00:03:33,676
and why do they need to do it.

79
00:03:34,276 --> 00:03:36,296
So we do have to adjust
our procedures that way.

80
00:03:37,186 --> 00:03:38,536
>> So we're looking right now

81
00:03:38,536 --> 00:03:40,536
at some recorded video
of Tom Marshburn.

82
00:03:40,536 --> 00:03:42,776
He was one of the crew
members you've been working

83
00:03:42,776 --> 00:03:43,556
with this week.

84
00:03:43,776 --> 00:03:45,876

Can you explain a little bit
about what he's doing here,

85
00:03:45,876 --> 00:03:47,076
what he's taking care of?

86
00:03:47,826 --> 00:03:51,376
>> Sure. You can see we've got
two spacesuits in the airlock.

87
00:03:51,586 --> 00:03:54,266
The helmets are off, so you
can actually look inside the

88
00:03:54,266 --> 00:03:59,396
spacesuits, and periodically,
when we don't use our EMUs

89
00:03:59,456 --> 00:04:02,746
for actual space walks,
we do have to make sure

90
00:04:02,746 --> 00:04:05,286
that the systems are
operating nominally,

91
00:04:05,286 --> 00:04:08,586
and that means we run the
pump, which runs the air,

92
00:04:08,856 --> 00:04:11,026
or really oxygen and
water through the system.

93
00:04:11,786 --> 00:04:15,136
We found, again, because
we were actually doing it,

94
00:04:15,236 --> 00:04:17,926
we had a period of a couple

of years where we had suits

95
00:04:17,926 --> 00:04:21,276
on orbit, and we
didn't use them.

96
00:04:21,816 --> 00:04:23,916
And they got, the
water stagnated

97
00:04:23,916 --> 00:04:25,316
and then the pumps didn't work

98
00:04:25,316 --> 00:04:27,656
when we actually needed
them to go out EVA.

99
00:04:28,356 --> 00:04:31,236
So we've learned that we've got
to occasionally start them up,

100
00:04:31,266 --> 00:04:33,386
just like you want
to, if you have a car.

101
00:04:33,966 --> 00:04:36,196
You can't let the car sit
in the garage for too long.

102
00:04:36,196 --> 00:04:37,446
You have to make sure it runs,

103
00:04:37,446 --> 00:04:39,846
so we do the same
thing with the suits.

104
00:04:39,976 --> 00:04:41,586
So that's what Tom
is working on here.

105
00:04:42,206 --> 00:04:45,146
>> And now, specifically,
you did a cooling loop scrub

106
00:04:45,146 --> 00:04:50,176
and you put in some additives
to the cooling water, right?

107
00:04:50,636 --> 00:04:51,216
>> That's correct.

108
00:04:51,866 --> 00:04:54,156
So part of the running
of the water

109
00:04:54,156 --> 00:04:56,586
through the system is
we have filters in line.

110
00:04:56,796 --> 00:05:00,386
As the water stays stagnant
in those lines, you know,

111
00:05:00,386 --> 00:05:04,046
it is contacting metal, so small
particulates will come out.

112
00:05:04,616 --> 00:05:06,846
These components are very small,

113
00:05:06,846 --> 00:05:09,826
and so it really doesn't take
a lot of contamination for them

114
00:05:09,826 --> 00:05:11,796
to seize up and stop working.

115
00:05:12,246 --> 00:05:15,896
So we filter the water for about

an hour, and that filters them,

116
00:05:15,896 --> 00:05:19,466
not only in the suits, but
you can see the two connecting

117
00:05:19,466 --> 00:05:22,266
lines, we call them the
servicing cooling umbilical,

118
00:05:22,266 --> 00:05:26,046
those are the two white lines
going back into the crew lock.

119
00:05:26,396 --> 00:05:30,766
And we also scrub the
airlock heat exchanger.

120
00:05:31,046 --> 00:05:32,776
Then, once we do that,

121
00:05:32,776 --> 00:05:34,896
we actually add iodine
into the system.

122
00:05:35,456 --> 00:05:38,986
That'll run for about two hours,
and that's to kill any organic

123
00:05:38,986 --> 00:05:41,916
or microbe growth
that may be occurring.

124
00:05:42,556 --> 00:05:43,726
>> Okay. Well, how
did it all go?

125
00:05:44,386 --> 00:05:46,096
>> Actually, it went
extremely well.

126
00:05:46,336 --> 00:05:51,666
When I drained Tom Marshburn, we
had gone through this procedure.

127
00:05:51,666 --> 00:05:53,736
It's a version that we
run here on the ground,

128
00:05:53,736 --> 00:05:55,266
and they run on orbit.

129
00:05:55,266 --> 00:05:56,906
And there are a lot of parts

130
00:05:56,906 --> 00:05:59,216
where we actually do the
commanding on the ground.

131
00:05:59,216 --> 00:06:01,786
So I told him, oh, don't worry
about this part, you won't have

132
00:06:01,786 --> 00:06:04,136
to do this in orbit and
we'll watch the data.

133
00:06:04,506 --> 00:06:06,166
So we'll tell you if
anything goes wrong.

134
00:06:06,946 --> 00:06:09,036
So I have to go and
tell him, okay,

135
00:06:09,036 --> 00:06:11,256
we're going to do a little
bit, something different now.

136

00:06:11,416 --> 00:06:14,536
And he did a lot of
complex commanding

137
00:06:14,746 --> 00:06:18,826
that they would not be
expected to do normally.

