



1  
00:00:01,033 --> 00:00:03,900  
[music playing]

2  
00:00:17,166 --> 00:00:22,666  
- So welcome to the 2015  
NASA Ames Summer Series.

3  
00:00:22,666 --> 00:00:27,000  
Space biology is important  
for many reasons.

4  
00:00:27,000 --> 00:00:30,566  
It informs  
our human-exploration missions.

5  
00:00:30,566 --> 00:00:33,500  
It informs astrobiology.

6  
00:00:33,500 --> 00:00:36,566  
It informs our life support  
in space

7  
00:00:36,566 --> 00:00:41,966  
and it informs how  
we function here on Earth.

8  
00:00:41,966 --> 00:00:45,133  
Most importantly,  
space biology is a science

9  
00:00:45,133 --> 00:00:47,000  
that looks at the mechanisms

10  
00:00:47,000 --> 00:00:51,300  
of biology, or life.

11  
00:00:51,300 --> 00:00:54,666  
Space biology  
is also an integral part

12

00:00:54,666 --> 00:00:58,733  
of NASA Ames research.

13

00:00:58,733 --> 00:01:04,033  
We would not be able to do  
the science that we want to do,

14

00:01:04,033 --> 00:01:05,400  
or advance it,

15

00:01:05,400 --> 00:01:11,400  
without astronauts  
doing the research in space.

16

00:01:11,400 --> 00:01:13,833  
But astronauts are  
more than just the people

17

00:01:13,833 --> 00:01:15,833  
who do the experiments in space.

18

00:01:15,833 --> 00:01:19,266  
They have a life  
that we could learn

19

00:01:19,266 --> 00:01:23,166  
and inspire to do and follow.

20

00:01:24,533 --> 00:01:26,533  
Today's talk, entitled

21

00:01:26,533 --> 00:01:31,700  
"Rats, Folks, and Jellyfish:  
Studying Life in Space,"

22

00:01:31,700 --> 00:01:36,700  
will be given by  
Astronaut Dr. Rhea Seddon.

23

00:01:38,833 --> 00:01:43,200

Rhea began her career  
by receiving a degree--

24

00:01:43,200 --> 00:01:45,833

a Bachelors of Arts  
in Physiology--

25

00:01:45,833 --> 00:01:49,733

from UC Berkeley in 1970.

26

00:01:49,733 --> 00:01:52,500

She followed that  
with a medical degree--

27

00:01:52,500 --> 00:01:54,266

an MD degree--

28

00:01:54,266 --> 00:01:57,166

from the University of  
Tennessee College of Medicine

29

00:01:57,166 --> 00:02:02,533

in 1973.

30

00:02:02,533 --> 00:02:05,000

After completing her degrees,

31

00:02:05,000 --> 00:02:07,566

she went and followed  
and did both an internship

32

00:02:07,566 --> 00:02:10,400

and a residency in surgery,

33

00:02:10,400 --> 00:02:13,300

completing the residency  
in 1978,

34

00:02:13,300 --> 00:02:16,966  
whereupon she joined NASA  
as an astronaut.

35

00:02:16,966 --> 00:02:20,600  
She was one  
of the first six women

36

00:02:20,600 --> 00:02:24,266  
to enter the astronaut program.

37

00:02:24,266 --> 00:02:29,100  
She's a veteran  
of three shuttle missions--

38

00:02:29,100 --> 00:02:35,100  
STS-51-D  
on Discovery in 1985;

39

00:02:35,100 --> 00:02:40,266  
STS-40,  
which also stands for SLS-1,

40

00:02:40,266 --> 00:02:43,800  
Space Life Sciences 1,

41

00:02:43,800 --> 00:02:45,900  
where she was  
a Mission Specialist

42

00:02:45,900 --> 00:02:48,933  
in 1991 on Columbia;

43

00:02:48,933 --> 00:02:52,633  
and then STS-58/SLS-2,

44

00:02:52,633 --> 00:02:57,666  
Payload Commander this time,

on Columbia.

45

00:02:57,666 --> 00:02:59,633

That's quite an achievement,

46

00:02:59,633 --> 00:03:02,333

both being a doctor  
and astronaut,

47

00:03:02,333 --> 00:03:04,966

but she didn't stop there.

48

00:03:04,966 --> 00:03:07,166

So in 2010,

49

00:03:07,166 --> 00:03:10,166

she got a certificate  
in Creative Writing

50

00:03:10,166 --> 00:03:13,266

from the Middle  
Tennessee State University.

51

00:03:13,266 --> 00:03:15,033

So you would think that,  
after all that,

52

00:03:15,033 --> 00:03:18,733

you would just retire  
from going to school.

53

00:03:18,733 --> 00:03:21,933

She finished that,  
and then put that into action

54

00:03:21,933 --> 00:03:24,366

and wrote a book  
and published it.

55

00:03:24,366 --> 00:03:26,033

So with that,  
please welcome me--

56

00:03:26,033 --> 00:03:32,033

join me in welcoming  
astronaut Dr. Rhea Seddon.

57

00:03:32,033 --> 00:03:33,833

[applause]

58

00:03:33,833 --> 00:03:36,833

- Nicely done.

59

00:03:38,533 --> 00:03:41,033

Thank you, Dr. Cohen.

60

00:03:41,033 --> 00:03:44,666

As you can tell,  
it's been an amazing life.

61

00:03:44,666 --> 00:03:46,366

And people say,

62

00:03:46,366 --> 00:03:48,600

"How in the world did  
you go from this to that

63

00:03:48,600 --> 00:03:49,800

to this to that?"

64

00:03:49,800 --> 00:03:53,233

And, you know, for me,

65

00:03:53,233 --> 00:03:56,466

it's interesting to ponder that,

66

00:03:56,466 --> 00:03:58,900

when you get to be my age,

67

00:03:58,900 --> 00:04:01,000  
and you begin to think  
about,

68

00:04:01,000 --> 00:04:04,033  
"Well, what happened that  
made me do those things?"

69

00:04:04,033 --> 00:04:07,833  
I can remember  
being a small girl

70

00:04:07,833 --> 00:04:12,266  
in the backyard  
of a small town in Tennessee,

71

00:04:12,266 --> 00:04:15,100  
and my father said, "See?"

72

00:04:15,100 --> 00:04:17,333  
And there was Sputnik.

73

00:04:17,333 --> 00:04:20,066  
So even at 11 years old,

74

00:04:20,066 --> 00:04:22,100  
I knew that  
that was the beginning

75

00:04:22,100 --> 00:04:25,400  
of something awesome  
for my generation.

76

00:04:25,400 --> 00:04:29,500  
It was the beginning  
of the Space Age.

77

00:04:29,500 --> 00:04:32,200

And of course,  
there didn't seem to be

78

00:04:32,200 --> 00:04:34,400  
any place for me in that.

79

00:04:34,400 --> 00:04:36,033  
They weren't even flying  
humans yet.

80

00:04:36,033 --> 00:04:38,866  
And even when they began to fly  
humans, it was only men.

81

00:04:38,866 --> 00:04:42,566  
It was only pilots--  
only test pilots.

82

00:04:42,566 --> 00:04:44,533  
But I was interested in science,

83

00:04:44,533 --> 00:04:48,900  
and was fascinated  
by the human body.

84

00:04:48,900 --> 00:04:53,033  
And so,  
when I finished high school,

85

00:04:53,033 --> 00:04:55,900  
I thought, "Well,  
what is the best university

86

00:04:55,900 --> 00:04:59,033  
in the United States  
in the life sciences?"

87

00:04:59,033 --> 00:05:01,966  
And it was this strange place  
called Berkeley.

88

00:05:01,966 --> 00:05:05,133

Now, I have never--

I had never been to California.

89

00:05:05,133 --> 00:05:11,133

But I applied

and was accepted in 1965.

90

00:05:11,133 --> 00:05:14,200

And for those of you

who are old enough to remember,

91

00:05:14,200 --> 00:05:16,400

that was an interesting year.

92

00:05:16,400 --> 00:05:18,800

That was the Free Speech

Movement.

93

00:05:18,800 --> 00:05:22,033

And that morphed

into the anti-war movement

94

00:05:22,033 --> 00:05:27,066

and the People's Park movement

and free love and drugs.

95

00:05:27,066 --> 00:05:29,066

And there I was

in the middle of it.

96

00:05:29,066 --> 00:05:30,333

I sort of felt like--

97

00:05:30,333 --> 00:05:33,300

later on, when I watched

the movie "Forrest Gump"--

98

00:05:33,300 --> 00:05:36,366

just kind of like, "Here I am,"  
and "Why am I here?"

99

00:05:36,366 --> 00:05:39,566

But I certainly got  
a good education at Berkeley,

100

00:05:39,566 --> 00:05:41,100

both in physiology

101

00:05:41,100 --> 00:05:43,666

and in life in general.

102

00:05:43,666 --> 00:05:45,766

But I was one of the few people

103

00:05:45,766 --> 00:05:48,333

at the time  
that was majoring in Science.

104

00:05:48,333 --> 00:05:51,766

Women just didn't do that,  
particularly women that I knew.

105

00:05:51,766 --> 00:05:54,966

Luckily, I had some good mentors  
along the way.

106

00:05:54,966 --> 00:05:57,466

But as I was finishing  
Berkeley, you know,

107

00:05:57,466 --> 00:06:00,733

I thought, "I'd really like  
to go to medical school."

108

00:06:00,733 --> 00:06:01,833

But you can imagine,

109

00:06:01,833 --> 00:06:02,933

coming from Tennessee,

110

00:06:02,933 --> 00:06:04,800

my first couple

of years at Berkeley,

111

00:06:04,800 --> 00:06:06,233

I struggled to keep up

112

00:06:06,233 --> 00:06:08,833

with all of the rest

of the people who were pre-med.

113

00:06:08,833 --> 00:06:12,233

About a third of the class

started as pre-med students,

114

00:06:12,233 --> 00:06:13,566

so there was a lot

of competition.

115

00:06:13,566 --> 00:06:14,933

My grades weren't great.

116

00:06:14,933 --> 00:06:18,133

I joined the Pre-Med Club,

117

00:06:18,133 --> 00:06:20,366

and the advisor

kept saying, "You know,

118

00:06:20,366 --> 00:06:21,566

if you don't bring

your grades up,

119

00:06:21,566 --> 00:06:23,066

you'll never be able

to get into school."

120

00:06:23,066 --> 00:06:25,066

And of course, getting  
into the California schools

121

00:06:25,066 --> 00:06:29,100

was close to impossible  
unless you had a 3.98.

122

00:06:29,100 --> 00:06:30,766

When I applied  
to medical school,

123

00:06:30,766 --> 00:06:33,133

I had a 3.25.

124

00:06:33,133 --> 00:06:35,100

My last two quarters  
were straight As,

125

00:06:35,100 --> 00:06:37,366

and apparently  
that counted for something.

126

00:06:37,366 --> 00:06:38,966

And it certainly counted  
for something at

127

00:06:38,966 --> 00:06:40,833

The University of Tennessee,

128

00:06:40,833 --> 00:06:42,100

where not too many students

129

00:06:42,100 --> 00:06:44,166

were applying from Berkeley,  
as you can imagine,

130

00:06:44,166 --> 00:06:47,433

but Berkeley had  
such a great reputation.

131  
00:06:47,433 --> 00:06:49,566  
But they were not taking  
very many women

132  
00:06:49,566 --> 00:06:50,933  
in medical school back then.

133  
00:06:50,933 --> 00:06:54,633  
It's hard for young women today  
to realize that

134  
00:06:54,633 --> 00:06:57,333  
women were just not being taken  
into those fields.

135  
00:06:57,333 --> 00:06:59,633  
But the University of Tennessee,  
the year I applied,

136  
00:06:59,633 --> 00:07:02,366  
decided that they were gonna  
take a lot of women

137  
00:07:02,366 --> 00:07:05,900  
because there was a big push  
to train more women doctors.

138  
00:07:05,900 --> 00:07:09,400  
So in a class of 100,  
they took six women.

139  
00:07:09,400 --> 00:07:12,066  
That was a lot.

140  
00:07:12,066 --> 00:07:15,366  
But, you know,  
it took hard work,

141

00:07:15,366 --> 00:07:16,700

it took dedication,

142

00:07:16,700 --> 00:07:19,433

and it took fitting in

with a group of men

143

00:07:19,433 --> 00:07:22,533

and learning to work with men

144

00:07:22,533 --> 00:07:24,100

and with male professors.

145

00:07:24,100 --> 00:07:26,566

There were very few female

professors.

146

00:07:26,566 --> 00:07:29,466

There were a lot of nurses

that helped along the way--

147

00:07:29,466 --> 00:07:32,466

nurses who hoped that women

would succeed in medicine.

148

00:07:32,466 --> 00:07:34,133

So I was fortunate to--

149

00:07:34,133 --> 00:07:36,400

that that was part

of my background,

150

00:07:36,400 --> 00:07:40,466

learning to work

with all kinds of people.

151

00:07:40,466 --> 00:07:42,600

My skills, my talents,

152

00:07:42,600 --> 00:07:47,833

my interests  
fell into the world of surgery.

153

00:07:47,833 --> 00:07:49,833

And if it was strange  
to have a woman doctor,

154

00:07:49,833 --> 00:07:53,633

it was even stranger  
to have a woman surgeon.

155

00:07:53,633 --> 00:07:57,400

But I applied to the university  
program and was accepted,

156

00:07:57,400 --> 00:07:59,166

and was the only woman

157

00:07:59,166 --> 00:08:02,366

they'd ever had  
in the surgery program.

158

00:08:02,366 --> 00:08:04,033

But again, lots of hard work,

159

00:08:04,033 --> 00:08:06,666

lots of people  
who wanted me to succeed.

160

00:08:06,666 --> 00:08:09,466

And I was successful in that.

161

00:08:09,466 --> 00:08:13,533

And so I was gonna go  
be a rich surgeon, you know?

162

00:08:13,533 --> 00:08:14,866

That was my future, you know?

163

00:08:14,866 --> 00:08:19,100

I loved it, and so that's  
what I was gonna do.

164

00:08:19,100 --> 00:08:20,766

One of the professors

165

00:08:20,766 --> 00:08:22,066

that I worked with said,

166

00:08:22,066 --> 00:08:24,300

"You should come out  
to my flying school.

167

00:08:24,300 --> 00:08:25,833

I have a flight school out here.

168

00:08:25,833 --> 00:08:27,266

You'd love to learn how to fly."

169

00:08:27,266 --> 00:08:29,633

And I thought, "I'm gonna  
be like him and have a airplane

170

00:08:29,633 --> 00:08:31,433

when I'm a rich doctor."

