



Episode 18: To Launch a Starliner

December 2019

@NASAKennedy
#NASARocketRanch

New episodes every month!

1

00:00:00,250 --> 00:00:02,870

We will ultimately make sure the vehicle is safe to fly crews.

2

00:00:02,870 --> 00:00:07,450

The difference is where we draw the line between us and the commercial partner.

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00:00:07,450 --> 00:00:12,000

Commercial and government partnerships and contracts might not sound that fascinating,

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00:00:12,000 --> 00:00:17,240

but when we're talking about certifying Boeing Starliner to carry humans to space, the challenges

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00:00:17,240 --> 00:00:20,480

and complexities become a whole lot more interesting.

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00:00:20,480 --> 00:00:21,920

Next on the Rocket Ranch.

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00:00:21,920 --> 00:00:25,840

EGS Program chief engineer verifying no constraints to launch.

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00:00:25,840 --> 00:00:28,800

Three, two, one, and lift off.

9

00:00:28,800 --> 00:00:29,780

Welcome to space.

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00:00:33,180 --> 00:00:37,230

We'll hear from the certification lead for Starliner in a few minutes, who is responsible

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00:00:37,230 --> 00:00:40,030

for something called burning down paper.

12
00:00:40,030 --> 00:00:45,010
But, first up, we have Steve Payne, his job
is to think through pretty much anything that

13
00:00:45,010 --> 00:00:49,969
can go wrong on launch day and how to make
sure we respond to keep everything and everyone

14
00:00:49,969 --> 00:00:50,960
safe.

15
00:00:51,640 --> 00:00:53,900
All right. I'm in the booth now with Steve Payne.

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00:00:53,910 --> 00:00:55,530
Steve, thank you for joining me today.

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00:00:55,530 --> 00:00:56,899
Hey, good afternoon.

18
00:00:56,899 --> 00:01:01,059
Steve, rumor has it that you are a big fan
of model rockets, so you can't get enough of rockets

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00:01:01,059 --> 00:01:03,910
during your day job, you have to go home and
do it as well, is that true?

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00:01:03,910 --> 00:01:05,480
That is a true statement.

21
00:01:05,480 --> 00:01:08,630
I tend to get carried away with things you
can put a rocket motor on.

22
00:01:08,630 --> 00:01:10,729
Whoa, wait a second.

23

00:01:10,729 --> 00:01:13,540

So, things you can put a rocket motor on.

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00:01:13,540 --> 00:01:16,770

So, I believe, technically, the answer to that question is you can put a rocket motor

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00:01:16,770 --> 00:01:18,070

on anything.

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00:01:18,070 --> 00:01:19,070

Pretty much.

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00:01:19,070 --> 00:01:20,990

Have you experimented with such things?

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00:01:20,990 --> 00:01:29,340

Well, there is a room in my house with a boneyard of several things that I have put rocket motors

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00:01:29,340 --> 00:01:36,119

on and flown, from Crayon, piggy banks to rolled up cardboard tubes from the middle

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00:01:36,119 --> 00:01:42,220

of gift wrapping paper and anything that you can make pointy and put fins on, that's around

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00:01:42,220 --> 00:01:43,420

my house will fly.

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00:01:43,420 --> 00:01:44,420

[Laughs]

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00:01:44,420 --> 00:01:49,940

I got -- couple of years ago, I was -- they asked me to build them a model rocket for

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00:01:49,940 --> 00:01:51,700

display for an event at school.

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00:01:51,700 --> 00:01:54,210

It was a fundraiser.

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00:01:54,210 --> 00:01:55,320

And so, I said, "Well, what do you want?"

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00:01:55,320 --> 00:01:56,320

They said, "Well, a big rocket.

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00:01:56,320 --> 00:01:59,320

You know, about your height and whatnot."

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00:01:59,320 --> 00:02:01,100

So, I said, "Sure."

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00:02:01,100 --> 00:02:07,810

And, well, several weeks later, I showed up with a 15-foot tall, two-scaled Saturn 1B

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00:02:07,810 --> 00:02:08,810

rocket.

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00:02:08,810 --> 00:02:09,810

[Chuckles]

43

00:02:09,810 --> 00:02:10,810

[Laughs] Oh, man.

44

00:02:10,810 --> 00:02:11,810

Yeah.

45

00:02:11,810 --> 00:02:12,810

That's awesome.

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00:02:12,810 --> 00:02:13,810

Yeah.

47
00:02:13,810 --> 00:02:14,810
So, they -- yeah, give me rocket, I get carried away.

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00:02:14,810 --> 00:02:18,180
So, Steve, I've -- you're the kind of guy that I just ran into you all the time.

49
00:02:18,180 --> 00:02:21,041
Like, I never know where I'm going to see you pop up but I see you all the time and

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00:02:21,041 --> 00:02:23,230
it's a pleasure every time.

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00:02:23,230 --> 00:02:26,480
Can you tell me, kind of, what your background is because I'm not even sure, because I've

52
00:02:26,480 --> 00:02:28,370
seen you in so many different capacities here?

53
00:02:28,370 --> 00:02:30,400
Well, where do you want me to start?

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00:02:30,400 --> 00:02:32,370
Let's just say, what's your schooling been?

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00:02:32,370 --> 00:02:34,180
What's your -- what are your degrees in or degree?

56
00:02:34,180 --> 00:02:35,180
All right.

57
00:02:35,180 --> 00:02:38,630
I have a degree in Mechanical Engineering from Syracuse.

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00:02:38,630 --> 00:02:39,630

Okay.

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00:02:39,630 --> 00:02:41,000

Where I spent many freezing years.

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00:02:41,000 --> 00:02:42,000

[Laughs]

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00:02:42,000 --> 00:02:44,480

After that, I joined the navy.