138
00:06:19,706 --> 00:06:22,216
So actually, that was the part
that I was concerned about,

139
00:06:22,506 --> 00:06:25,916
not that he couldn't do
it, but it's not something

140
00:06:25,916 --> 00:06:27,486
that we typically
train them to do.

141
00:06:27,826 --> 00:06:30,276
And he did a fantastic
job, and we learned a lot

142
00:06:30,276 --> 00:06:33,406
from his experience
going through it.

143
00:06:33,406 --> 00:06:35,946
>> So what you're talking
about is that there are steps

144
00:06:35,946 --> 00:06:38,156
in all these procedures
that just call

145
00:06:38,156 --> 00:06:40,406
out for Mission Control,
well, do this, now.

146

00:06:40,866 --> 00:06:44,236
But instead, now it
calls out and says, Tom,

147
00:06:44,236 --> 00:06:45,566
you've got to go do this, now.

148
00:06:46,216 --> 00:06:46,666
>> That's right.

149
00:06:47,186 --> 00:06:50,026
And it's really quite a bit of
difference between how we used

150
00:06:50,026 --> 00:06:53,966
to run things through
Mercury and up

151
00:06:53,966 --> 00:06:56,146
through the shuttle
phase, we had a lot

152
00:06:56,146 --> 00:06:57,966
of switches for crews to flip.

153
00:06:58,216 --> 00:07:01,236
We had fairly limited commanding
from the ground to the vehicle.

154
00:07:01,676 --> 00:07:04,206
We relied very heavily
on crew interaction

155
00:07:04,206 --> 00:07:05,906
with the systems
to make it operate.

156
00:07:06,786 --> 00:07:11,296
Station, ISS, the International
Space Station, is very different

157
00:07:11,296 --> 00:07:13,726
in that sense, because
we want at crew to focus

158
00:07:13,726 --> 00:07:15,626
on doing science
and experiments,

159
00:07:16,546 --> 00:07:17,776
so we do a lot more commanding

160
00:07:17,776 --> 00:07:20,106
from the ground and
using computers.

161
00:07:20,876 --> 00:07:24,866
So in this case, we sort of went
back to old school, if you will,

162
00:07:25,016 --> 00:07:29,926
and had Tom command the space
station through the interfaces,

163
00:07:29,926 --> 00:07:31,236
the computers they
have on board.

164
00:07:31,846 --> 00:07:34,176
And he probably sent
more commands

165
00:07:34,176 --> 00:07:37,106
than most astronauts
do on board.

166
00:07:37,436 --> 00:07:40,566
>> Okay. Well, Sandy, tell us
a little bit about yourself.

167
00:07:40,566 --> 00:07:43,346
Where are you from and
where did you go to school,

168
00:07:43,346 --> 00:07:45,216
and how did you get into
this space business?

169
00:07:46,166 --> 00:07:49,046
>> Well, I'm originally from
northern New England, from Maine

170
00:07:49,046 --> 00:07:51,066
and New Hampshire,
very rural areas,

171
00:07:51,066 --> 00:07:54,416
which are not necessarily
hotbeds of space activity.

172
00:07:55,036 --> 00:07:58,456
And nobody I ever knew
growing up was involved

173
00:07:58,456 --> 00:07:59,666
with the space industry,

174
00:07:59,666 --> 00:08:02,256
but I was just a little
kid running around,

175
00:08:02,386 --> 00:08:03,746
like most kids are.

176
00:08:04,416 --> 00:08:08,316
And then I saw this movie called
Star Wars, and that just --

177
00:08:09,386 --> 00:08:11,316

everything sort of
came into focus

178
00:08:11,316 --> 00:08:14,136
and I didn't know how I was
going to do something like that,

179
00:08:14,166 --> 00:08:16,386
but I knew that's what I
wanted to be involved with,

180
00:08:16,386 --> 00:08:18,926
just the excitement of space
and traveling through space.

181
00:08:19,786 --> 00:08:22,206
And I have very supportive
parents and family

182
00:08:22,206 --> 00:08:25,076
who never said, well,
you can't do that.

183
00:08:25,146 --> 00:08:27,616
And they were very encouraging.

184
00:08:27,966 --> 00:08:29,996
And so I eventually
went to school.

185
00:08:30,506 --> 00:08:33,416
I studied physics, first
at Wesleyan University,

186
00:08:33,546 --> 00:08:34,376
which is in Connecticut,

187
00:08:34,376 --> 00:08:35,876
and then the University
of New Hampshire.

188
00:08:35,876 --> 00:08:37,306
I have a master's
degree in physics.

189
00:08:38,256 --> 00:08:39,166
>> Wow, interesting.

190
00:08:39,456 --> 00:08:41,576
Well Sandy, thanks so much
for being with us here today

191
00:08:41,576 --> 00:08:44,396
and explaining to us
what iSTAR is all about,

192
00:08:44,396 --> 00:08:47,486
and why crew members are
having to do more work

193
00:08:47,486 --> 00:08:49,076
on board the space station.

194
00:08:49,406 --> 00:08:52,606
We look forward to hearing
what the future might be

195
00:08:52,606 --> 00:08:54,666
for these kinds of
procedures as we go farther

196
00:08:54,666 --> 00:08:55,826
and farther out into space.

197
00:08:55,826 --> 00:08:56,336
Thanks a lot.

198
00:08:56,536 --> 00:08:58,446
>> Well, thank you,

I appreciate it.

199
00:08:58,746 --> 00:08:59,776
>> That's Sandy Fletcher,

200
00:08:59,776 --> 00:09:04,516
the lead Extravehicular
Unit Engineer