171

00:08:31,433 --> 00:08:35,200

So I asked my father  
for flying lessons,

172

00:08:35,200 --> 00:08:36,700

and he gave me flying lessons,

173

00:08:36,700 --> 00:08:39,100

and I got  
my private pilot's license.

174

00:08:39,100 --> 00:08:42,333

And then, all of a sudden,  
rather serendipitously--

175

00:08:42,333 --> 00:08:45,266

if you read my book, you'll see  
how strange this was--

176

00:08:45,266 --> 00:08:49,033

I found out that there was going

177

00:08:49,033 --> 00:08:54,133

to be a selection  
for space shuttle astronauts.

178

00:08:54,133 --> 00:08:58,466

Well, people kind of  
didn't even know in 1977

179

00:08:58,466 --> 00:09:01,633

what the space shuttle  
was going to be.

180

00:09:01,633 --> 00:09:03,200

But I wrote for an application,

181

00:09:03,200 --> 00:09:06,166

just to see whether or not  
I met all the criteria

182

00:09:06,166 --> 00:09:08,700

to apply, and I did.

183

00:09:08,700 --> 00:09:12,066

You had to be at least  
five feet tall,

184

00:09:12,066 --> 00:09:14,633

and I made that by two inches.

185

00:09:14,633 --> 00:09:16,766

And you had to be  
in good health.

186

00:09:16,766 --> 00:09:18,933

They perf--you had to have  
a bachelor's degree,

187

00:09:18,933 --> 00:09:20,800

preferably an advanced degree,

188

00:09:20,800 --> 00:09:23,700

and preferably experience  
in your field.

189

00:09:23,700 --> 00:09:25,666

And they took my residency--

190

00:09:25,666 --> 00:09:28,233

my four years  
of residency--as experience.

191

00:09:28,233 --> 00:09:30,066

I thought it was more school,

192

00:09:30,066 --> 00:09:32,366

but they thought  
it was experience.

193

00:09:32,366 --> 00:09:36,700

So I applied to the space  
program.

194

00:09:36,700 --> 00:09:40,733

Lo and behold,  
in the summer of 1977,

195

00:09:40,733 --> 00:09:44,400

I was called to Houston  
for an interview.

196

00:09:44,400 --> 00:09:47,133

And, um--

197

00:09:47,133 --> 00:09:51,500

they were going  
to interview 220 people,

198

00:09:51,500 --> 00:09:55,433

and in groups of 20.

199

00:09:55,433 --> 00:09:56,866

And I asked,

200

00:09:56,866 --> 00:10:00,200

when they called, "Well, how  
many actual people applied?"

201

00:10:00,200 --> 00:10:02,300

If you counted  
all the military applications,

202

00:10:02,300 --> 00:10:03,966

there were 10,000 people.

203

00:10:03,966 --> 00:10:05,400

So I felt like,

204

00:10:05,400 --> 00:10:07,100

"Man," you know,

205

00:10:07,100 --> 00:10:08,833

"If nothing more happens,

206

00:10:08,833 --> 00:10:11,433

I made the cut down to 220."

207

00:10:11,433 --> 00:10:13,533

Went down to Houston for a week,

208

00:10:13,533 --> 00:10:16,366

and it was the first group  
of Mission Specialists,

209

00:10:16,366 --> 00:10:19,633

or non-pilots,  
that were being interviewed.

210

00:10:19,633 --> 00:10:22,133

And so Monday morning  
was when my--

211

00:10:22,133 --> 00:10:23,733

we went on Sunday.

212

00:10:23,733 --> 00:10:26,400

We were gonna have a week of  
interviews and physical exams.

213

00:10:26,400 --> 00:10:30,766

My interview was scheduled  
for 10:30 on Monday morning.

214

00:10:30,766 --> 00:10:34,466

In looking back at the records,  
I was the first woman

215

00:10:34,466 --> 00:10:37,533

that they ever interviewed  
for the astronaut program.

216

00:10:37,533 --> 00:10:40,366

The first two groups  
had been all male pilots.

217

00:10:40,366 --> 00:10:43,266  
So that was an honor in itself.

218  
00:10:43,266 --> 00:10:45,133  
I made it  
through the physical exams,

219  
00:10:45,133 --> 00:10:47,900  
the psychological  
and psychiatric exams,

220  
00:10:47,900 --> 00:10:50,600  
the claustrophobia exam--

221  
00:10:50,600 --> 00:10:52,200  
many, many different things--

222  
00:10:52,200 --> 00:10:55,233  
and sort of went home  
with lots of souvenirs,

223  
00:10:55,233 --> 00:10:58,200  
'cause I figured, "I'm gonna  
have souvenirs of this."

224  
00:10:58,200 --> 00:10:59,900  
Well, you know,

225  
00:10:59,900 --> 00:11:03,066  
in January of 1978,  
the call came,

226  
00:11:03,066 --> 00:11:06,166  
and said, "Are you  
still interested in this job?"

227  
00:11:06,166 --> 00:11:08,100  
And of course I was.  
I wasn't--

228

00:11:08,100 --> 00:11:09,333

it was like coming to Berkeley.

229

00:11:09,333 --> 00:11:11,100

I wasn't really sure

what I was getting into,

230

00:11:11,100 --> 00:11:13,533

but it sounded like

the most fascinating thing

231

00:11:13,533 --> 00:11:15,566

that a person

could do at the time.

232

00:11:15,566 --> 00:11:17,600

And so I joined

the Astronaut Corps

233

00:11:17,600 --> 00:11:22,433

and started work with NASA

in July of 1978.

234

00:11:22,433 --> 00:11:24,733

So I'm gonna tell you

a little bit about that.

235

00:11:24,733 --> 00:11:27,233

In that class,

they took 35 astronauts,

236

00:11:27,233 --> 00:11:29,800

and six of us were women.

237

00:11:29,800 --> 00:11:30,966

The women who had been

238

00:11:30,966 --> 00:11:32,600

interviewed all thought

that they would take

239

00:11:32,600 --> 00:11:33,700

one or two women,

240

00:11:33,700 --> 00:11:34,833

but not six.

241

00:11:34,833 --> 00:11:36,133

So we were delighted

242

00:11:36,133 --> 00:11:37,266

that there were the six of us.

243

00:11:37,266 --> 00:11:38,400

We were very different.

244

00:11:38,400 --> 00:11:40,100

We came from different parts  
of the country.

245

00:11:40,100 --> 00:11:43,666

We had different backgrounds,  
all in science--

246

00:11:43,666 --> 00:11:47,233

Astrophysics, Geology,  
Engineering, Biochemistry,

247

00:11:47,233 --> 00:11:48,500

Medicine.

248

00:11:48,500 --> 00:11:49,933

But we formed a bond,

249

00:11:49,933 --> 00:11:51,933

as you can imagine.

250

00:11:51,933 --> 00:11:53,933

We were afraid  
they were gonna wash us out,

251

00:11:53,933 --> 00:11:56,100

that they would put barriers  
in our way

252

00:11:56,100 --> 00:11:59,000

that would see  
that we didn't get to succeed.

253

00:11:59,000 --> 00:12:02,400

But we were willing  
to support each other

254

00:12:02,400 --> 00:12:04,100

and to go through this together,

255

00:12:04,100 --> 00:12:07,233

and it turned out  
that we all had a chance to fly.

256

00:12:07,233 --> 00:12:10,466

So it was a great group  
to be a part of.

257

00:12:10,466 --> 00:12:13,333

You can see I'm the runt  
of the litter.

258

00:12:13,333 --> 00:12:16,600

And, in fact,  
it wasn't as hard being female.

259

00:12:16,600 --> 00:12:18,033

It was really hard being little,

260

00:12:18,033 --> 00:12:19,066

'cause there were a lot

of things

261

00:12:19,066 --> 00:12:21,033

that NASA hadn't thought of--

262

00:12:21,033 --> 00:12:24,100

couldn't accommodate

a 5'2" female.

263

00:12:24,100 --> 00:12:27,566

The height requirement, I think,

for the men, was 5'6".

264

00:12:27,566 --> 00:12:29,066

And so there was a lot

of equipment

265

00:12:29,066 --> 00:12:31,633

that they forgot didn't fit

a 5'2"--

266

00:12:31,633 --> 00:12:34,266

but, again, you work that out.

267

00:12:34,266 --> 00:12:37,300

For the first few years

I was at NASA,

268

00:12:37,300 --> 00:12:38,533

the shuttle wasn't flying.

269

00:12:38,533 --> 00:12:41,200

Remember, I was accepted

in 1978.

270

00:12:41,200 --> 00:12:43,900

The shuttle didn't fly

until 1981.

271

00:12:43,900 --> 00:12:47,033

But I was anxious,  
besides all of the training

272

00:12:47,033 --> 00:12:48,800

that I was going through,

273

00:12:48,800 --> 00:12:51,233

to get involved  
in some of the Life Sciences

274

00:12:51,233 --> 00:12:55,033

and the medical operations--

275

00:12:55,033 --> 00:12:58,366

experiments and tests  
that were being done.

276

00:12:58,366 --> 00:13:00,700

And so I jumped at the chance

277

00:13:00,700 --> 00:13:02,966

of flying on the zero-g plane.

278

00:13:02,966 --> 00:13:04,933

This is a large  
commercial airliner

279

00:13:04,933 --> 00:13:06,266

that's been cleaned out.

280

00:13:06,266 --> 00:13:08,833

The inside is cleaned out,  
so it's an open space.

281

00:13:08,833 --> 00:13:11,666

It flies up and down  
like a roller coaster.

282

00:13:11,666 --> 00:13:13,333  
At the top of each parabola,

283  
00:13:13,333 --> 00:13:15,500  
you get 30 seconds  
of weightlessness.

284  
00:13:15,500 --> 00:13:18,133  
And so, if you can take  
all of the things--the processes

285  
00:13:18,133 --> 00:13:19,933  
and the experiments  
that you want to do--

286  
00:13:19,933 --> 00:13:22,233  
break them down  
into 30-second segments,

287  
00:13:22,233 --> 00:13:24,566  
you can practice  
being in zero-g.

288  
00:13:24,566 --> 00:13:26,800  
And that was as close  
as we could get,

289  
00:13:26,800 --> 00:13:28,633  
while we were still here  
on Earth.

290  
00:13:28,633 --> 00:13:30,566  
So here we are,  
trying to develop a way

291  
00:13:30,566 --> 00:13:32,966  
to do CPR in weightlessness.

292  
00:13:32,966 --> 00:13:35,266  
For those of you

who've taken CPR,

293

00:13:35,266 --> 00:13:36,500

you know that  
one of the things

294

00:13:36,500 --> 00:13:37,933

you have to do  
to pump the heart is,

295

00:13:37,933 --> 00:13:41,300

you have to put your weight  
on that chest to push the heart.

296

00:13:41,300 --> 00:13:43,333

How do you do that  
in weightlessness?

297

00:13:43,333 --> 00:13:45,400

And so we were working that out.

298

00:13:45,400 --> 00:13:47,266

It was lots of fun.

299

00:13:47,266 --> 00:13:49,366

It gave me the best experience

300

00:13:49,366 --> 00:13:51,333

I could get, at the time,

301

00:13:51,333 --> 00:13:53,666

of being weightless.

302

00:13:53,666 --> 00:13:57,633

Luckily, I did pretty good jobs  
and was assigned to crews.

303

00:13:57,633 --> 00:13:59,900

This is STS-51-D.

304

00:13:59,900 --> 00:14:04,466

I'm proud to say the Commander  
of that flight, Colonel Bobko,

305

00:14:04,466 --> 00:14:06,066

is here today to watch,

306

00:14:06,066 --> 00:14:08,900

and he's gonna keep me straight  
if I say the wrong thing--

307

00:14:08,900 --> 00:14:10,200

come up afterwards,

308

00:14:10,200 --> 00:14:12,166

and say, "Your commander says  
you got that wrong."

309

00:14:12,166 --> 00:14:14,933

So, Bo,

I hope you enjoy the talk.

310

00:14:14,933 --> 00:14:16,366

Here we are.

311

00:14:16,366 --> 00:14:18,766

We actually ended up  
training for--

312

00:14:18,766 --> 00:14:20,000

we had four different crews

313

00:14:20,000 --> 00:14:21,700

in training  
for four different flights--

314

00:14:21,700 --> 00:14:23,266

had four different patches--

315

00:14:23,266 --> 00:14:26,233  
because our flights kept  
being cancelled or postponed.

316

00:14:26,233 --> 00:14:29,166  
But we eventually were able  
to get off the ground

317

00:14:29,166 --> 00:14:31,800  
in April of 1985.

318

00:14:31,800 --> 00:14:34,800  
Strange to think  
it was 30 years ago, Bo.

319

00:14:34,800 --> 00:14:36,933  
We haven't gotten  
a day older, have we?

320

00:14:36,933 --> 00:14:38,533  
We had a great time.

321

00:14:38,533 --> 00:14:41,933  
It was primarily a flight  
to launch a couple of satellites

322

00:14:41,933 --> 00:14:44,233  
and do some orbiter testing,

323

00:14:44,233 --> 00:14:46,200  
but they did put  
some science onboard

324

00:14:46,200 --> 00:14:49,700  
for the scientists that we had.

325

00:14:49,700 --> 00:14:51,700  
Here I am.

This is weightlessness.

326

00:14:51,700 --> 00:14:54,466

It's a joy, but it takes  
some getting used to.

327

00:14:54,466 --> 00:14:56,566

And that's really what I'm  
gonna talk to you about today.

328

00:14:56,566 --> 00:14:59,200

I'm not gonna tell you  
all of the data results

329

00:14:59,200 --> 00:15:03,133

from all our tests and research  
and our experiments.

330

00:15:03,133 --> 00:15:05,300

I'm gonna tell you  
about the challenges

331

00:15:05,300 --> 00:15:08,933

of doing life-sciences research  
in space.

332

00:15:08,933 --> 00:15:10,466

And that's one of the things

333

00:15:10,466 --> 00:15:13,533

that astronauts  
really were there for,

334

00:15:13,533 --> 00:15:15,966

was helping scientists translate

335

00:15:15,966 --> 00:15:17,633

what they had done in the lab

336

00:15:17,633 --> 00:15:20,700  
into something  
that could be done in flight.

337  
00:15:20,700 --> 00:15:25,333  
This is the American Flight  
Echocardiograph machine--

338  
00:15:25,333 --> 00:15:26,600  
the first time

339  
00:15:26,600 --> 00:15:28,800  
that we were able to look  
inside the human body,

340  
00:15:28,800 --> 00:15:30,933  
at the heart, using ultrasound

341  
00:15:30,933 --> 00:15:33,900  
to look at what happens  
to the heart and blood vessels

342  
00:15:33,900 --> 00:15:35,666  
when you go into weightlessness.