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00:02:44,480 --> 00:02:51,330

I was a navy pilot for a while after the Tomcat, the F-14 supersonic fighter bomber, did that

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00:02:51,330 --> 00:02:52,610

for several years.

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00:02:52,610 --> 00:02:58,150

And then, after I finished my active duty career, I came out to Kennedy Space Center

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00:02:58,150 --> 00:03:02,270

and I started to work for one of our support contractors here, Lockheed Space Operations

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00:03:02,270 --> 00:03:04,640

Company doing payload operations.

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00:03:04,640 --> 00:03:07,950

I used to load cargo into the shuttle's payload bay.

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00:03:07,950 --> 00:03:10,080

Is that, like, you personally would be the one to, like—

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00:03:10,080 --> 00:03:11,080
I was the--

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00:03:11,080 --> 00:03:12,080
--put things in?

71
00:03:12,080 --> 00:03:13,080
--operations person.

72
00:03:13,080 --> 00:03:14,080
No.

73
00:03:14,080 --> 00:03:15,080
I wasn't the technicians.

74
00:03:15,080 --> 00:03:16,080
We have technicians--

75
00:03:16,080 --> 00:03:17,080
Okay.

76
00:03:17,080 --> 00:03:18,080
--to do all the turning of wrenches.

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00:03:18,080 --> 00:03:19,450
We have the engineers who develop the procedures
and decide how much torque everything should

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00:03:19,450 --> 00:03:20,450
have.

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00:03:20,450 --> 00:03:24,670
And then, we have the operations folks, which
is where my expertise lies primarily and it's

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00:03:24,670 --> 00:03:30,410
the person who makes sure that the people,
the paper, the parts, the conditions, the

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00:03:30,410 --> 00:03:36,239
schedules are all there so that it can gel
and the operation can take place.

82
00:03:36,239 --> 00:03:40,340
And to grease the skids, make sure that if
they have a hiccup of any sort, we're the

83
00:03:40,340 --> 00:03:44,090
trouble shooters who make sure that we overcome
that hiccup and press on.

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00:03:44,090 --> 00:03:48,989
That's, kind of, a good segue point, I think,
because we're here today to talk about the

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00:03:48,989 --> 00:03:55,650
Commercial Crew Program and specifically Boeing's
upcoming orbital flight test with our Starliner

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00:03:55,650 --> 00:03:57,120
CST-100.

87
00:03:57,120 --> 00:04:03,560
And your role is actually, kind of, just that,
of like, accounting for a day we hope never

88
00:04:03,560 --> 00:04:04,700
comes.

89
00:04:04,700 --> 00:04:05,700
That is--

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00:04:05,700 --> 00:04:06,700
Is that a fair assessment?

91
00:04:06,700 --> 00:04:07,700
That is a fair assessment.

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00:04:07,700 --> 00:04:08,700
It is like an insurance policy.

93
00:04:08,700 --> 00:04:09,700
Uh-hmm.

94
00:04:09,700 --> 00:04:12,340
It costs money and you resent having to pay it.

95
00:04:12,340 --> 00:04:13,440
[Laughing]

96
00:04:13,440 --> 00:04:17,570
And for most of the time, you'll never need it, but the day that you do, you're--

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00:04:17,570 --> 00:04:18,699
It's worth every penny.

98
00:04:18,699 --> 00:04:19,699
Right.

99
00:04:19,699 --> 00:04:20,699
And--

100
00:04:20,699 --> 00:04:21,699
Yeah.

101
00:04:21,699 --> 00:04:22,699
And if you don't have it, you'll wish you had.

102
00:04:22,699 --> 00:04:29,190
So, my job and it is sometimes unpopular is to point out where we are unprotected and

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00:04:29,190 --> 00:04:33,440

what kinds of things we would need to do to be able to mitigate whatever hazard there

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00:04:33,440 --> 00:04:38,740

might be or respond to whatever emergency condition has taken place.

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00:04:38,740 --> 00:04:47,070

And when things get ugly, I'm the guy that everybody looks at and says, "Steve, fix it."

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00:04:47,070 --> 00:04:48,070

[Laughing]

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00:04:48,070 --> 00:04:52,780

So, I have to have a way to fix it and it involves quite a bit of planning upfront and

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00:04:52,780 --> 00:04:58,720

setting up of structures, and teams, and mechanisms, and communications, and procedures so that

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00:04:58,720 --> 00:05:01,139

when you do need it, it works smoothly.

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00:05:01,139 --> 00:05:03,080

So, what's your official title right now?

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00:05:03,080 --> 00:05:06,870

Just -- is it something cool like waste management specialist or is it like -- is it more engineering

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00:05:06,870 --> 00:05:07,870

than that?

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00:05:07,870 --> 00:05:08,870

No.

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00:05:08,870 --> 00:05:10,190

It's, kind of, a prosaic term.

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00:05:10,190 --> 00:05:12,889

I -- I'm a Launch Integration Manager.

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00:05:12,889 --> 00:05:13,889

Okay.

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00:05:13,889 --> 00:05:17,800

Which is the -- you know, that little fine print that says duties as assigned at the

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00:05:17,800 --> 00:05:18,979

end of your job description?

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00:05:18,979 --> 00:05:19,979

Yeah.

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00:05:19,979 --> 00:05:23,729

I think all of us have that somewhere in your job description and most of us know that it's,

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00:05:23,729 --> 00:05:25,300

kind of, a catchall for stuff.

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00:05:25,300 --> 00:05:26,300

Yeah.

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00:05:26,300 --> 00:05:32,130

Well, that's 99.9% of my job is all that stuff because it doesn't belong to anybody else.

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00:05:32,130 --> 00:05:37,520

We have engineers who are experts in a particular system and we have folks that are focused

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00:05:37,520 --> 00:05:38,830

on inflight stuff.

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00:05:38,830 --> 00:05:44,400

We have folks that are focused on fueling the vehicle, folks that are focused on engines,

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00:05:44,400 --> 00:05:48,040

or focused on avionics or other such systems.

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00:05:48,040 --> 00:05:53,750

Somebody has to have a 10,000-foot view, see the combined picture, and put all the pieces

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00:05:53,750 --> 00:05:54,750

together.

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00:05:54,750 --> 00:05:57,360

That's what the integration part of the title is.

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00:05:57,360 --> 00:06:02,080

And if you start to think, if you were going to launch a rocket somewhere and you had -- starting

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00:06:02,080 --> 00:06:04,360

from a blank slate, what would you need?

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00:06:04,360 --> 00:06:05,360

Yeah.

134

00:06:05,360 --> 00:06:06,360

Well, you will need a launch team.

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00:06:06,360 --> 00:06:09,470

I mean, other than a rocket, you need a launch team.

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00:06:09,470 --> 00:06:10,470

Sure.

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00:06:10,470 --> 00:06:13,440

So, in the early days of the program here, I was helping put up together the, "Who's

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00:06:13,440 --> 00:06:14,509

going to be on our launch team?"

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00:06:14,509 --> 00:06:15,810

"What are they going to do?"

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00:06:15,810 --> 00:06:16,810

"What are their functions?"

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00:06:16,810 --> 00:06:20,360

"How do we plug in to the commercial provider's launch team?"

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00:06:20,360 --> 00:06:22,050

"What communications go back and forth?"

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00:06:22,050 --> 00:06:23,199

"What channels do we need?"

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00:06:23,199 --> 00:06:24,789

"What infrastructure needs to be there?"

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00:06:24,789 --> 00:06:26,380

"What control rooms are necessary?"

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00:06:26,380 --> 00:06:31,389

So, all that had to be thought out and after much deliberation and back and forth, we came

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00:06:31,389 --> 00:06:32,460

up with a plan.

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00:06:32,460 --> 00:06:34,479

And so, we put all that in place.

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00:06:34,479 --> 00:06:40,669

Some of it is what are the operations that take place when the crew arrives on the center?

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00:06:40,669 --> 00:06:44,509

Well, the crew officers focus on health stabilization.

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00:06:44,509 --> 00:06:47,330

For example, they arrive seven days prior to launch.

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00:06:47,330 --> 00:06:50,699

We don't want them getting sick before going up to the station, so there's all these involved

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00:06:50,699 --> 00:06:54,610

procedures for making sure they don't get sick and take something up with them and make

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00:06:54,610 --> 00:06:56,520

everybody on station sick.

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00:06:56,520 --> 00:07:00,200

So, we have to come up with a procedure for that.

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00:07:00,200 --> 00:07:05,660

Last time we looked at it, we had a space shuttle procedure from the 2011 timeframe

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00:07:05,660 --> 00:07:10,650

and we had been using a procedure that worked in Russia, but we didn't have one for now

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00:07:10,650 --> 00:07:11,650

for this program.

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00:07:11,650 --> 00:07:12,650

Sure.

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00:07:12,650 --> 00:07:15,150

That incorporated all those changes and all the international pieces.

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00:07:15,150 --> 00:07:16,789

So, we have to go create a new one.

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00:07:16,789 --> 00:07:18,400

So, it was integrating again.

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00:07:18,400 --> 00:07:19,400

"What do the Russians do?"

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00:07:19,400 --> 00:07:20,430

"What do the Japanese want?"

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00:07:20,430 --> 00:07:22,520

"What are our European partners need?"

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00:07:22,520 --> 00:07:24,960

"What are our special situations here?"

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00:07:24,960 --> 00:07:29,220

We rewrote a new procedure, got it all partnered in and then, we have to go execute that.

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00:07:29,220 --> 00:07:33,080

So, somebody had to integrate that story and then it ended up in my duties as assigned

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00:07:33,080 --> 00:07:34,410

bucket.

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00:07:34,410 --> 00:07:35,750

Yeah.

171

00:07:35,750 --> 00:07:37,319

Things like emergency management.

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00:07:37,319 --> 00:07:42,910

If you're at the pad and something goes wrong, how do you get off that pad?

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00:07:42,910 --> 00:07:45,990

Well, we have Emergency Egress Systems.

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00:07:45,990 --> 00:07:49,699

Somebody had to provide input as to this is what we need, this is how we're going to get

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00:07:49,699 --> 00:07:53,840

out, this is acceptable, this is not acceptable.

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00:07:53,840 --> 00:07:55,210

And so, help the design of that.

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00:07:55,210 --> 00:07:56,790

So, we influence the design of that.

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00:07:56,790 --> 00:07:57,790

Okay.

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00:07:57,790 --> 00:07:59,169

Once we get off the tower, then what?

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00:07:59,169 --> 00:08:00,569

How do you get out of there?

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00:08:00,569 --> 00:08:03,130

Well, we had to provide them with vehicles that were suitable.

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00:08:03,130 --> 00:08:07,539

We procured armored vehicles and modified them so that the crew could get away safely.

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00:08:07,539 --> 00:08:09,080

All right.

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00:08:09,080 --> 00:08:12,060

Now, once you've left, what happens if you're hurt?

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00:08:12,060 --> 00:08:16,349

So, we had to come up with a medical team to go check them out and make sure that we

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00:08:16,349 --> 00:08:18,930

can patch them if need be.

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00:08:18,930 --> 00:08:22,861

If they have any propellants on them and they're contaminated, we need a decontamination team

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00:08:22,861 --> 00:08:24,530

to go make sure that they're clean.

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00:08:24,530 --> 00:08:25,759

If there--

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00:08:25,759 --> 00:08:29,800

So, are you the guy that's thinking through all of these things?