343  
00:15:35,666 --> 00:15:37,366  
This is the middeck  
of the shuttle,

344  
00:15:37,366 --> 00:15:40,500  
and there were a number  
of small middeck experiments

345  
00:15:40,500 --> 00:15:42,100  
that NASA put on board,

346  
00:15:42,100 --> 00:15:44,966  
mostly to look  
at operational issues--

347  
00:15:44,966 --> 00:15:47,400  
operational meaning

348  
00:15:47,400 --> 00:15:49,000  
things like your heart,

349  
00:15:49,000 --> 00:15:50,466  
your blood flow.

350  
00:15:50,466 --> 00:15:53,866  
And so this was an experiment  
that was put on board for me,

351  
00:15:53,866 --> 00:15:57,366  
and that I had trained on a lot  
on the ground

352  
00:15:57,366 --> 00:16:00,933  
and thought I knew  
what I was doing

353  
00:16:00,933 --> 00:16:03,000  
until I set up the equipment.

354  
00:16:03,000 --> 00:16:05,100  
And you can see  
the problem here.

355  
00:16:05,100 --> 00:16:06,933  
Everything goes haywire.

356  
00:16:06,933 --> 00:16:09,133  
It won't lay down

357  
00:16:09,133 --> 00:16:10,233  
like it does here on the ground.

358  
00:16:10,233 --> 00:16:11,466

You've got all the wires.

359

00:16:11,466 --> 00:16:12,933

You've got  
your equipment floating away.

360

00:16:12,933 --> 00:16:15,866

Your checklist has to be taped  
to the wall.

361

00:16:15,866 --> 00:16:18,200

You have to get it all set up.

362

00:16:18,200 --> 00:16:19,433

And you have to get used

363

00:16:19,433 --> 00:16:22,700

to the fact  
that that's gonna happen.

364

00:16:22,700 --> 00:16:26,266

So this was great experience  
for me on my first flight.

365

00:16:26,266 --> 00:16:28,333

Here we are,  
doing that experiment,

366

00:16:28,333 --> 00:16:30,600

and it almost looks like  
we're standing on the ground,

367

00:16:30,600 --> 00:16:33,033

but we have our feet  
in foot loops on the floor

368

00:16:33,033 --> 00:16:34,466

to stabilize ourselves.

369

00:16:34,466 --> 00:16:37,366

Here I am with Jeff Hoffman,  
looking at his heart.

370

00:16:37,366 --> 00:16:39,900

You can tell  
how tall and thin he is.

371

00:16:39,900 --> 00:16:42,066

His heart's right there  
for me to look at.

372

00:16:42,066 --> 00:16:45,900

But lo and behold, his heart  
swung out a little bit.

373

00:16:45,900 --> 00:16:47,933

It was in a different place  
in weightlessness,

374

00:16:47,933 --> 00:16:49,633

and so I had to fish  
around for it.

375

00:16:49,633 --> 00:16:51,700

But you can see we're  
a little bit better organized.

376

00:16:51,700 --> 00:16:54,566

And the way you can tell that  
this picture was taken in space

377

00:16:54,566 --> 00:16:57,233

and not on the ground is  
the bumper stickers in the back.

378

00:16:57,233 --> 00:16:59,433

We liked to advertise  
our schools.

379

00:16:59,433 --> 00:17:01,166  
Jeff went to Amherst.

380  
00:17:01,166 --> 00:17:02,933  
I went to the University  
of Tennessee.

381  
00:17:02,933 --> 00:17:05,200  
And we tried, when we  
were taking nice pictures,

382  
00:17:05,200 --> 00:17:07,266  
to bring back home,  
to slap those on the wall.

383  
00:17:07,266 --> 00:17:09,300  
We obviously didn't do  
that in training.

384  
00:17:09,300 --> 00:17:11,800  
They do let  
you take a few things with you

385  
00:17:11,800 --> 00:17:13,700  
when you go into space,

386  
00:17:13,700 --> 00:17:17,833  
just so it looks like  
you're really in flight.

387  
00:17:17,833 --> 00:17:19,400  
Lots of good information

388  
00:17:19,400 --> 00:17:21,933  
came back on four subjects  
during this flight.

389  
00:17:21,933 --> 00:17:24,233  
We even trained one  
of our Payload Specialists

390

00:17:24,233 --> 00:17:26,766

to do some studies  
on motion sickness.

391

00:17:26,766 --> 00:17:28,400

This is Senator Jake Garn.

392

00:17:28,400 --> 00:17:30,933

He's the first politician  
in space.

393

00:17:30,933 --> 00:17:32,733

He was a senator  
from the state of Utah.

394

00:17:32,733 --> 00:17:36,933

A lot of controversy  
about flying politicians,

395

00:17:36,933 --> 00:17:39,333

but Jake got a lot  
of experience here.

396

00:17:39,333 --> 00:17:42,100

You can tell  
that he was very suited

397

00:17:42,100 --> 00:17:46,166

to doing the brainwave test,  
by his hairline.

398

00:17:46,166 --> 00:17:49,200

That's why we told him that that  
was the one he needed to do.

399

00:17:49,200 --> 00:17:51,933

But looking  
at space motion sickness--

400

00:17:51,933 --> 00:17:55,200

the press sort of had a heyday  
with making jokes

401

00:17:55,200 --> 00:17:58,900

about poor Jake  
doing motion-sickness studies,

402

00:17:58,900 --> 00:18:00,466

getting sick in space.

403

00:18:00,466 --> 00:18:02,266

He's a pilot.  
He'd never been sick.

404

00:18:02,266 --> 00:18:06,100

But anyway, Garry Trudeau  
did a series in "Doonesbury"

405

00:18:06,100 --> 00:18:09,666

calling him  
"Barfing Jake Garn."

406

00:18:09,666 --> 00:18:12,900

And he did really well in space,  
barfing.

407

00:18:12,900 --> 00:18:17,500

But he certainly did a lot  
of work for us.

408

00:18:17,500 --> 00:18:19,900

And later on,  
in some of NASA's dark days,

409

00:18:19,900 --> 00:18:23,333

it was very helpful to have him  
representing us

410

00:18:23,333 --> 00:18:25,066  
in the Congress.

411  
00:18:25,066 --> 00:18:26,600  
And he was very well-respected

412  
00:18:26,600 --> 00:18:28,366  
because he had been there  
and done that.

413  
00:18:28,366 --> 00:18:29,933  
So here's Jake.

414  
00:18:29,933 --> 00:18:31,000  
But you can see  
he's got to put

415  
00:18:31,000 --> 00:18:33,600  
all of his equipment  
in a place,

416  
00:18:33,600 --> 00:18:36,700  
stabilize himself, in order  
to get the good science.

417  
00:18:36,700 --> 00:18:39,666  
So it can be done  
by private citizens,

418  
00:18:39,666 --> 00:18:42,666  
but it works a little bit better  
when you do it with people

419  
00:18:42,666 --> 00:18:44,866  
who know the science.

420  
00:18:44,866 --> 00:18:46,600  
I was fortunate.

421

00:18:46,600 --> 00:18:47,866  
About that time

422  
00:18:47,866 --> 00:18:51,300  
I was assigned to  
another space-shuttle mission.

423  
00:18:51,300 --> 00:18:55,433  
It was called  
Spacelab Life Sciences 1.

424  
00:18:55,433 --> 00:18:59,100  
The life-sciences Spacelabs  
were not operational issues.

425  
00:18:59,100 --> 00:19:00,566  
They were research missions.

426  
00:19:00,566 --> 00:19:04,600  
And NASA sent out announcements  
of opportunity to scientists

427  
00:19:04,600 --> 00:19:07,566  
all over the world  
to propose science.

428  
00:19:07,566 --> 00:19:09,766  
Lots of proposals came in.

429  
00:19:09,766 --> 00:19:12,900  
A few were selected for flight.

430  
00:19:12,900 --> 00:19:16,066  
Certainly--I think even some  
of our experimenters

431  
00:19:16,066 --> 00:19:19,333  
and our research scientists  
are here today to hear the talk.

432

00:19:19,333 --> 00:19:21,766

Very complex mission--

433

00:19:21,766 --> 00:19:23,300

an integrated mission--

434

00:19:23,300 --> 00:19:24,633

the Spacelab missions

435

00:19:24,633 --> 00:19:26,666

that had flown before

had a little of this science,

436

00:19:26,666 --> 00:19:27,866

a little of that science.

437

00:19:27,866 --> 00:19:29,233

This was the first time

438

00:19:29,233 --> 00:19:32,933

a mission had been dedicated  
entirely to life sciences.

439

00:19:32,933 --> 00:19:35,766

And so, we could test  
many different systems

440

00:19:35,766 --> 00:19:38,300

and see what was going on  
inside the human body.

441

00:19:38,300 --> 00:19:39,600

Doesn't help to look  
at your heart

442

00:19:39,600 --> 00:19:41,866

if you don't know  
what your kidneys are doing,

443

00:19:41,866 --> 00:19:43,433

what your  
blood-pressure-regulation

444

00:19:43,433 --> 00:19:46,933

system are doing, what's  
going on with your metabolism.

445

00:19:46,933 --> 00:19:48,633

So it was a wonderful mission.

446

00:19:48,633 --> 00:19:54,366

It was the mission  
that I came to NASA to fly.

447

00:19:54,366 --> 00:19:57,133

We had our crew picture done.

448

00:19:57,133 --> 00:19:59,833

We were three physicians  
there in the front row,

449

00:19:59,833 --> 00:20:01,333

and Millie's a biochemist.

450

00:20:01,333 --> 00:20:04,800

She's from out this way--an  
invaluable member of our crew.

451

00:20:04,800 --> 00:20:06,600

And we're getting ready  
for our flight.

452

00:20:06,600 --> 00:20:08,066

We're wearing  
the big orange suits

453

00:20:08,066 --> 00:20:09,600

that were worn

after the Challenger.

454

00:20:09,600 --> 00:20:11,700

This was in 1991.

455

00:20:11,700 --> 00:20:14,900

And we're all looking  
very formal in our--

456

00:20:14,900 --> 00:20:18,300

in our attire,  
in our formal picture.

457

00:20:18,300 --> 00:20:20,900

The crews, of course,  
like to have a little fun.

458

00:20:20,900 --> 00:20:22,766

And in the not-NASA archives--

459

00:20:22,766 --> 00:20:24,566

you will probably never  
see this next picture,

460

00:20:24,566 --> 00:20:27,033

but I'll show it to you.

461

00:20:27,033 --> 00:20:30,133

Here we are goofing off.

462

00:20:30,133 --> 00:20:32,766

We decided we were  
the perfect M.A.S.H. unit.

463

00:20:32,766 --> 00:20:35,566

You can see  
Hawkeye and Trapper John.

464

00:20:35,566 --> 00:20:38,300

You can see Father Mulcahy,  
Hot Lips.

465  
00:20:38,300 --> 00:20:41,866  
And being named Rhea,  
I had to be Radar, of course.

466  
00:20:41,866 --> 00:20:43,400  
And none of the men,

467  
00:20:43,400 --> 00:20:46,966  
for some reason, wanted to be  
Klinger, the cross-dresser.

468  
00:20:46,966 --> 00:20:49,300  
And so Drew Gaffney  
drew the short straw,

469  
00:20:49,300 --> 00:20:50,900  
and he got to wear the dress.

470  
00:20:50,900 --> 00:20:53,066  
So we did have a little bit  
of fun with it.

471  
00:20:53,066 --> 00:20:55,133  
But it was a great crew.

472  
00:20:55,133 --> 00:20:57,866  
I'm gonna show you, for the  
second life-sciences mission--

473  
00:20:57,866 --> 00:21:00,600  
I had gained a lot  
of experience on the first one.

474  
00:21:00,600 --> 00:21:02,366  
I volunteered  
to make the second one

475

00:21:02,366 --> 00:21:04,700

because I thought  
we could make it more efficient,

476

00:21:04,700 --> 00:21:06,233

and we had learned a lot

477

00:21:06,233 --> 00:21:08,566

about doing  
all of these science experiments

478

00:21:08,566 --> 00:21:09,966

all clumped together--

479

00:21:09,966 --> 00:21:13,733

how to coordinate everything  
and make sure the data was good.

480

00:21:13,733 --> 00:21:16,133

And so I volunteered  
for this mission.

481

00:21:16,133 --> 00:21:18,533

It was the first time  
that I had worked with Ames,

482

00:21:18,533 --> 00:21:19,833

I think.

483

00:21:19,833 --> 00:21:23,666

They were in charge  
of the non-human experiments--

484

00:21:23,666 --> 00:21:25,366

the animals, the jellyfish,

485

00:21:25,366 --> 00:21:27,666

the things that we flew  
that were not people.

486

00:21:27,666 --> 00:21:29,133

They were managed here.

487

00:21:29,133 --> 00:21:32,766

And I got to know an awful lot  
of just great people out here,

488

00:21:32,766 --> 00:21:35,433

so anxious to be a part  
of this grand endeavor,

489

00:21:35,433 --> 00:21:37,300

and worked so hard

490

00:21:37,300 --> 00:21:41,866

to make sure that everything  
that we wanted to do got done.

491

00:21:41,866 --> 00:21:43,266

Again, a great crew.

492

00:21:43,266 --> 00:21:47,033

We had three Payload Specialist  
candidates that trained with us.

493

00:21:47,033 --> 00:21:49,766

One flew, Dr. Marty Fettman--

494

00:21:49,766 --> 00:21:51,466

the first veterinarian in space,

495

00:21:51,466 --> 00:21:53,866

because we were gonna  
carry animals on the mission,

496

00:21:53,866 --> 00:21:55,766

and it was helpful  
to have him there

497

00:21:55,766 --> 00:21:58,700  
to represent the animals.

498

00:21:58,700 --> 00:22:02,733  
And Dr. Larry Young

499

00:22:02,733 --> 00:22:06,400  
and Dr. Jay Buckey trained  
with us--didn't make the flight,

500

00:22:06,400 --> 00:22:09,500  
but they were representing us  
in the Payload Control Center

501

00:22:09,500 --> 00:22:11,900  
on the ground,  
an invaluable resource.

502

00:22:11,900 --> 00:22:13,633  
They had trained.  
They knew all the things

503

00:22:13,633 --> 00:22:16,833  
we were gonna do  
and really represented the crew

504

00:22:16,833 --> 00:22:19,833  
in the Payload Control Center.

505

00:22:19,833 --> 00:22:22,800  
And, of course, we had  
to have an informal picture.

506

00:22:22,800 --> 00:22:24,900  
And we thought, "Okay,  
what are we?"

507

00:22:24,900 --> 00:22:27,000

We are going to stay in space

508

00:22:27,000 --> 00:22:30,100  
for longer than  
any other mission had stayed.

509

00:22:30,100 --> 00:22:33,366  
And we had so much crammed  
on board that we had to stow.

510

00:22:33,366 --> 00:22:34,433  
We had to train on--

511

00:22:34,433 --> 00:22:36,300  
we had to know where it was.

512

00:22:36,300 --> 00:22:38,666  
I mean, what did this feel like?

513

00:22:38,666 --> 00:22:42,533  
Well, it sort of felt  
like a family camping trip.

514

00:22:42,533 --> 00:22:45,266  
So here are the happy campers.

515

00:22:45,266 --> 00:22:47,800  
I hadn't realized  
till I looked at this picture

516

00:22:47,800 --> 00:22:51,066  
how many hairy chests  
there were on this flight,

517

00:22:51,066 --> 00:22:54,100  
but here we are having a good  
time with some of our science

518

00:22:54,100 --> 00:22:55,333

and some of our camping gear.

519

00:22:55,333 --> 00:22:57,933

But again,  
crews always enjoy

520

00:22:57,933 --> 00:22:59,400

having a little fun.

521

00:22:59,400 --> 00:23:00,866

And you train for so long,

522

00:23:00,866 --> 00:23:03,600

under such amount of stress,

523

00:23:03,600 --> 00:23:06,333

that it's good to have a chance  
to laugh every once in a while--

524

00:23:06,333 --> 00:23:08,666

mostly at yourself.

525

00:23:08,666 --> 00:23:10,433

This is Spacelab.

526

00:23:10,433 --> 00:23:12,300

Spacelab was  
a working laboratory

527

00:23:12,300 --> 00:23:13,733

that sat in the cargo bay--

528

00:23:13,733 --> 00:23:15,333

at the back of the cargo bay--

529

00:23:15,333 --> 00:23:17,100

about 15 feet in diameter,

530

00:23:17,100 --> 00:23:18,600  
23 feet long,

531  
00:23:18,600 --> 00:23:19,900  
and a working laboratory

532  
00:23:19,900 --> 00:23:21,800  
where you could put  
all your lab stuff.

533  
00:23:21,800 --> 00:23:23,833  
The middeck  
of the shuttle--very cramped,

534  
00:23:23,833 --> 00:23:25,500  
and it's living quarters,

535  
00:23:25,500 --> 00:23:28,933  
so it was very helpful  
to have lots and lots of room.

536  
00:23:28,933 --> 00:23:31,033  
And when you're on the ground,  
and you're looking at this,

537  
00:23:31,033 --> 00:23:33,066  
and everything is neat  
and put away,

538  
00:23:33,066 --> 00:23:36,633  
you think, "We've got lots  
of room to do this."

539  
00:23:36,633 --> 00:23:39,266  
Well, it fills up fast.

540  
00:23:39,266 --> 00:23:41,633  
And it fills up  
in many dimensions.

541  
00:23:41,633 --> 00:23:42,633  
Imagine if you--

542  
00:23:42,633 --> 00:23:44,066  
if we in this room

543  
00:23:44,066 --> 00:23:46,600  
could use all the real estate  
that's up above us.

544  
00:23:46,600 --> 00:23:49,333  
We're using maybe 1/3  
of the space in here.

545  
00:23:49,333 --> 00:23:50,800  
There's a lot more real estate.

546  
00:23:50,800 --> 00:23:53,033  
And that's what we had  
to learn to do

547  
00:23:53,033 --> 00:23:55,333  
when we were in the Spacelab.

548  
00:23:55,333 --> 00:23:57,800  
You see Millie up here?

549  
00:23:57,800 --> 00:23:59,433  
We had lots of stowage.

550  
00:23:59,433 --> 00:24:02,533  
We learned how to hook our feet  
on the handrails

551  
00:24:02,533 --> 00:24:03,900  
and open up this,

552  
00:24:03,900 --> 00:24:06,500

and it was a great place  
to stow.

553

00:24:06,500 --> 00:24:08,133

On the ground,  
it was kind of a pain

554

00:24:08,133 --> 00:24:09,166

to get stuff out of there,

555

00:24:09,166 --> 00:24:11,500

but in space, it worked well.

556

00:24:11,500 --> 00:24:12,966

Lots of checklists,

557

00:24:12,966 --> 00:24:15,500

lots of things out

558

00:24:15,500 --> 00:24:16,866

that we needed to leave out,

559

00:24:16,866 --> 00:24:19,500

'cause we were gonna do  
something later that day,

560

00:24:19,500 --> 00:24:22,900

lots of people back in there--

561

00:24:22,900 --> 00:24:24,266

who's that?

562

00:24:24,266 --> 00:24:27,166

Anybody know?

563

00:24:27,166 --> 00:24:28,833

Looks terrible.

564

00:24:28,833 --> 00:24:30,233  
Not space motion sickness.

565  
00:24:30,233 --> 00:24:31,700  
That's Resusci Annie.

566  
00:24:31,700 --> 00:24:33,933  
We did some tests of doing CPR.

567  
00:24:33,933 --> 00:24:35,866  
Remember the one  
that I did early on?

568  
00:24:35,866 --> 00:24:37,600  
We took Resusci Annie with us

569  
00:24:37,600 --> 00:24:39,966  
to do a little bit more formal  
studies there.

570  
00:24:39,966 --> 00:24:42,600  
But again,

571  
00:24:42,600 --> 00:24:45,633  
learning to do it  
in a very different environment.

572  
00:24:45,633 --> 00:24:48,700  
The scientists know how to do it  
in their lab.

573  
00:24:48,700 --> 00:24:50,933  
They have no idea how they're  
gonna do it up there.

574  
00:24:50,933 --> 00:24:53,000  
And that's the role  
of the astronauts.

575

00:24:53,000 --> 00:24:56,100

And that was part of the fun  
that we had--

576

00:24:56,100 --> 00:24:58,800

trying to think about "how  
are we gonna do this?"

577

00:24:58,800 --> 00:25:00,700

and "what's it gonna look like?"

578

00:25:00,700 --> 00:25:02,800

and "what are we gonna do  
if it doesn't act that way

579

00:25:02,800 --> 00:25:03,966

when we get there?"

580

00:25:03,966 --> 00:25:07,200

and figuring it out  
to get the job done.

581

00:25:07,200 --> 00:25:08,466

Many, many experiments--

582

00:25:08,466 --> 00:25:10,366

a lot of people counting on us.

583

00:25:10,366 --> 00:25:12,400

The scientists said,  
"You are our eyes

584

00:25:12,400 --> 00:25:15,500

and our hands in space,"  
and we took that responsibility

585

00:25:15,500 --> 00:25:17,566

very seriously.

586

00:25:17,566 --> 00:25:20,366

Just to show you,  
this is one blood draw.

587

00:25:20,366 --> 00:25:22,766

We did metabolic experiments.

588

00:25:22,766 --> 00:25:25,400

And we had four subjects,

589

00:25:25,400 --> 00:25:27,800

and we were gonna have to do--  
get up in the morning,

590

00:25:27,800 --> 00:25:28,833

before we ate breakfast,

591

00:25:28,833 --> 00:25:30,366

and draw blood samples.

592

00:25:30,366 --> 00:25:33,966

We'd injected tracers,  
and this is it all set out.

593

00:25:33,966 --> 00:25:35,066

We had trained.

594

00:25:35,066 --> 00:25:36,366

We had planned.

595

00:25:36,366 --> 00:25:39,433

And we worked out that this was  
the most efficient way

596

00:25:39,433 --> 00:25:44,433

to put the most stuff  
in one small container,

597

00:25:44,433 --> 00:25:45,600

and here it is.

598

00:25:45,600 --> 00:25:47,000

This is four subjects.

599

00:25:47,000 --> 00:25:49,000

You can see,

we all had different colors.

600

00:25:49,000 --> 00:25:50,533

You may not be able to see it,

601

00:25:50,533 --> 00:25:53,000

but the colors here--

602

00:25:53,000 --> 00:25:55,766

they're red, orange, green,

603

00:25:55,766 --> 00:25:57,233

and purple, I think.

604

00:25:57,233 --> 00:25:59,200

Each crew member

had a different color.

605

00:25:59,200 --> 00:26:03,166

So our tubes were color-coded,

our--

606

00:26:03,166 --> 00:26:04,800

Everything was color-coded

607

00:26:04,800 --> 00:26:08,366

with our specific color,

608

00:26:08,366 --> 00:26:11,033

so that when it came back, we

knew that that was Ray's blood,

609

00:26:11,033 --> 00:26:13,566

or Millie's blood,  
or somebody else's blood.

610

00:26:13,566 --> 00:26:16,333

So this was all laid out for us.

611

00:26:16,333 --> 00:26:18,833

And, you know,  
it looks complex.

612

00:26:18,833 --> 00:26:20,400

It was even complex

613

00:26:20,400 --> 00:26:23,133

when you had to use this stuff.

614

00:26:23,133 --> 00:26:25,900

This is a blood draw  
using that tray.

615

00:26:25,900 --> 00:26:28,933

And look what's going on here.

616

00:26:28,933 --> 00:26:30,666

Millie's the subject.

617

00:26:30,666 --> 00:26:33,466

She's having her blood  
drawn by Drew.

618

00:26:33,466 --> 00:26:36,500

She's holding the blood  
that has been drawn already.

619

00:26:36,500 --> 00:26:40,866

He draws the blood  
and hands it to her.

620

00:26:40,866 --> 00:26:43,900

Jim is pulling out the tubes  
next.

621

00:26:43,900 --> 00:26:46,566

He's looking at the colors,  
the time,

622

00:26:46,566 --> 00:26:48,133

which one of the blood  
draws is it,

623

00:26:48,133 --> 00:26:50,566

and hands it to Drew  
to draw the blood.

624

00:26:50,566 --> 00:26:52,166

Now, it's really helpful

625

00:26:52,166 --> 00:26:54,166

to have plenty of help  
when you're doing this.

626

00:26:54,166 --> 00:26:56,366

The other thing  
that's going on here

627

00:26:56,366 --> 00:26:58,333

that maybe  
is a little bit more subtle is,

628

00:26:58,333 --> 00:27:00,300

they can cross-check each other.

629

00:27:00,300 --> 00:27:03,066

If Drew was trying  
to pull those things out,

630

00:27:03,066 --> 00:27:05,466

he might pull the wrong thing.

631

00:27:05,466 --> 00:27:07,133

But Jim pulls out the tubes,

632

00:27:07,133 --> 00:27:08,333

he looks at them,

633

00:27:08,333 --> 00:27:10,966

and then Drew,

before he draws the blood,

634

00:27:10,966 --> 00:27:12,133

gets to look at them again.

635

00:27:12,133 --> 00:27:14,266

So that's called cross-checking,

636

00:27:14,266 --> 00:27:15,500

and it's really helpful--

637

00:27:15,500 --> 00:27:16,900

certainly in medicine,

638

00:27:16,900 --> 00:27:19,600

for instance, if you're gonna  
get a pint of blood--

639

00:27:19,600 --> 00:27:21,800

that two people

look at that and cross check

640

00:27:21,800 --> 00:27:23,566

and make sure

you're getting the right stuff.

641

00:27:23,566 --> 00:27:25,900

Or if somebody's going  
to operate on you,

642

00:27:25,900 --> 00:27:29,000

it's nice to have somebody  
there that's gonna cross check

643

00:27:29,000 --> 00:27:30,766

to make sure  
you're the right person,

644

00:27:30,766 --> 00:27:32,266

and the right procedure's  
being done.

645

00:27:32,266 --> 00:27:34,266

So cross-check is one  
of those things

646

00:27:34,266 --> 00:27:36,800

that's a very nice life skill  
and something

647

00:27:36,800 --> 00:27:38,133

that we learned how to do,

648

00:27:38,133 --> 00:27:41,433

so that we didn't mess up  
when we got to space.

649

00:27:41,433 --> 00:27:43,166

I have to tell you  
a little story.

650

00:27:43,166 --> 00:27:45,133

As we're going out  
to the launch pad

651

00:27:45,133 --> 00:27:47,666

for this mission, the Chief  
of the Astronaut Office

652

00:27:47,666 --> 00:27:49,800

has to get off the bus  
before we go out to the pad.

653

00:27:49,800 --> 00:27:53,566

And he said, "I would like you  
to all bow your heads

654

00:27:53,566 --> 00:27:55,900

so I can say a prayer  
before I get off the bus."

655

00:27:55,900 --> 00:27:57,266

And we all thought, "Okay."

656

00:27:57,266 --> 00:27:58,933

We very somberly--

657

00:27:58,933 --> 00:28:02,000

and his prayer  
was the astronaut's prayer:

658

00:28:02,000 --> 00:28:04,133

"God help you  
if you screw up."

659

00:28:04,133 --> 00:28:08,133

So we remembered that.

660

00:28:08,133 --> 00:28:11,033

For the next few days,  
that was our mission--

661

00:28:11,033 --> 00:28:12,966

to do that.

662

00:28:12,966 --> 00:28:15,266

And scientists, when they  
propose experiments, say,

663

00:28:15,266 --> 00:28:16,433

"This is really gonna be easy,

664

00:28:16,433 --> 00:28:19,300

because I just

want them to draw some blood

665

00:28:19,300 --> 00:28:20,933

and collect some urine."

666

00:28:20,933 --> 00:28:22,266

Now, if you're part of

667

00:28:22,266 --> 00:28:23,466

an experiment

like that on the ground,

668

00:28:23,466 --> 00:28:25,366

that's not a big deal.

669

00:28:25,366 --> 00:28:27,400

You go in the bathroom,

you collect urine.

670

00:28:27,400 --> 00:28:29,766

How do you collect urine

in space?

671

00:28:29,766 --> 00:28:31,233

Many people don't know that--

672

00:28:31,233 --> 00:28:32,766

you know,

673

00:28:32,766 --> 00:28:35,100

there's a problem with that,

if it says--you can imagine.

674

00:28:35,100 --> 00:28:38,333

We use airflow to pull waste  
away from the body.

675

00:28:38,333 --> 00:28:40,066

The air comes  
under the toilet seat,

676

00:28:40,066 --> 00:28:44,433

and it pulls the urine  
into the toilet.

677

00:28:44,433 --> 00:28:45,900

We have a funnel  
that we can put--

678

00:28:45,900 --> 00:28:47,666

that goes down the tube.

679

00:28:47,666 --> 00:28:49,400

How are you gonna  
get a urine specimen?