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00:08:29,800 --> 00:08:31,340

Like, is that really role that--

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00:08:31,340 --> 00:08:32,340

That's my role--

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00:08:32,340 --> 00:08:34,849

--obviously you can't, like, do all these things on your own, the application of it

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00:08:34,849 --> 00:08:38,279

but your job is to think through all of these minute detail.

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00:08:38,279 --> 00:08:39,839

And, some of them are —

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00:08:39,839 --> 00:08:40,839

Correct.

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00:08:40,839 --> 00:08:41,839

—not minute, but—

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00:08:41,839 --> 00:08:42,839

Right.

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00:08:42,839 --> 00:08:43,839

—you're the guy?

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00:08:43,839 --> 00:08:44,839

Yeah.

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00:08:44,839 --> 00:08:45,839

It's -- I'm the guy that points out, "Hey, you're gonna need this, and this, and this,

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00:08:45,839 --> 00:08:46,839

and this, and this, and this."

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00:08:46,839 --> 00:08:48,470

And they say, "That's great, Steve, go make it so."

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00:08:48,470 --> 00:08:49,470

[Laughing]

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00:08:49,470 --> 00:08:52,790

And I kick myself for opening my mouth so

much.

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00:08:52,790 --> 00:08:54,870

But I've -- we've gone and we've made it so.

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00:08:54,870 --> 00:08:57,900

We've worried about the medevac and we found helicopter support.

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00:08:57,900 --> 00:08:59,180

We've configured helicopters.

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00:08:59,180 --> 00:09:00,860

We worried about medical support.

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00:09:00,860 --> 00:09:04,519

We've contracted with outside entities to provide us medical support.

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00:09:04,519 --> 00:09:06,130

We worried about decontamination.

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00:09:06,130 --> 00:09:11,540

We worked with our KSC and Cape Canaveral Fire Teams to provide decontamination.

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00:09:11,540 --> 00:09:13,140

And so on, and so on, and so forth.

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00:09:13,140 --> 00:09:14,140

Yup.

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00:09:14,140 --> 00:09:16,830

Are you writing the procedures for these kinds of things or you just -- kind of, are you

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00:09:16,830 --> 00:09:18,880

a part of a team that's writing the procedure for these?

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00:09:18,880 --> 00:09:20,730

I'm pulling together the team that's--

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00:09:20,730 --> 00:09:21,730

Okay.

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00:09:21,730 --> 00:09:22,730

--writing the procedures.

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00:09:22,730 --> 00:09:27,480

We run our emergency escape and rescue working group where all the stuff is discussed.

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00:09:27,480 --> 00:09:29,470

And I'm the coach here and--

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00:09:29,470 --> 00:09:30,470

Okay.

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00:09:30,470 --> 00:09:34,990

--provide guidance and make sure that everything that needs to be in place is there.

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00:09:34,990 --> 00:09:41,089

And are you -- or I have this picture of you all, this team you, kind of, gathered together

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00:09:41,089 --> 00:09:44,570

just sitting in a room with a giant white board thinking of, like, "What things can

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00:09:44,570 --> 00:09:45,570

go wrong?"

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00:09:45,570 --> 00:09:49,230

And just, like, throw everything on a wall and then, go from there?

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00:09:49,230 --> 00:09:52,620

Like, is that a fair picture or is there something more formal than that?

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00:09:52,620 --> 00:09:55,220

There is a lot of what-iffing and--

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00:09:55,220 --> 00:09:56,220

Okay.

231

00:09:56,220 --> 00:09:57,750

And scenario development.

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00:09:57,750 --> 00:10:02,870

If we have -- there are so many things that could go wrong if you let your imagination

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00:10:02,870 --> 00:10:03,870

run wild.

234

00:10:03,870 --> 00:10:04,870

Sure.

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00:10:04,870 --> 00:10:05,870

And we do because--

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00:10:05,870 --> 00:10:06,870

Yeah.

237

00:10:06,870 --> 00:10:09,070

--usually, life is more interesting than fiction.

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00:10:09,070 --> 00:10:10,420

[Laughs]

239

00:10:10,420 --> 00:10:14,980

If you imagine a scenario, "Well, we had to leave the pad because bad weather was coming

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00:10:14,980 --> 00:10:16,000
and so we had to leave.”

241

00:10:16,000 --> 00:10:17,000
"Oh, okay.”

242

00:10:17,000 --> 00:10:18,000
How do you handle that?

243

00:10:18,000 --> 00:10:24,060
Or, "We had to leave the pad because something
was starting to go wrong and we wanted to

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00:10:24,060 --> 00:10:25,410
get out before it got bad.”

245

00:10:25,410 --> 00:10:26,410
"Okay.”

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00:10:26,410 --> 00:10:27,410
That's another response.

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00:10:27,410 --> 00:10:30,760
Or, "We had to leave the pad because, hey,
we're leaking fuel somewhere and we need to

248

00:10:30,760 --> 00:10:31,760
get out of here.”

249

00:10:31,760 --> 00:10:32,760
Sure.

250

00:10:32,760 --> 00:10:33,760
So, that's another scenario.

251

00:10:33,760 --> 00:10:37,529
Or -- then there's a really bad day, something

went kablooney and we have to go get people

252

00:10:37,529 --> 00:10:38,529

up there.

253

00:10:38,529 --> 00:10:42,769

So, we had to put together a team to go get them up there and procedures for that.

254

00:10:42,769 --> 00:10:47,760

So, all these things are waiting in the wings to be called upon on launch day--

255

00:10:47,760 --> 00:10:48,760

Uh-hmm.

256

00:10:48,760 --> 00:10:49,760

--should we need them.

257

00:10:49,760 --> 00:10:55,589

And if anything goes wrong, we've got aces up our sleeve for all kinds of different scenario.

258

00:10:55,589 --> 00:11:02,870

You, kind of, talked about the interestingness of fiction versus reality.