680

00:28:49,400 --> 00:28:51,566

How are you gonna measure  
the volume of urine

681

00:28:51,566 --> 00:28:53,900

that a subject puts out  
during the day?

682

00:28:53,900 --> 00:28:55,666

A special piece of equipment

683

00:28:55,666 --> 00:28:58,633

was designed, called  
the Urine Monitoring System--

684

00:28:58,633 --> 00:29:00,266

pulls the urine in,

685

00:29:00,266 --> 00:29:03,133

centrifugally separates

686

00:29:03,133 --> 00:29:05,766

the urine from the air.

687

00:29:05,766 --> 00:29:07,566

It can measure a volume,

688

00:29:07,566 --> 00:29:10,233

and it can pull a specimen

out here.

689

00:29:10,233 --> 00:29:14,066

We all had our color-coded tubes

that it was pulled into

690

00:29:14,066 --> 00:29:15,266

and put it in here.

691

00:29:15,266 --> 00:29:18,266

So a very simple thing

to do on the ground,

692

00:29:18,266 --> 00:29:20,300

a very complex thing

to do on orbit,

693

00:29:20,300 --> 00:29:21,733

and to do it correctly.

694

00:29:21,733 --> 00:29:23,566

And so, again,

695

00:29:23,566 --> 00:29:26,533

science was easy

for some of the scientists,

696

00:29:26,533 --> 00:29:28,600  
and they couldn't understand  
why it was gonna be so hard

697

00:29:28,600 --> 00:29:30,233  
when they got into space.

698

00:29:30,233 --> 00:29:34,066  
But there were things like that  
that had to be accommodated.

699

00:29:34,066 --> 00:29:35,533  
How do you weigh  
yourself in space?

700

00:29:35,533 --> 00:29:38,733  
Oh, you know, you tell  
a subject, "Go weigh yourself."

701

00:29:38,733 --> 00:29:40,500  
This is how you  
weight yourself in space.

702

00:29:40,500 --> 00:29:43,366  
This is the Body Mass  
Measuring Device.

703

00:29:43,366 --> 00:29:45,966  
You sit in this chair,  
strap in,

704

00:29:45,966 --> 00:29:47,766  
release a spring,

705

00:29:47,766 --> 00:29:51,333  
and the heavier you are,  
the slower the spring rocks

706

00:29:51,333 --> 00:29:52,433  
back and forth.

707  
00:29:52,433 --> 00:29:54,400  
The computer  
can calculate your weight.

708  
00:29:54,400 --> 00:29:56,900  
So, a simple thing  
done on the ground,

709  
00:29:56,900 --> 00:29:59,533  
a very complex thing  
done on orbit.

710  
00:29:59,533 --> 00:30:03,633  
And we had to learn how to do  
this to do it accurately.

711  
00:30:03,633 --> 00:30:06,966  
And operationally, you know, you  
practice things on the ground,

712  
00:30:06,966 --> 00:30:08,900  
and then you get into space,

713  
00:30:08,900 --> 00:30:10,733  
and you can't quite  
do them the same.

714  
00:30:10,733 --> 00:30:13,700  
This is looking at blood flow  
to the leg.

715  
00:30:13,700 --> 00:30:16,033  
There's a problem  
when astronauts stand up

716  
00:30:16,033 --> 00:30:18,800  
after they get home,

sometimes they get lightheaded.

717

00:30:18,800 --> 00:30:20,200

The idea was,

718

00:30:20,200 --> 00:30:22,800

maybe the blood is not getting  
back to the heart as well.

719

00:30:22,800 --> 00:30:24,266

So this is an experiment.

720

00:30:24,266 --> 00:30:27,233

Usually, in this, the subject's  
lying down when you do that.

721

00:30:27,233 --> 00:30:29,933

But look how much easier  
it is to do this here,

722

00:30:29,933 --> 00:30:31,533

and do it this way.

723

00:30:31,533 --> 00:30:33,566

But sometimes you have to do it  
a time or two to say,

724

00:30:33,566 --> 00:30:35,233

"Hey, you know,  
it works better this way.

725

00:30:35,233 --> 00:30:36,733

I just put my subject  
up there,

726

00:30:36,733 --> 00:30:38,800

and the operator'll be down here  
next to all the equipment."

727

00:30:38,800 --> 00:30:39,833

Works much better.

728

00:30:39,833 --> 00:30:41,233

So operationally,

729

00:30:41,233 --> 00:30:44,066

sometimes you have to not  
only have different equipment,

730

00:30:44,066 --> 00:30:46,533

but have a different way of  
thinking

731

00:30:46,533 --> 00:30:49,633

about what's possible.

732

00:30:49,633 --> 00:30:52,500

We also--this is an experiment

733

00:30:52,500 --> 00:30:54,266

that put pressure or suction

734

00:30:54,266 --> 00:30:56,966

on the blood pressure sensors  
in the neck,

735

00:30:56,966 --> 00:30:59,933

to see whether or not  
the heart responded--

736

00:30:59,933 --> 00:31:01,700

whether that was one  
of the problems

737

00:31:01,700 --> 00:31:05,033

with dropping blood pressure  
when you got back,

738

00:31:05,033 --> 00:31:07,366  
if those reflexes  
got out of shape.

739  
00:31:07,366 --> 00:31:09,333  
But, as you can imagine, you

740  
00:31:09,333 --> 00:31:12,533  
have to worry about the safety  
of experiments like this.

741  
00:31:12,533 --> 00:31:13,733  
You know, "I'm gonna mess

742  
00:31:13,733 --> 00:31:15,833  
with  
your blood-pressure receptors,

743  
00:31:15,833 --> 00:31:17,666  
and it's gonna do something  
to your heart,

744  
00:31:17,666 --> 00:31:19,533  
and you're gonna  
have to monitor"--

745  
00:31:19,533 --> 00:31:22,166  
what do we do if you  
have a bad reaction to that?

746  
00:31:22,166 --> 00:31:25,433  
So there was a lot of planning  
for worst-case scenarios.

747  
00:31:25,433 --> 00:31:26,466  
You know, "What are we gonna do?

748  
00:31:26,466 --> 00:31:27,966  
How will we recognize it?"

749

00:31:27,966 --> 00:31:30,066

And then, "How do we deal  
with it, when we're in space?"

750

00:31:30,066 --> 00:31:32,433

Luckily, nothing happened,  
but, again--

751

00:31:32,433 --> 00:31:35,966

the exercise of proving  
to our safety organization

752

00:31:35,966 --> 00:31:38,866

that it was safe to do this.

753

00:31:38,866 --> 00:31:41,133

This is how we did exercise  
in space.

754

00:31:41,133 --> 00:31:43,300

And tell you a little bit  
about that--we were wondering,

755

00:31:43,300 --> 00:31:45,033

"How much exercise could you do?"

756

00:31:45,033 --> 00:31:48,400

What was your intake of oxygen,  
output of CO<sub>2</sub>?"

757

00:31:48,400 --> 00:31:49,566

You know, "What does that  
look like?"

758

00:31:49,566 --> 00:31:51,500

So here I am on a bike,

759

00:31:51,500 --> 00:31:54,033

but it looks a little odd.

760

00:31:54,033 --> 00:31:56,000

What is this?

761

00:31:56,000 --> 00:31:58,500

There's a similar one  
on the other side.

762

00:31:58,500 --> 00:32:00,900

You can imagine,  
if you're sitting on a bike

763

00:32:00,900 --> 00:32:02,533

bolted to the floor,

764

00:32:02,533 --> 00:32:05,033

and you start pushing  
the pedals,

765

00:32:05,033 --> 00:32:06,800

you're gonna  
go the opposite direction.

766

00:32:06,800 --> 00:32:08,700

So you have to have something  
to hold you down.

767

00:32:08,700 --> 00:32:11,800

Those are shoulder boards  
that hold you down to the bike,

768

00:32:11,800 --> 00:32:13,733

so you could do the exercise.

769

00:32:13,733 --> 00:32:16,600

One thing that we had not  
thought of

770

00:32:16,600 --> 00:32:17,833

for this experiment--

771

00:32:17,833 --> 00:32:20,600

because you went  
to maximal exercise.

772

00:32:20,600 --> 00:32:22,133

So the guys are there and,

773

00:32:22,133 --> 00:32:24,300

you know, they're big mooses.

774

00:32:24,300 --> 00:32:26,200

They're doing big-time exercise,

775

00:32:26,200 --> 00:32:28,000

and they start to sweat.

776

00:32:28,000 --> 00:32:30,066

If you ever sweat on the bike  
in the gym,

777

00:32:30,066 --> 00:32:31,066

it goes on the floor,

778

00:32:31,066 --> 00:32:32,233

and you clean it up afterwards.

779

00:32:32,233 --> 00:32:33,500

Where does it go?

780

00:32:33,500 --> 00:32:35,100

It blobs up.

781

00:32:35,100 --> 00:32:36,500

And here you are,

782

00:32:36,500 --> 00:32:37,933

you float by,

783

00:32:37,933 --> 00:32:40,566

and there's this  
giant blob of sweat

784

00:32:40,566 --> 00:32:42,400

hanging off the back  
of this guy.

785

00:32:42,400 --> 00:32:44,600

So he had--we had to have  
helpers

786

00:32:44,600 --> 00:32:46,066

to go around with a towel

787

00:32:46,066 --> 00:32:49,100

and keep the sweat in one place.

788

00:32:49,100 --> 00:32:51,700

Another thing  
that I'm often asked,

789

00:32:51,700 --> 00:32:54,266

especially by kids--

790

00:32:54,266 --> 00:32:58,733

"You ever see any UFOs  
or aliens in space?"

791

00:32:58,733 --> 00:33:01,566

And I said, "No, I haven't."

792

00:33:01,566 --> 00:33:03,900

But, quite frankly,

793

00:33:03,900 --> 00:33:06,333

occasionally we catch them

794

00:33:06,333 --> 00:33:08,866  
and see them in pictures.

795

00:33:08,866 --> 00:33:12,800  
What is this?

796

00:33:12,800 --> 00:33:14,166  
That's an alien.

797

00:33:14,166 --> 00:33:15,366  
That's a crew member.

798

00:33:15,366 --> 00:33:17,566  
He just kind of looks weird  
in that picture.

799

00:33:17,566 --> 00:33:19,833  
And people say, "What is that?"

800

00:33:19,833 --> 00:33:22,766  
That's our alien.

801

00:33:22,766 --> 00:33:24,766  
This is doing  
a lung-function test.

802

00:33:24,766 --> 00:33:27,233  
Dave Wolf is breathing  
on this machine

803

00:33:27,233 --> 00:33:29,400  
to look at  
how your lungs function.

804

00:33:29,400 --> 00:33:31,466  
Again, easy to do on the ground,

805

00:33:31,466 --> 00:33:34,000  
uses a gas called argon.

806  
00:33:34,000 --> 00:33:36,800  
There are other things  
on there--gases,

807  
00:33:36,800 --> 00:33:40,233  
or liquids that turn to gas,  
like Freon in the freezers.

808  
00:33:40,233 --> 00:33:42,666  
One of the things  
you had to prove was that,

809  
00:33:42,666 --> 00:33:45,033  
if all that gas leaked out,

810  
00:33:45,033 --> 00:33:48,800  
it would not reach  
a dangerous concentration

811  
00:33:48,800 --> 00:33:50,233  
in the Spacelab.

812  
00:33:50,233 --> 00:33:52,000  
And so that was one  
of the other things

813  
00:33:52,000 --> 00:33:53,100  
that we had to worry about.

814  
00:33:53,100 --> 00:33:55,966  
How little gas could you use?

815  
00:33:55,966 --> 00:33:59,466  
How to keep your subject safe--

816  
00:33:59,466 --> 00:34:01,900

this is a subject  
doing a vestibular test,

817  
00:34:01,900 --> 00:34:02,966  
rotating in the chair.

818  
00:34:02,966 --> 00:34:04,466  
But you can see,  
he's blindfolded.

819  
00:34:04,466 --> 00:34:05,600  
He's strapped in.

820  
00:34:05,600 --> 00:34:07,533  
If something happened--  
an emergency happened--

821  
00:34:07,533 --> 00:34:09,600  
he gets disoriented doing this.

822  
00:34:09,600 --> 00:34:11,100  
How do we get him  
out of there safely?

823  
00:34:11,100 --> 00:34:13,200  
So things  
that you frequently don't have

824  
00:34:13,200 --> 00:34:15,033  
to worry about on the ground,

825  
00:34:15,033 --> 00:34:17,766  
you have to think about  
when you get up there.

826  
00:34:17,766 --> 00:34:19,566  
Jellyfish.

827  
00:34:19,566 --> 00:34:22,100

The title of the talk  
talked about jellyfish.

828  
00:34:22,100 --> 00:34:24,766  
Interesting that we took  
some flasks of jellyfish,

829  
00:34:24,766 --> 00:34:26,533  
we injected them  
with hormones.

830  
00:34:26,533 --> 00:34:29,700  
Jellyfish start  
like these little polyps.

831  
00:34:29,700 --> 00:34:31,733  
They get some thyroid hormone,

832  
00:34:31,733 --> 00:34:32,900  
and they strobilate.

833  
00:34:32,900 --> 00:34:34,900  
They turn into little sections.

834  
00:34:34,900 --> 00:34:36,533  
And they float free.

835  
00:34:36,533 --> 00:34:38,700  
And they form statoliths  
that are kind of

836  
00:34:38,700 --> 00:34:40,233  
like the otoliths  
in your ear--

837  
00:34:40,233 --> 00:34:42,066  
little stones that tell them

838  
00:34:42,066 --> 00:34:43,900

where up and down are  
and whether they're moving.

839

00:34:43,900 --> 00:34:46,533

The question is,  
did they develop them in space?

840

00:34:46,533 --> 00:34:49,166

And they did. That's obviously  
hardwired into the--

841

00:34:49,166 --> 00:34:50,500

into their DNA.

842

00:34:50,500 --> 00:34:52,366

They swam in circles up there,

843

00:34:52,366 --> 00:34:53,566

but they could swim just--

844

00:34:53,566 --> 00:34:56,233

just nicely  
when they got back down.

845

00:34:56,233 --> 00:34:58,900

So a simple experiment,

846

00:34:58,900 --> 00:35:01,933

but it was fun to do, and fun  
to watch the little jellies

847

00:35:01,933 --> 00:35:04,166

swimming in their little flasks.

848

00:35:04,166 --> 00:35:07,066

We took animals into space  
for the first time--

849

00:35:07,066 --> 00:35:08,233

lots of rats.

850

00:35:08,233 --> 00:35:10,933

They had flown  
in sealed containers before.

851

00:35:10,933 --> 00:35:13,566

This was the Research  
Animal Holding Facility,

852

00:35:13,566 --> 00:35:16,233

a massive project  
by the Ames folks.

853

00:35:16,233 --> 00:35:19,833

The first time the Research  
Animal Holding Facility flew,

854

00:35:19,833 --> 00:35:22,100

it didn't function very well.

855

00:35:22,100 --> 00:35:24,000

The airflow was not very good,

856

00:35:24,000 --> 00:35:26,266

and some of the air came out.

857

00:35:26,266 --> 00:35:27,800

And when your commander

858

00:35:27,800 --> 00:35:30,266

is sitting up in the cockpit,

859

00:35:30,266 --> 00:35:33,800

and he looks up,  
and he says, "Oh, shit,"

860

00:35:33,800 --> 00:35:35,233

and that's what it is,

861

00:35:35,233 --> 00:35:38,533

because it's come  
out of the animal cages,

862

00:35:38,533 --> 00:35:42,033

the people back in Mission  
Control get a little freaky.

863

00:35:42,033 --> 00:35:45,300

And so the animal cages  
had to be redesigned.

864

00:35:45,300 --> 00:35:47,233

We didn't think we would have  
them for this mission,

865

00:35:47,233 --> 00:35:51,566

but because we were delayed  
by Challenger, we--

866

00:35:51,566 --> 00:35:53,000

they were redesigned in time.

867

00:35:53,000 --> 00:35:54,833

Thank you,  
all you wonderful Ames people

868

00:35:54,833 --> 00:35:56,433

that work so hard on this.

869

00:35:56,433 --> 00:35:59,033

We flew them on SLS-1 as a test.

870

00:35:59,033 --> 00:36:00,500

We're pulling them out.

871

00:36:00,500 --> 00:36:04,566

We got a permission to pull them

out of the holding facility.

872

00:36:04,566 --> 00:36:05,833

The animals were healthy.

873

00:36:05,833 --> 00:36:07,366

The cages were working well.

874

00:36:07,366 --> 00:36:11,066

We pulled them out,  
took them over to a workbench

875

00:36:11,066 --> 00:36:13,466

to see how the animals  
reacted to weightlessness.

876

00:36:13,466 --> 00:36:14,533

They didn't get aggressive.

877

00:36:14,533 --> 00:36:15,633

They were easy to handle.

878

00:36:15,633 --> 00:36:18,600

And that was a good thing  
for SLS-2,

879

00:36:18,600 --> 00:36:21,366

because we did animal  
dissections for the first time.

880

00:36:21,366 --> 00:36:22,766

And you can imagine--

881

00:36:22,766 --> 00:36:25,333

if you remember your freshman  
or sophomore biology class

882

00:36:25,333 --> 00:36:27,666

and dissecting a frog

or dissecting an animal,

883

00:36:27,666 --> 00:36:30,633

imagine planning

to do that in weightlessness.

884

00:36:30,633 --> 00:36:32,766

A lot of stuff

about the animals themselves,

885

00:36:32,766 --> 00:36:34,900

the tissues that we had to save,

886

00:36:34,900 --> 00:36:38,633

the fixatives we had

to put them in, the instruments

887

00:36:38,633 --> 00:36:41,433

we had to use, the time

constraints that we had--

888

00:36:41,433 --> 00:36:44,100

and we practiced, and practiced,

and practiced, and practiced,

889

00:36:44,100 --> 00:36:46,566

thanks to the amazing people

890

00:36:46,566 --> 00:36:49,366

here at Ames that helped

us plan that and do that,

891

00:36:49,366 --> 00:36:51,133

put all the stowage for us.

892

00:36:51,133 --> 00:36:53,300

And they breathed a sigh

of relief

893

00:36:53,300 --> 00:36:54,500  
when we voiced down,

894  
00:36:54,500 --> 00:36:55,700  
"We did six animals,

895  
00:36:55,700 --> 00:36:57,533  
and we got all the tissues  
that we meant to."

896  
00:36:57,533 --> 00:36:59,400  
So it was amazing.

897  
00:36:59,400 --> 00:37:01,766  
We wanted to compare  
the reaction of the rats

898  
00:37:01,766 --> 00:37:03,166  
in space to people,

899  
00:37:03,166 --> 00:37:06,533  
to see whether or not they  
were good models for humans.

900  
00:37:06,533 --> 00:37:08,633  
So a very,  
very important part

901  
00:37:08,633 --> 00:37:10,766  
of what we were doing  
on this mission.

902  
00:37:10,766 --> 00:37:12,566  
When we come back  
to Earth, you know,

903  
00:37:12,566 --> 00:37:14,366  
you're above the atmosphere  
when you start out,

904  
00:37:14,366 --> 00:37:15,966  
and when you enter  
the Earth's atmosphere

905  
00:37:15,966 --> 00:37:17,900  
and you hit  
all the air molecules,

906  
00:37:17,900 --> 00:37:19,333  
it heats up the shuttle.

907  
00:37:19,333 --> 00:37:21,966  
You have to be protected  
from that heat.

908  
00:37:21,966 --> 00:37:23,666  
And this is what it looks like.

909  
00:37:23,666 --> 00:37:26,033  
And the folks  
at Ames Research Center

910  
00:37:26,033 --> 00:37:28,766  
were in charge of  
the thermal protection system.

911  
00:37:28,766 --> 00:37:31,600  
And we owe our lives  
to the people that designed

912  
00:37:31,600 --> 00:37:35,466  
this remarkable system  
of insulating blankets,

913  
00:37:35,466 --> 00:37:37,033  
reinforced carbon-carbon,

914  
00:37:37,033 --> 00:37:41,033  
and all the tiles that fit

on the bottom of the shuttle.

915

00:37:41,033 --> 00:37:44,100

And this is what it looks  
like when you're in the midst

916

00:37:44,100 --> 00:37:45,333

of that fireball,

917

00:37:45,333 --> 00:37:48,000

and you realize  
how much your life

918

00:37:48,000 --> 00:37:51,033

depends on that system.

919

00:37:51,033 --> 00:37:52,066

I'll read a little book--

920

00:37:52,066 --> 00:37:54,600

a bit out of the book.

921

00:37:54,600 --> 00:37:57,433

"After a successful  
deorbit burn,

922

00:37:57,433 --> 00:38:01,100

the orbiter flipped over so  
that its nose was forward again.

923

00:38:01,100 --> 00:38:04,200

The nose had to be cocked up  
about 40 degrees,

924

00:38:04,200 --> 00:38:06,566

so the heat shield tiles  
on the underbelly

925

00:38:06,566 --> 00:38:09,033

would get most of the heating  
during reentry.

926

00:38:09,033 --> 00:38:11,633

As we sank deeper and deeper  
into the atmosphere,

927

00:38:11,633 --> 00:38:14,300

an orange glow  
began to appear out the windows.

928

00:38:14,300 --> 00:38:17,566

Behind my head, heated air  
molecules struck the tail

929

00:38:17,566 --> 00:38:20,666

and created bright flashes  
of light on the backs

930

00:38:20,666 --> 00:38:22,633

of Bryan and Sid's helmets.

931

00:38:22,633 --> 00:38:25,800

We were in a thin-skinned  
protective cocoon in the midst

932

00:38:25,800 --> 00:38:29,033

of a fireball as hot  
as the surface of the sun.

933

00:38:29,033 --> 00:38:31,766

If there were any breaks  
in our vehicle's skin,

934

00:38:31,766 --> 00:38:33,766

we'd soon be incinerated."

935

00:38:33,766 --> 00:38:35,700

So you really think about

936  
00:38:35,700 --> 00:38:38,600  
the people  
who are looking out for you

937  
00:38:38,600 --> 00:38:41,466  
and who have done  
remarkable things like this.

938  
00:38:41,466 --> 00:38:45,233  
And so, again,  
thank you to the Ames folks.

939  
00:38:45,233 --> 00:38:47,366  
You always hope  
that you have as many landings

940  
00:38:47,366 --> 00:38:48,466  
as you do take-offs.

941  
00:38:48,466 --> 00:38:50,200  
And I was fortunate that I did.

942  
00:38:50,200 --> 00:38:52,300  
This is my last landing.

943  
00:38:52,300 --> 00:38:54,266  
Instead of getting out  
and kicking the tires,

944  
00:38:54,266 --> 00:38:56,900  
we had to move into a people  
mover to get back to the lab,

945  
00:38:56,900 --> 00:39:00,066  
because we had normal testing  
before we left,

946  
00:39:00,066 --> 00:39:01,200  
we were tested in flight,

947

00:39:01,200 --> 00:39:02,600  
and then they wanted to see

948

00:39:02,600 --> 00:39:06,200  
how we adapted  
to getting back to Earth.

949

00:39:06,200 --> 00:39:08,500  
So it was wonderful.

950

00:39:08,500 --> 00:39:12,600  
What great experiences I had,  
and how fortunate I was

951

00:39:12,600 --> 00:39:16,000  
to be able to do  
all these rather unusual things.

952

00:39:16,000 --> 00:39:18,566  
I wanted to capture  
those things.

953

00:39:18,566 --> 00:39:20,133  
I put them down in a book.

954

00:39:20,133 --> 00:39:21,633  
It's not a great work  
of literature,

955

00:39:21,633 --> 00:39:23,133  
but it is a simple story

956

00:39:23,133 --> 00:39:27,000  
of what it's like to go from  
being a little girl in Tennessee

957

00:39:27,000 --> 00:39:28,466  
to getting to go to space--

958

00:39:28,466 --> 00:39:31,033  
and having kids along the way,

959

00:39:31,033 --> 00:39:32,966  
marrying a fellow astronaut,

960

00:39:32,966 --> 00:39:35,200  
getting to be  
an astronaut's spouse,

961

00:39:35,200 --> 00:39:36,866  
and doing great things.

962

00:39:36,866 --> 00:39:40,733  
The logo on the left  
is the astronaut symbol,

963

00:39:40,733 --> 00:39:42,300  
slightly modified,

964

00:39:42,300 --> 00:39:45,533  
and it is my--  
the logo for my book.

965

00:39:45,533 --> 00:39:47,466  
So, again,  
I appreciate your being here,

966

00:39:47,466 --> 00:39:48,966  
and we'll do some questions  
and answers,

967

00:39:48,966 --> 00:39:49,966  
if we have time.

968

00:39:49,966 --> 00:39:50,966  
- Yes.

969  
00:39:50,966 --> 00:39:52,300  
- All right.

970  
00:39:52,300 --> 00:39:54,700  
[applause]

971  
00:39:59,700 --> 00:40:00,766  
- Thank you, Rhea.

972  
00:40:00,766 --> 00:40:02,533  
If you have a question, please

973  
00:40:02,533 --> 00:40:05,533  
raise your hand, wait  
for a microphone to come to you,

974  
00:40:05,533 --> 00:40:06,866  
and ask your question.

975  
00:40:06,866 --> 00:40:08,666  
And then return the microphone.

976  
00:40:08,666 --> 00:40:10,500  
Thank you.

977  
00:40:14,666 --> 00:40:16,066  
- Thank you, Dr. Seddon,

978  
00:40:16,066 --> 00:40:17,800  
on behalf of the astronauts

979  
00:40:17,800 --> 00:40:20,433  
and women  
and kids of all ages.

980  
00:40:20,433 --> 00:40:22,800  
You really are quite  
the inspiration.

981

00:40:22,800 --> 00:40:24,533

I didn't have a question,

982

00:40:24,533 --> 00:40:26,233

but I just wanted

to congratulate you

983

00:40:26,233 --> 00:40:27,300

on your induction

984

00:40:27,300 --> 00:40:29,633

into the

Astronaut Hall of Fame 2015.

985

00:40:29,633 --> 00:40:30,733

- Thank you so much, Yvonne--

986

00:40:30,733 --> 00:40:32,066

appreciate that.

987

00:40:32,066 --> 00:40:34,933

[applause]

988

00:40:37,066 --> 00:40:38,333

- It was quite an honor.

989

00:40:38,333 --> 00:40:42,133

You know, I heard a talk

recently by an astronaut scholar

990

00:40:42,133 --> 00:40:45,466

who talked about the value

of recognition.

991

00:40:45,466 --> 00:40:47,800

You know, when you think

you're doing a pretty good job,

992  
00:40:47,800 --> 00:40:48,933  
you're not really sure

993  
00:40:48,933 --> 00:40:51,866  
until somebody rewards you  
in some way

994  
00:40:51,866 --> 00:40:53,166  
or mentions you in some way.

995  
00:40:53,166 --> 00:40:55,466  
So I always try to remember  
that,

996  
00:40:55,466 --> 00:40:57,700  
to tell people how much  
we appreciate the things

997  
00:40:57,700 --> 00:40:59,733  
that they've done for us.

998  
00:40:59,733 --> 00:41:02,433  
Other questions?

999  
00:41:02,433 --> 00:41:04,700  
- You talked a little bit  
about some things

1000  
00:41:04,700 --> 00:41:08,000  
that are more complicated  
in space than they are on Earth.

1001  
00:41:08,000 --> 00:41:09,866  
Is there any one thing

1002  
00:41:09,866 --> 00:41:12,633  
that scientists usually  
fail to think about

1003

00:41:12,633 --> 00:41:14,433

when they're thinking  
about space experiments,

1004

00:41:14,433 --> 00:41:17,633

or something that you thought  
was interesting?

1005

00:41:17,633 --> 00:41:21,966

- Hmm.

1006

00:41:21,966 --> 00:41:23,700

I guess, you know,

1007

00:41:23,700 --> 00:41:26,866

one of the easiest things  
to do in space is to--

1008

00:41:26,866 --> 00:41:28,033

is to move around,

1009

00:41:28,033 --> 00:41:30,066

'cause you fly everywhere.

1010

00:41:30,066 --> 00:41:33,133

And so getting  
from place to place

1011

00:41:33,133 --> 00:41:35,366

is relatively easy.

1012

00:41:35,366 --> 00:41:39,566

So it's easy to do that.

1013

00:41:39,566 --> 00:41:42,366

I guess one of the things  
that the scientists often

1014

00:41:42,366 --> 00:41:44,766  
forget on complicated missions  
like this

1015  
00:41:44,766 --> 00:41:46,733  
is that you have--

1016  
00:41:46,733 --> 00:41:48,366  
you have four subjects.

1017  
00:41:48,366 --> 00:41:49,933  
You have lots of experiments.

1018  
00:41:49,933 --> 00:41:51,100  
And they have to share.

1019  
00:41:51,100 --> 00:41:53,566  
They have to coordinate  
with other scientists.

1020  
00:41:53,566 --> 00:41:55,566  
And frequently, that's a bit  
of a leap for them.