259

00:11:02,870 --> 00:11:08,089

Have you had any specific instances in the past that we've had a bad day or almost a

260

00:11:08,089 --> 00:11:12,670

really bad day and these kinds of -- you've been able to use these kinds of applications?

261

00:11:12,670 --> 00:11:15,220

Or is this all still been, like, very theoretical for your world?

262

00:11:15,220 --> 00:11:20,490

Well, we have a -- I've only really had issues during processing because, fortunately, we

263

00:11:20,490 --> 00:11:23,360

haven't had this happened to us during a launch countdown but--

264

00:11:23,360 --> 00:11:24,360

Cool.

265

00:11:24,360 --> 00:11:27,460

--I used to work daily process in the space shuttles and we every now and again would

266

00:11:27,460 --> 00:11:30,240

have a fuel spill issue.

267

00:11:30,240 --> 00:11:36,030

And we would find out that you can mechanize or make automatic all your response all you

268

00:11:36,030 --> 00:11:37,380

want but there's people involve.

269

00:11:37,380 --> 00:11:38,380

Yeah.

270

00:11:38,380 --> 00:11:41,649

And people respond differently than machinery.

271

00:11:41,649 --> 00:11:47,630

We had one case where technicians were working on some pipes that had contained hypergolic

272

00:11:47,630 --> 00:11:51,450

fuels, and they weren't drained completely.

273

00:11:51,450 --> 00:11:52,930

We expect them to be but they weren't.

274

00:11:52,930 --> 00:11:57,930

And so, one of the technicians got an amount of this fuel on them, and the procedure is

275

00:11:57,930 --> 00:11:59,790

you egress the facility.

276

00:11:59,790 --> 00:12:01,350

You go out the nearest exit door.

277

00:12:01,350 --> 00:12:03,649

You go out to the safety wash shower.

278

00:12:03,649 --> 00:12:09,160

You strip down completely and you wash yourself so that you don't have chemicals on you.

279

00:12:09,160 --> 00:12:11,230

Well, if you consider human nature--

280

00:12:11,230 --> 00:12:12,230

Yeah.

281

00:12:12,230 --> 00:12:14,670

This shower is an open shower in the middle of the parking lot.

282

00:12:14,670 --> 00:12:15,670

Yeah.

283

00:12:15,670 --> 00:12:16,790

People don't want to strip down completely.

284

00:12:16,790 --> 00:12:17,790

Sure.

285

00:12:17,790 --> 00:12:18,790

We end up--

286

00:12:18,790 --> 00:12:19,790

Well, and that's what's going through my head
this time.

287

00:12:19,790 --> 00:12:22,270

I'm like, am I standing on the parking lot
doing this right now?

288

00:12:22,270 --> 00:12:23,270

Right.

289

00:12:23,270 --> 00:12:26,589

So, he didn't and we ended up -- he was contaminated.

290

00:12:26,589 --> 00:12:29,040

The medical personnel that responded were
contaminated.

291

00:12:29,040 --> 00:12:30,040

The ambulance--

292

00:12:30,040 --> 00:12:31,040

Uh-hmm.

293

00:12:31,040 --> 00:12:32,040

--I put him in were contaminated.

294

00:12:32,040 --> 00:12:33,040

Uh-hmm.

295

00:12:33,040 --> 00:12:34,040

When he got to the hospital, the hospital
was contaminated.

296

00:12:34,040 --> 00:12:35,040

Uh-hmm.

297

00:12:35,040 --> 00:12:39,290

So, with one of those things, you integrate this and so we started providing modesty garments.

298

00:12:39,290 --> 00:12:40,290

Huh.

299

00:12:40,290 --> 00:12:42,550

So, that when you go out there and you strip down you have something to put on.

300

00:12:42,550 --> 00:12:43,550

Huh.

301

00:12:43,550 --> 00:12:44,610

You're not just standing out there...

302

00:12:44,610 --> 00:12:45,610

Yeah.

303

00:12:45,610 --> 00:12:50,110

And the human nature part is the part that most people forget.

304

00:12:50,110 --> 00:12:51,110

Right.

305

00:12:51,110 --> 00:12:53,480

Ironically, I think you're a hundred percent right.

306

00:12:53,480 --> 00:12:54,480

Yeah.

307

00:12:54,480 --> 00:12:58,470

So, when we try to design our systems and our responses that involve humans, we're trying

308

00:12:58,470 --> 00:13:01,630

to make them as simple as intuitive as possible--

309

00:13:01,630 --> 00:13:02,630

Uh-hmm.

310

00:13:02,630 --> 00:13:07,910

--so, that if you're in a panic, kind of, situation, you don't have to do much thinking.

311

00:13:07,910 --> 00:13:10,550

There's one or two steps and you're out of there.

312

00:13:10,550 --> 00:13:13,420

And that's how we try to design all our stuff.

313

00:13:13,420 --> 00:13:20,741

We had a -- when we have an escape vehicle that we parked at the base of the -- or near

314

00:13:20,741 --> 00:13:24,730

the perimeter of the -- of the launch pad, so that when the crew escape from the tower

315

00:13:24,730 --> 00:13:30,100

down a wire that's hanging down, they'll end up at this vehicle and they can hop in and

316

00:13:30,100 --> 00:13:31,100

leave.

317

00:13:31,100 --> 00:13:33,540

Now, we've done it so that the vehicles are running.

318

00:13:33,540 --> 00:13:36,480

We've done a checklist to make sure all the switches, and lights, and everything are the

319

00:13:36,480 --> 00:13:37,480

way they should be.

320

00:13:37,480 --> 00:13:39,320

All the sensor is on board or turned on.

321

00:13:39,320 --> 00:13:40,320

Got you.

322

00:13:40,320 --> 00:13:41,320

Everything is ready.

323

00:13:41,320 --> 00:13:47,220

In theory, all you got to do is sit down,
put it in drive and take off the parking brake.

324

00:13:47,220 --> 00:13:48,279

Two steps -- three.

325

00:13:48,279 --> 00:13:49,279

Sure.

326

00:13:49,279 --> 00:13:51,190

Well, we've had people screw that up.

327

00:13:51,190 --> 00:13:52,190

[Laughing]

328

00:13:52,190 --> 00:13:53,190

So--

329

00:13:53,190 --> 00:13:54,190

Because adrenaline does weird things--

330

00:13:54,190 --> 00:13:55,190

Adrenaline does--

331
00:13:55,190 --> 00:13:56,190
--into our body.

332
00:13:56,190 --> 00:13:57,190
--weird things.

333
00:13:57,190 --> 00:13:58,190
You forget.

334
00:13:58,190 --> 00:13:59,190
You put it in gear, it's not moving.

335
00:13:59,190 --> 00:14:00,190
Why is it not moving?

336
00:14:00,190 --> 00:14:01,190
Oh, yeah, the parking brake.

337
00:14:01,190 --> 00:14:02,190
Yeah.

338
00:14:02,190 --> 00:14:03,820
So, we tried to simplify things down to the
minimalist steps we can.

339
00:14:03,820 --> 00:14:04,820
Yeah.

340
00:14:04,820 --> 00:14:09,089
We put big placards on, do this, then do that,
and we trained the crews so that they have

341
00:14:09,089 --> 00:14:10,089
that experience.

342
00:14:10,089 --> 00:14:14,360
So that if they can't remember, their buddy
next to them can tell them what to do.

343

00:14:14,360 --> 00:14:15,360

Uh-hmm.

344

00:14:15,360 --> 00:14:18,290

So, there's a lot of that simplify, simplify, simplify.

345

00:14:18,290 --> 00:14:22,970

So, that it's human -- it's a second nature instead of allowing for people to mess it

346

00:14:22,970 --> 00:14:25,180

up because people mess things up.

347

00:14:25,180 --> 00:14:26,600

They forget.

348

00:14:26,600 --> 00:14:29,500

So, that's a big piece of the gap.

349

00:14:29,500 --> 00:14:30,500

Yeah.

350

00:14:30,500 --> 00:14:32,899

As I think about, kind of, the launch day, typically, we have a launch manager, launch

351

00:14:32,899 --> 00:14:34,440

conductor, launch director, something like that.

352

00:14:34,440 --> 00:14:37,380

So, assuming that, kind of, this bad day gets triggered.

353

00:14:37,380 --> 00:14:39,970

Obviously, that's, kind of, a broad statement of--

354

00:14:39,970 --> 00:14:40,970

Uh-hmm.

355

00:14:40,970 --> 00:14:42,150

There's lots of things that I could mean.

356

00:14:42,150 --> 00:14:45,790

Is it -- does control, kind of, switch over to you at that point or does that person,

357

00:14:45,790 --> 00:14:50,130

kind of, maintain the conducting role through that procedure?

358

00:14:50,130 --> 00:14:54,290

Well, we are plugged into the commercial provider's launch team.

359

00:14:54,290 --> 00:14:57,190

They run the launch countdown because it's their rocket, their pad--

360

00:14:57,190 --> 00:14:58,190

Yeah.

361

00:14:58,190 --> 00:14:59,190

--their procedure--

362

00:14:59,190 --> 00:15:00,190

An important distinction.

363

00:15:00,190 --> 00:15:01,190

Right.

364

00:15:01,190 --> 00:15:03,370

And it's different than what it was for the old days when NASA ran everything.

365

00:15:03,370 --> 00:15:05,579

But we are plugged in as a part of the team.

366

00:15:05,579 --> 00:15:10,180

When they call for the pad -- for the crew
or even the pad personnel who are out there

367

00:15:10,180 --> 00:15:13,699

that tell them get off the tower, it's dangerous,
go escape.

368

00:15:13,699 --> 00:15:16,660

At that point, we go into gear and we deploy
our team.

369

00:15:16,660 --> 00:15:19,320

We tell our medical folks to start rolling
forward.

370

00:15:19,320 --> 00:15:21,850

We tell our decontamination teams to go.

371

00:15:21,850 --> 00:15:25,170

We scramble our medevac helicopter so that
they get in the air and start making their

372

00:15:25,170 --> 00:15:26,630

way out there.

373

00:15:26,630 --> 00:15:31,880

We coordinate with the launch conductor or
launch director from the provider to count

374

00:15:31,880 --> 00:15:34,540

heads, make sure we got everybody.

375

00:15:34,540 --> 00:15:41,020

If not everybody got out, then we go send
in pad rescue teams and recover whoever was

376

00:15:41,020 --> 00:15:42,020
left.

377

00:15:42,020 --> 00:15:46,170
Then, we got to go treat all those people
and we got to package them and do all that,

378

00:15:46,170 --> 00:15:48,329
and then report back we got everybody.

379

00:15:48,329 --> 00:15:52,910
And pass the information to their companies
because it's not just NASA now.

380

00:15:52,910 --> 00:15:53,910
Right.

381

00:15:53,910 --> 00:15:58,529
I have to tell them, "Hey, person from company
A, your employee ended up in this hospital

382

00:15:58,529 --> 00:15:59,600
because he was hurt."

383

00:15:59,600 --> 00:16:00,600
Uh-hmm.

384

00:16:00,600 --> 00:16:03,899
So, those, kind of, things are how we plug
into their team.

385

00:16:03,899 --> 00:16:05,160
And we coordinate in advance.

386

00:16:05,160 --> 00:16:09,329
Where are we going to send them once they
get out of the rocket, what's going on, what's

387

00:16:09,329 --> 00:16:14,110

the weather, what are the conditions, can we go back in or can't we go back in?

388

00:16:14,110 --> 00:16:19,639

All those kind of things are discussed as part of the team and that's one aspect.