1021  
00:41:55,566 --> 00:41:57,333  
They're used  
to doing their science.

1022  
00:41:57,333 --> 00:41:58,466  
And you have to--

1023  
00:41:58,466 --> 00:42:00,666  
you have to work  
to put everything together.

1024  
00:42:00,666 --> 00:42:03,333  
Certain experiments  
can't be done back-to-back.

1025

00:42:03,333 --> 00:42:06,633

And that integration  
is sometimes difficult

1026

00:42:06,633 --> 00:42:10,200

and requires a lot of

1027

00:42:10,200 --> 00:42:12,433

coordinating and compromising,

1028

00:42:12,433 --> 00:42:15,200

and so I think

1029

00:42:15,200 --> 00:42:17,066

that's one

of the things that make--

1030

00:42:17,066 --> 00:42:18,266

made it a little difficult.

1031

00:42:18,266 --> 00:42:20,300

As the Payload Commander  
of my third flight,

1032

00:42:20,300 --> 00:42:22,566

I got a chance

to help with doing that.

1033

00:42:22,566 --> 00:42:25,366

And I think we, you know,  
we built a great team,

1034

00:42:25,366 --> 00:42:27,700

and we all wanted to help  
each other out,

1035

00:42:27,700 --> 00:42:30,000

and so, making that work

1036

00:42:30,000 --> 00:42:31,700

was one of the more  
complicated things.

1037

00:42:31,700 --> 00:42:34,433

People are--scientists are used  
to doing their science,

1038

00:42:34,433 --> 00:42:37,366

and their lab,  
and having all the time.

1039

00:42:39,533 --> 00:42:41,766

- Hi, Dr. Seddon.

Thank you for your talk today.

1040

00:42:41,766 --> 00:42:44,633

A good number of us got to work  
with Bob Phillips,

1041

00:42:44,633 --> 00:42:46,566

in the years after SLS-1.

1042

00:42:46,566 --> 00:42:49,066

And so he passed a couple  
of years ago.

1043

00:42:49,066 --> 00:42:51,066

I'm wondering  
if you have a good memory

1044

00:42:51,066 --> 00:42:52,433

that you might share with us,

1045

00:42:52,433 --> 00:42:54,533

of something that--since  
he ultimately didn't get to fly,

1046

00:42:54,533 --> 00:42:57,800

but I know he served as CAPCOM

on the mission, but--

1047

00:42:57,800 --> 00:42:59,033

- Bob Phillips

1048

00:42:59,033 --> 00:43:02,066

was a veterinarian

who trained with us for SLS-1--

1049

00:43:02,066 --> 00:43:04,466

a wonderful, wonderful guy.

1050

00:43:04,466 --> 00:43:05,966

And we just loved him.

1051

00:43:05,966 --> 00:43:09,566

He developed a health problem  
during our training

1052

00:43:09,566 --> 00:43:13,333

that made him

ineligible for flight.

1053

00:43:13,333 --> 00:43:17,466

And we wanted to remember him  
in a way--

1054

00:43:17,466 --> 00:43:21,566

we couldn't put his name  
on our--

1055

00:43:21,566 --> 00:43:23,133

our crew patch,

1056

00:43:23,133 --> 00:43:24,766

and that was unfortunate.

1057

00:43:24,766 --> 00:43:27,533

We felt--we felt

he should be remembered.

1058

00:43:27,533 --> 00:43:33,366

He represented us in--

1059

00:43:33,366 --> 00:43:36,033

in the Payload Operations  
Control Center.

1060

00:43:36,033 --> 00:43:38,833

Do you see the P?

1061

00:43:38,833 --> 00:43:40,433

P for Phillips--

1062

00:43:40,433 --> 00:43:43,066

so we were happy  
to be able to do that,

1063

00:43:43,066 --> 00:43:45,000

and I think it was special  
for him.

1064

00:43:45,000 --> 00:43:46,400

And, you know,

1065

00:43:46,400 --> 00:43:49,366

he lived many, many years  
with that health problem--

1066

00:43:49,366 --> 00:43:53,200

and probably wouldn't have  
affected his being in flight.

1067

00:43:53,200 --> 00:43:55,633

But we were sorry  
he didn't get to go,

1068

00:43:55,633 --> 00:43:58,333

but he was so excited  
about the mission itself.

1069

00:43:58,333 --> 00:44:02,733

So thank you for mentioning Bob.  
Wonderful guy.

1070

00:44:02,733 --> 00:44:05,566

- You have been  
such a trailblazer

1071

00:44:05,566 --> 00:44:08,166

and accomplished so much  
in your life.

1072

00:44:08,166 --> 00:44:11,133

What is your next goal?

1073

00:44:11,133 --> 00:44:14,033

- I mentioned that I had married

1074

00:44:14,033 --> 00:44:15,633

a fellow astronaut--

1075

00:44:15,633 --> 00:44:18,566

Captain Hoot Gibson,  
a pilot astronaut.

1076

00:44:18,566 --> 00:44:20,400

He commanded  
four shuttle missions.

1077

00:44:20,400 --> 00:44:22,933

He flew as the co-pilot  
on his first one.

1078

00:44:22,933 --> 00:44:25,166

I would love  
to write his book.

1079

00:44:25,166 --> 00:44:26,566

It is

a totally different book.

1080

00:44:26,566 --> 00:44:29,200

It's the pilot's side of things.

1081

00:44:29,200 --> 00:44:34,200

But, just as I served as

his spouse during his missions,

1082

00:44:34,200 --> 00:44:37,900

he served as my spouse

during my missions,

1083

00:44:37,900 --> 00:44:40,266

and has many funny stories

about it.

1084

00:44:40,266 --> 00:44:42,766

Bo can tell you

that he's quite a character.

1085

00:44:42,766 --> 00:44:46,900

One of his flights

was known as Swine Flight.

1086

00:44:46,900 --> 00:44:48,600

They--if you read the book,

1087

00:44:48,600 --> 00:44:50,366

they all snorted

at pretty girls.

1088

00:44:50,366 --> 00:44:52,933

Of course,

that wasn't politically correct,

1089

00:44:52,933 --> 00:44:54,366

but they did it anyway,

1090

00:44:54,366 --> 00:44:57,500  
and so they were known  
in the office as Swine Flight.

1091

00:44:57,500 --> 00:44:59,400  
But they--he made it fun.

1092

00:44:59,400 --> 00:45:00,733  
And, as I mentioned,

1093

00:45:00,733 --> 00:45:03,866  
if you can have a crew  
get together and have fun

1094

00:45:03,866 --> 00:45:06,433  
in the midst of all this stress,  
it's wonderful.

1095

00:45:06,433 --> 00:45:08,933  
So I think that's my next one.

1096

00:45:08,933 --> 00:45:10,733  
I'm hoping that  
he'll let me do it.

1097

00:45:10,733 --> 00:45:15,033  
I learned a lot  
by doing this first one.

1098

00:45:15,033 --> 00:45:16,166  
We have a question  
down here?

1099

00:45:16,166 --> 00:45:19,300  
Have you got one  
back there?

1100

00:45:19,300 --> 00:45:22,033

- Hi, thank you very much  
for the talk.

1101

00:45:22,033 --> 00:45:26,033

In the cramped conditions  
of the middeck and the Spacelab,

1102

00:45:26,033 --> 00:45:28,866

how did you avoid--or what were  
the countermeasures in place--

1103

00:45:28,866 --> 00:45:30,966

to not, like, bump into a switch

1104

00:45:30,966 --> 00:45:33,666

or snag on a wire  
or something like that?

1105

00:45:33,666 --> 00:45:35,233

And did you ever  
mess up an experiment

1106

00:45:35,233 --> 00:45:37,233

because of something like that?

1107

00:45:37,233 --> 00:45:39,333

- I'd like to think we didn't.

1108

00:45:39,333 --> 00:45:42,300

And probably--  
probably someone has.

1109

00:45:42,300 --> 00:45:44,900

The important switches  
are guarded.

1110

00:45:44,900 --> 00:45:48,466

There are little things  
around each switch.

1111

00:45:48,466 --> 00:45:51,500

And the ones that are critical--  
the ones up on the flight deck

1112

00:45:51,500 --> 00:45:54,100

above the captain,  
the commander,

1113

00:45:54,100 --> 00:45:55,100

and the pilot's seat--

1114

00:45:55,100 --> 00:45:57,133

all have guards  
down over them.

1115

00:45:57,133 --> 00:45:58,466

So, in order to  
activate them,

1116

00:45:58,466 --> 00:46:02,966

you have to lift the guard  
to move the switch.

1117

00:46:02,966 --> 00:46:05,800

Occasionally, things  
got kicked or bumped.

1118

00:46:05,800 --> 00:46:07,766

Everything was made very sturdy.

1119

00:46:07,766 --> 00:46:10,833

The plugs that we plugged in

1120

00:46:10,833 --> 00:46:13,633

were super heavy-duty,

1121

00:46:13,633 --> 00:46:16,433

and had to be screwed

and locked in.

1122

00:46:16,433 --> 00:46:19,433

But it was one of those things  
that you had to worry about.

1123

00:46:19,433 --> 00:46:20,800

You couldn't just  
go flying around.

1124

00:46:20,800 --> 00:46:23,700

And you learned  
how to move smoothly and gently,

1125

00:46:23,700 --> 00:46:25,400

and watch things.

1126

00:46:25,400 --> 00:46:26,966

I think there was probably--

1127

00:46:26,966 --> 00:46:30,533

we went back in the lab  
to play around one day

1128

00:46:30,533 --> 00:46:32,233

and took some pictures,

1129

00:46:32,233 --> 00:46:34,566

you know,  
of off-hours with astronauts,

1130

00:46:34,566 --> 00:46:35,933

and were goofing around.

1131

00:46:35,933 --> 00:46:37,800

And when we were done,

1132

00:46:37,800 --> 00:46:40,200

there was an experiment

that had been turned off.

1133

00:46:40,200 --> 00:46:43,500

And we probably kicked something  
in that area.

1134

00:46:43,500 --> 00:46:44,800

We'll never know.

1135

00:46:44,800 --> 00:46:48,133

But I can't think  
of any major catastrophes--

1136

00:46:48,133 --> 00:46:49,933

things that  
were broken or not.

1137

00:46:49,933 --> 00:46:52,533

Everything had to be  
super strong to deal--you know,

1138

00:46:52,533 --> 00:46:55,066

to keep the safety people happy.

1139

00:46:55,066 --> 00:46:56,366

Not a lot of glass to break,

1140

00:46:56,366 --> 00:46:58,666

or things  
that were too delicate.

1141

00:46:58,666 --> 00:46:59,833

So we had to--

1142

00:46:59,833 --> 00:47:01,866

we had to worry about it.

1143

00:47:01,866 --> 00:47:03,333

One down here.

1144

00:47:03,333 --> 00:47:04,566

- Did you--you did a lot

1145

00:47:04,566 --> 00:47:06,066

of experiments related  
to weightlessness.

1146

00:47:06,066 --> 00:47:10,133

Did you do any experiments  
related to space radiation?

1147

00:47:10,133 --> 00:47:11,233

- Space radiation--

1148

00:47:11,233 --> 00:47:12,366

it's kind of one of those things

1149

00:47:12,366 --> 00:47:14,166

that we worry about for going

1150

00:47:14,166 --> 00:47:16,533

into interplanetary space,  
to Mars.

1151

00:47:16,533 --> 00:47:19,733

And I don't think  
we have all the answers to that.

1152

00:47:19,733 --> 00:47:22,266

We did wear radiation monitors.

1153

00:47:22,266 --> 00:47:25,366

And so, you know,

1154

00:47:25,366 --> 00:47:28,333

we made sure that at least,  
when we got back,

1155

00:47:28,333 --> 00:47:31,200

they could tell us that we  
hadn't had a lot of radiation.

1156

00:47:31,200 --> 00:47:33,533

It was interesting--  
on SLS-1,

1157

00:47:33,533 --> 00:47:36,300

we got back and we were  
saying hello to everybody--

1158

00:47:36,300 --> 00:47:37,466

somebody said,

1159

00:47:37,466 --> 00:47:41,433

"Could you feel that--  
that sunburst?"

1160

00:47:41,433 --> 00:47:44,166

That--those sun things--

1161

00:47:44,166 --> 00:47:45,366

whatever it was that was--

1162

00:47:45,366 --> 00:47:48,400

you know, they'd had a--  
had a solar flare.

1163

00:47:48,400 --> 00:47:50,533

"Could you feel  
the solar flare? "

1164

00:47:50,533 --> 00:47:51,600

And we were going,

1165

00:47:51,600 --> 00:47:53,666

"What solar flare?"

1166

00:47:53,666 --> 00:47:55,000

And I guess the folks  
in Mission Control

1167

00:47:55,000 --> 00:47:57,333

decided that it  
wasn't gonna be a problem.

1168

00:47:57,333 --> 00:47:59,066

They didn't even  
tell us about it, but--

1169

00:47:59,066 --> 00:48:00,433

and I don't think the radiation

1170

00:48:00,433 --> 00:48:03,100

that we had  
was that much higher.

1171

00:48:03,100 --> 00:48:04,400

I know that they--

1172

00:48:04,400 --> 00:48:07,233

that we go back to NASA  
every year for physical exams,

1173

00:48:07,233 --> 00:48:09,733

and they watch astronauts

1174

00:48:09,733 --> 00:48:12,766

to see if there are any untoward  
effects that they can--

1175

00:48:12,766 --> 00:48:15,133

they can say  
were caused by radiation.

1176

00:48:15,133 --> 00:48:18,000

But no, I didn't do any

of the radiation experiments.

1177

00:48:18,000 --> 00:48:21,566

I liked life sciences instead.

1178

00:48:21,566 --> 00:48:22,566

How we doing?

1179

00:48:22,566 --> 00:48:23,700

- Good.

1180

00:48:23,700 --> 00:48:25,766

- Hi, thank you  
for the talk today.

1181

00:48:25,766 --> 00:48:27,500

My question is,

1182

00:48:27,500 --> 00:48:31,033

what was going through your mind  
on your very first mission,

1183

00:48:31,033 --> 00:48:33,133

right after the solid rocket  
boosters ignited

1184

00:48:33,133 --> 00:48:34,500

and liftoff occurred,

1185

00:48:34,500 --> 00:48:37,833

and you realized  
that you were going to space?

1186

00:48:37,833 --> 00:48:40,633

- My first thought was,  
"We blew up."

1187

00:48:40,633 --> 00:48:42,500

[laughter]

1188

00:48:42,500 --> 00:48:43,566

- You're sitting  
on the launch pad,

1189

00:48:43,566 --> 00:48:45,233

and you're looking at the sky.