389

00:16:19,639 --> 00:16:25,399

Also on -- in my job bucket is if we have what we call a pad abort or SpaceX calls it

390

00:16:25,399 --> 00:16:31,150

a pad escape, where you have to essentially jettison the capsule.

391

00:16:31,150 --> 00:16:34,000

It's like an ejection seat but the whole capsule goes with you.

392

00:16:34,000 --> 00:16:35,000

Right.

393

00:16:35,000 --> 00:16:39,290

So, on a day like that and the capsule ends up out over the water, floating in the ocean

394

00:16:39,290 --> 00:16:42,910

off the coast, it's up to us to deploy rescue forces.

395

00:16:42,910 --> 00:16:47,222

We work with the Department of Defense and we send out helicopters with a pair of rescue

396

00:16:47,222 --> 00:16:50,980

jumpers to jump out, open the hatch, get the crew out of there.

397

00:16:50,980 --> 00:16:54,170

And if they're injured in some fashion, they take them off to hospitals and medevac come

398

00:16:54,170 --> 00:16:55,170

out.

399

00:16:55,170 --> 00:16:58,089

So, that part of the rescue responses are us, too.

400

00:16:58,089 --> 00:16:59,579

So, that's where the title.

401

00:16:59,579 --> 00:17:04,799

Right now, I'm the -- that function on launch day is called the Launch Rescue Director.

402

00:17:04,799 --> 00:17:08,579

And so that is my function on the day of launch.

403

00:17:08,579 --> 00:17:09,579

Okay.

404

00:17:09,579 --> 00:17:11,030

It's an interesting job.

405

00:17:11,030 --> 00:17:16,510

A few minutes ago, you, kind of, mentioned the fact that this is a very different process

406

00:17:16,510 --> 00:17:20,420

than back with shuttle, when it was just, kind of, NASA doing the space shuttle thing.

407

00:17:20,420 --> 00:17:25,120

Can you, kind of, give me a couple highlights of how is this different?

408

00:17:25,120 --> 00:17:30,450

Because ultimately we're kind of working arm-and-arm with Boeing, is my understanding, whereas

409

00:17:30,450 --> 00:17:33,660

with the Space Shuttle program NASA -- it was really NASA's program that we owned.

410

00:17:33,660 --> 00:17:37,240

So, practically speaking, how is that playing out differently for you?

411

00:17:37,240 --> 00:17:42,040

Well, back in the day, when I was in the test director's office, the test director ran the

412

00:17:42,040 --> 00:17:43,380

countdown.

413

00:17:43,380 --> 00:17:47,890

The test director was also the launch rescue -- landing and recovery director, which was

414

00:17:47,890 --> 00:17:51,990

their alternate -- one of the alternate jobs that we also had.

415

00:17:51,990 --> 00:17:56,920

And everything from running the count, to doing the evacuation, to handling the wounded,

416

00:17:56,920 --> 00:18:03,270

to medevac-ing them off to the hospitals, or if we ended up in the water, that was our

417

00:18:03,270 --> 00:18:05,390

launch rescue director back, then.

418

00:18:05,390 --> 00:18:09,010

If we ended up having to do a return to launch

site because with a winged vehicle, we have

419

00:18:09,010 --> 00:18:13,840

that option, we could fly back, that was launch rescue director's job to set that up.

420

00:18:13,840 --> 00:18:17,940

If we ended up landing overseas because our engine snuffed out, that was the launch rescue

421

00:18:17,940 --> 00:18:24,370

director's job to do or the landing and recovery director at that time.

422

00:18:24,370 --> 00:18:27,880

And if we ended up anywhere we shouldn't have ended up, in the middle of the woods somewhere

423

00:18:27,880 --> 00:18:28,880

where no vehicle--

424

00:18:28,880 --> 00:18:29,880

Sure.

425

00:18:29,880 --> 00:18:31,110

It was their job to go pick all that up.

426

00:18:31,110 --> 00:18:33,780

Now, we share those duties with our--

427

00:18:33,780 --> 00:18:34,780

Okay.

428

00:18:34,780 --> 00:18:35,780

--provider.

429

00:18:35,780 --> 00:18:41,460

For scenarios where we land, where we're supposed to land, the provider is there to handle all

430

00:18:41,460 --> 00:18:43,410

of that, not NASA.

431

00:18:43,410 --> 00:18:50,000

If we land, maybe, not quite where we intended to land but near, well, the provider's resources

432

00:18:50,000 --> 00:18:52,310

are there and we give them the lead on that.

433

00:18:52,310 --> 00:18:56,050

Although, we go assist because it's off nominal.

434

00:18:56,050 --> 00:18:57,050

Okay.

435

00:18:57,050 --> 00:19:01,600

If we land in the middle of the ocean, though, not in the designated landing areas, then

436

00:19:01,600 --> 00:19:05,860

that becomes a rescue operation and NASA takes that into our own hands because we have the

437

00:19:05,860 --> 00:19:06,940

resources to do that.

438

00:19:06,940 --> 00:19:09,850

Where the providers don't necessarily have that.

439

00:19:09,850 --> 00:19:10,850

Uh-hmm.

440

00:19:10,850 --> 00:19:14,510

And would you point to us being a federal agency as the primary thing there, because

441

00:19:14,510 --> 00:19:17,030

ultimately, like, we can, kind of, pull on
the rest of the federal government to, kind

442

00:19:17,030 --> 00:19:19,650

of, jump in and help out, which I think is
what we do ultimately.

443

00:19:19,650 --> 00:19:20,720

Precisely, yeah.

444

00:19:20,720 --> 00:19:26,820

We have the ability to go to pull on our Department
of Defense or other law enforcement, and coast

445

00:19:26,820 --> 00:19:34,140

guard, and miscellaneous, other Federal or
State resources to go provide rescue assistance.