1190

00:48:45,233 --> 00:48:47,533

And, of course,  
you're very worried about

1191

00:48:47,533 --> 00:48:49,133

whether you're really  
gonna get to go or not.

1192

00:48:49,133 --> 00:48:51,766

And Bo can tell you that,  
until the very last

1193

00:48:51,766 --> 00:48:54,500

of our launch window  
they said,

1194

00:48:54,500 --> 00:48:56,433

"Hey, hey, Commander, you know,

1195

00:48:56,433 --> 00:48:58,766

what's the best way to get  
this thing off the ground?"

1196

00:48:58,766 --> 00:49:01,766

And Bo said, "I think  
you could pick up the count."

1197

00:49:01,766 --> 00:49:02,833

And he said,

1198

00:49:02,833 --> 00:49:04,933

"Okay, in 30 seconds.

1199

00:49:04,933 --> 00:49:06,866

T-minus nine minutes  
and counting."

1200

00:49:06,866 --> 00:49:09,066

So it was, you know,

1201

00:49:09,066 --> 00:49:11,233

it was just kind of like,

"Oh, we really are going today."

1202

00:49:11,233 --> 00:49:12,833

We had decided we weren't going.

1203

00:49:12,833 --> 00:49:14,066

And you're sitting there,

1204

00:49:14,066 --> 00:49:17,100

and you--and the--

when the main engines start,

1205

00:49:17,100 --> 00:49:20,600

the tip of the top

of the shuttle rocks back.

1206

00:49:20,600 --> 00:49:22,233

And so you can see

the launch tower,

1207

00:49:22,233 --> 00:49:24,000

and you can see

that you're rocking back,

1208

00:49:24,000 --> 00:49:25,900

and you know,

when you come to upright,

1209

00:49:25,900 --> 00:49:27,866  
the boosters are gonna ignite.

1210  
00:49:27,866 --> 00:49:29,833  
And there's no way

1211  
00:49:29,833 --> 00:49:32,500  
for anybody to tell you  
what that's gonna be like.

1212  
00:49:32,500 --> 00:49:35,100  
There's no simulator  
that simulates that.

1213  
00:49:35,100 --> 00:49:38,633  
It really, really  
feels like an explosion.

1214  
00:49:38,633 --> 00:49:41,200  
And I was looking at my hands  
in my lap,

1215  
00:49:41,200 --> 00:49:44,766  
and thought, "I'm gonna  
watch my body disintegrate."

1216  
00:49:44,766 --> 00:49:46,266  
And luckily, I was  
on the flight deck,

1217  
00:49:46,266 --> 00:49:48,300  
and I could look  
at the computer screens

1218  
00:49:48,300 --> 00:49:52,000  
and see that we were still going  
in the right direction.

1219  
00:49:52,000 --> 00:49:55,433  
But the ride on the boosters

is just incredible--

1220

00:49:55,433 --> 00:49:59,166

lots of noise, vibration,  
acceleration.

1221

00:49:59,166 --> 00:50:01,300

And that first launch,

1222

00:50:01,300 --> 00:50:04,066

I think you're--there's nothing  
that can prepare you for that,

1223

00:50:04,066 --> 00:50:05,533

other than somebody telling you

1224

00:50:05,533 --> 00:50:08,033

it's gonna be something  
like you've never felt before.

1225

00:50:08,033 --> 00:50:09,566

My husband describes it

1226

00:50:09,566 --> 00:50:12,400

like it's a catapult  
off a carrier--

1227

00:50:12,400 --> 00:50:14,433

you know, just an--  
all of a sudden jerk--

1228

00:50:14,433 --> 00:50:16,566

but yeah, you have to--

1229

00:50:16,566 --> 00:50:18,466

you have to be willing  
to take that risk

1230

00:50:18,466 --> 00:50:22,500

and be ready to go.

1231

00:50:22,500 --> 00:50:24,733

In the back.

- Hi.

1232

00:50:24,733 --> 00:50:27,266

So my question is,

when you were--

1233

00:50:27,266 --> 00:50:29,233

you were talking about,

when you were a young girl,

1234

00:50:29,233 --> 00:50:32,466

you had a lot of people

believe in you

1235

00:50:32,466 --> 00:50:37,433

and propelling you forward--

mentors and things like that.

1236

00:50:37,433 --> 00:50:39,800

So I'm wondering, you know,

what was it that

1237

00:50:39,800 --> 00:50:41,800

made them believe in you

and want to do that?

1238

00:50:41,800 --> 00:50:43,266

And, like, what young--or,

1239

00:50:43,266 --> 00:50:46,300

what advice would you have for

young women who are,

1240

00:50:46,300 --> 00:50:48,633

you know,

have these sorts of dreams

1241

00:50:48,633 --> 00:50:52,333  
and want to be pioneers today?

1242

00:50:52,333 --> 00:50:53,766  
- Well, you know, back then,

1243

00:50:53,766 --> 00:50:55,800  
there were just certain things  
that women were supposed to do,

1244

00:50:55,800 --> 00:50:57,866  
certainly in the South.

1245

00:50:57,866 --> 00:51:01,100  
But luckily, my parents  
had some friends,

1246

00:51:01,100 --> 00:51:03,333  
a couple of women doctors.

1247

00:51:03,333 --> 00:51:05,700  
And they told me, you know,

1248

00:51:05,700 --> 00:51:07,300  
"You can do it  
if you want to do it."

1249

00:51:07,300 --> 00:51:09,600  
I had a father  
who was very supportive.

1250

00:51:09,600 --> 00:51:11,966  
You know,  
"Of course you can do that."

1251

00:51:11,966 --> 00:51:13,000  
There were a lot of dads  
that said,

1252

00:51:13,000 --> 00:51:14,333

"Ladies don't do that"

1253

00:51:14,333 --> 00:51:15,666

or "Girls don't do that."

1254

00:51:15,666 --> 00:51:20,266

And so I had a lot  
of support at home.

1255

00:51:20,266 --> 00:51:22,800

But there were just things  
that I wanted to do,

1256

00:51:22,800 --> 00:51:24,966

and I was gonna try to do them.

1257

00:51:24,966 --> 00:51:26,533

I always had a back-up plan.

1258

00:51:26,533 --> 00:51:30,833

If I--if that wasn't gonna work,  
I'd try something different.

1259

00:51:30,833 --> 00:51:33,033

But as I went along, luckily,

1260

00:51:33,033 --> 00:51:36,833

I met enough people  
who told me I could do it--

1261

00:51:36,833 --> 00:51:40,000

a few people who,  
in subtle ways,

1262

00:51:40,000 --> 00:51:43,133

told me I couldn't do it.

1263

00:51:43,133 --> 00:51:45,733

But, when you want  
to do something passionately,

1264

00:51:45,733 --> 00:51:49,366

and you want--  
you want to try to do it,

1265

00:51:49,366 --> 00:51:50,966

it doesn't hurt to try.

1266

00:51:50,966 --> 00:51:53,900

And that's  
what I tell young women.

1267

00:51:53,900 --> 00:51:55,866

Follow your dreams.

1268

00:51:55,866 --> 00:51:57,933

Reach for things  
that have never done before.

1269

00:51:57,933 --> 00:52:00,066

Don't be afraid to go first.

1270

00:52:00,066 --> 00:52:03,033

'Cause if you really want to do  
it, you'll figure out a way.

1271

00:52:03,033 --> 00:52:06,133

Or you'll figure out a way  
to do something similar.

1272

00:52:06,133 --> 00:52:10,300

So, you know, I encourage women  
who have achieved

1273

00:52:10,300 --> 00:52:14,166

to please tell young women

that they can do this,

1274

00:52:14,166 --> 00:52:15,400

that they can do that,

1275

00:52:15,400 --> 00:52:16,800

that they can do what you do.

1276

00:52:16,800 --> 00:52:18,633

They can do

what you wanted to do

1277

00:52:18,633 --> 00:52:21,100

but couldn't at the time.

I was fortunate.

1278

00:52:21,100 --> 00:52:24,066

I was in the right place

at the right time,

1279

00:52:24,066 --> 00:52:28,366

and so I think

I was lucky in many ways.

1280

00:52:28,366 --> 00:52:32,566

The good Lord looked out for me,

I guess.

1281

00:52:32,566 --> 00:52:34,300

Other questions?

1282

00:52:34,300 --> 00:52:37,300

- Thank you for sharing

your experiences with us.

1283

00:52:37,300 --> 00:52:40,800

I think a lot

of the vital--

1284

00:52:40,800 --> 00:52:42,300  
vital information

1285  
00:52:42,300 --> 00:52:45,933  
on the effects  
of weightlessness on humans

1286  
00:52:45,933 --> 00:52:48,633  
has been researched  
for many years--

1287  
00:52:48,633 --> 00:52:51,000  
you know, every single--  
every single mission.

1288  
00:52:51,000 --> 00:52:54,133  
And I think that a lot of the--  
a lot of the new things--

1289  
00:52:54,133 --> 00:52:55,400  
while those, you know,

1290  
00:52:55,400 --> 00:52:57,600  
macro-scale experiments  
are still occurring,

1291  
00:52:57,600 --> 00:52:59,000  
and should still occur,

1292  
00:52:59,000 --> 00:53:02,100  
a lot of the current experiments  
are more molecular.

1293  
00:53:02,100 --> 00:53:05,433  
Where do you see physiological  
experiments going in the future?

1294  
00:53:05,433 --> 00:53:08,500  
Where do you want to want  
to see us head

1295

00:53:08,500 --> 00:53:11,566  
in biological research?

1296

00:53:12,933 --> 00:53:15,400  
- You know, I think  
that there are so many things

1297

00:53:15,400 --> 00:53:16,633  
that we could study.

1298

00:53:16,633 --> 00:53:19,566  
Molecular biology  
is certainly one of them.

1299

00:53:19,566 --> 00:53:24,733  
I think it's gonna take NASA  
developing the equipment

1300

00:53:24,733 --> 00:53:28,066  
to allow us to do that  
and putting crews big enough,

1301

00:53:28,066 --> 00:53:31,333  
with enough training,  
up there to be able to do that.

1302

00:53:31,333 --> 00:53:34,833  
Those of us who worked  
with the animals on SLS-1 and 2

1303

00:53:34,833 --> 00:53:36,000  
were very disappointed

1304

00:53:36,000 --> 00:53:39,666  
when the animal holding cages  
and workstations

1305

00:53:39,666 --> 00:53:42,200

were defunded for station.

1306

00:53:42,200 --> 00:53:43,966

They're doing  
a little bit of it,

1307

00:53:43,966 --> 00:53:46,466

but not with the really  
sophisticated equipment

1308

00:53:46,466 --> 00:53:48,900

that we were able  
to use on Spacelab.

1309

00:53:48,900 --> 00:53:51,333

So I think there are many,  
many things

1310

00:53:51,333 --> 00:53:54,300

that could be proposed and done.

1311

00:53:54,300 --> 00:53:57,366

I think that there are animals  
that would be good models.

1312

00:53:57,366 --> 00:53:58,866

We can use centrifuges.

1313

00:53:58,866 --> 00:54:00,333

We can, you know,

1314

00:54:00,333 --> 00:54:02,166

put more sophisticated equipment

1315

00:54:02,166 --> 00:54:04,700

for molecular biology up there--

1316

00:54:04,700 --> 00:54:07,000

many, many things

that we can do.

1317

00:54:07,000 --> 00:54:11,366

It just depends on the funding  
and the will to do it.

1318

00:54:11,366 --> 00:54:13,966

I will mention that--

1319

00:54:13,966 --> 00:54:17,233

something that you said  
made me think about it.

1320

00:54:17,233 --> 00:54:19,966

A lot of the science

1321

00:54:19,966 --> 00:54:21,400

that have been done on humans

1322

00:54:21,400 --> 00:54:23,066

have been done on men.

1323

00:54:23,066 --> 00:54:25,833

And on these two flights,  
we had men and women.

1324

00:54:25,833 --> 00:54:27,266

And we compared the data,

1325

00:54:27,266 --> 00:54:29,800

and men and women adapt  
to weightlessness just the same,

1326

00:54:29,800 --> 00:54:31,700

so we've answered that question.

1327

00:54:31,700 --> 00:54:33,400

I'm sure there will be  
subtle differences

1328

00:54:33,400 --> 00:54:34,866

that someone  
will be able to find out,

1329

00:54:34,866 --> 00:54:39,166

but the major things  
were the same.

1330

00:54:39,166 --> 00:54:42,866

Rats are good models  
for some systems and not others.

1331

00:54:42,866 --> 00:54:45,600

Certainly cells  
would be wonderful--

1332

00:54:45,600 --> 00:54:47,466

to be able to take up cells

1333

00:54:47,466 --> 00:54:51,566

and--and do studies on them  
without having to fly rats.

1334

00:54:51,566 --> 00:54:54,666

But it's a brave new world  
out there,

1335

00:54:54,666 --> 00:54:57,300

but we have the ideas.

1336

00:54:57,300 --> 00:54:59,233

I think we have the technology.

1337

00:54:59,233 --> 00:55:03,200

We just have to have the funding  
to make it happen.

1338

00:55:05,733 --> 00:55:10,533

- As the commander  
on Rhea's first flight,

1339

00:55:10,533 --> 00:55:12,333

I had some concern that we had

1340

00:55:12,333 --> 00:55:15,366

one woman and six guys on board.

1341

00:55:15,366 --> 00:55:18,500

Well, with a strong,  
professional woman like Rhea,

1342

00:55:18,500 --> 00:55:22,300

those were about the right odds.

1343

00:55:22,300 --> 00:55:23,366

- Thank you, Bo.

1344

00:55:23,366 --> 00:55:25,133

[applause]

1345

00:55:29,233 --> 00:55:31,366

- Luckily, my first commander  
was a supporter

1346

00:55:31,366 --> 00:55:33,766

and was always encouraging,

1347

00:55:33,766 --> 00:55:37,600

and there were no major  
problems, were there?

1348

00:55:37,600 --> 00:55:39,400

We had a good time too.

1349

00:55:39,400 --> 00:55:41,800

Always great to have  
a good commander.

1350

00:55:41,800 --> 00:55:44,266

- So please join me  
in thanking

1351

00:55:44,266 --> 00:55:48,500

astronaut Dr. Rhea Seddon  
for an excellent talk.

1352

00:55:48,500 --> 00:55:49,866

Thank you very much.

1353

00:55:49,866 --> 00:55:51,200

- Thank you so much.

1354

00:55:51,200 --> 00:55:52,533

- Thank you.

Thank you.

1355

00:55:52,533 --> 00:55:56,433

[applause]