446

00:19:34,140 --> 00:19:39,070

In fact if it lands overseas somewhere, we
can call on the State Department and get foreign

447

00:19:39,070 --> 00:19:40,540

militaries forces--

448

00:19:40,540 --> 00:19:41,540

Wow.

449

00:19:41,540 --> 00:19:42,540

--to help us out.

450

00:19:42,540 --> 00:19:43,540

So--

451

00:19:43,540 --> 00:19:44,860

Are you thinking through that kind of stuff,
too?

452

00:19:44,860 --> 00:19:46,790

That fortunately is another group but yes.

453

00:19:46,790 --> 00:19:47,790

[Laughing]

454

00:19:47,790 --> 00:19:48,790

Yeah.

455

00:19:48,790 --> 00:19:49,790

That's a lot more.

456

00:19:49,790 --> 00:19:50,790

Somebody else's job, finally.

457

00:19:50,790 --> 00:19:51,790

[Laughing]

458

00:19:51,790 --> 00:19:52,790

Yes.

459

00:19:52,790 --> 00:19:56,049

That becomes somebody else's job but we have
-- for example, we fly -- our profile for

460

00:19:56,049 --> 00:20:01,080

the space station takes us, kind of, up the
coast over Newfoundland and then over near

461

00:20:01,080 --> 00:20:02,080

Ireland.

462

00:20:02,080 --> 00:20:03,080

Sure.

463

00:20:03,080 --> 00:20:08,620

If we were to fall into the ocean for some
reason near Ireland, we'd call on their Department

464

00:20:08,620 --> 00:20:12,500

of Defense to help us out, because they have rescue helicopters, and jets, and other such

465

00:20:12,500 --> 00:20:13,500

things.

466

00:20:13,500 --> 00:20:17,500

So, we go to the State Department -- we'd go first to our Department of Defense.

467

00:20:17,500 --> 00:20:19,570

We would go to the State Department, ask for assistance.

468

00:20:19,570 --> 00:20:24,220

They'd contact our counterparts across the sea, they would go respond.

469

00:20:24,220 --> 00:20:29,770

If we end up in some middle of nowhere and there are no other foreign agencies, then,

470

00:20:29,770 --> 00:20:31,690

we'll take what's called the ship of opportunity.

471

00:20:31,690 --> 00:20:34,960

Who's out there, who can go provide aid and rescue if need be.

472

00:20:34,960 --> 00:20:35,960

Yeah.

473

00:20:35,960 --> 00:20:36,960

And we send them instructions.

474

00:20:36,960 --> 00:20:37,960

This is how you open the hatch.

475

00:20:37,960 --> 00:20:38,960

Wow.

476

00:20:38,960 --> 00:20:39,960

This is what you have to be careful with.

477

00:20:39,960 --> 00:20:41,010

Please take care of my guys.

478

00:20:41,010 --> 00:20:42,010

Yeah.

479

00:20:42,010 --> 00:20:46,620

So, there's all that planning and scenario.

480

00:20:46,620 --> 00:20:52,419

We do have also aircrafts staged out of South Carolina and Hawaii, so that if we end up

481

00:20:52,419 --> 00:20:56,840

anywhere in the Atlantic, we can fly a large transport aircraft to where they are within

482

00:20:56,840 --> 00:20:58,960

a couple hours.

483

00:20:58,960 --> 00:21:03,990

Drop rescue jumpers out the back, drop inflatable boats, and other miscellaneous things to have

484

00:21:03,990 --> 00:21:05,220

at least a floating island--

485

00:21:05,220 --> 00:21:06,220

Sure.

486

00:21:06,220 --> 00:21:07,350

--of aid.

487

00:21:07,350 --> 00:21:08,350

Sure.

488

00:21:08,350 --> 00:21:11,159

And then, we send whichever the nearest ship is to go help them out.

489

00:21:11,159 --> 00:21:14,120

The same in the Pacific, if we end up out there, we do the same thing.

490

00:21:14,120 --> 00:21:15,850

There's an aircraft staged out there.

491

00:21:15,850 --> 00:21:17,400

So, there's a lot of planning--

492

00:21:17,400 --> 00:21:18,400

Yeah.

493

00:21:18,400 --> 00:21:20,470

--and it's a lot of coordination in advance.

494

00:21:20,470 --> 00:21:21,470

Yeah.

495

00:21:21,470 --> 00:21:24,110

And hopefully, you'll never ever, ever need this.

496

00:21:24,110 --> 00:21:25,110

Yes.

497

00:21:25,110 --> 00:21:32,400

But you still got to practice, and you still got to have the resources in place, and you

498

00:21:32,400 --> 00:21:34,510

have to convince people that they need this.

499

00:21:34,510 --> 00:21:39,370

Steve, the commercial crew program has been in motion for about eight years now, and it's

500

00:21:39,370 --> 00:21:41,040

been a lot of hard work.

501

00:21:41,040 --> 00:21:46,860

What's the feeling of the entire team, kind of, as you're involved in this day-to-day

502

00:21:46,860 --> 00:21:55,000

-- obviously, you haven't flown the Starliner yet into space, and so that's still coming.

503

00:21:55,000 --> 00:21:57,900

How's the team -- like, what's that feeling?

504

00:21:57,900 --> 00:21:59,780

What's that atmosphere like?

505

00:21:59,780 --> 00:22:03,730

Well, you know that feeling you get when you have a final the next day?

506

00:22:03,730 --> 00:22:05,030

Stress, usually?

507

00:22:05,030 --> 00:22:06,030

Yeah.

508

00:22:06,030 --> 00:22:07,030

Yeah?

509

00:22:07,030 --> 00:22:08,030

That feeling.

510

00:22:08,030 --> 00:22:09,030

Urgency?

511

00:22:09,030 --> 00:22:12,490

Urgency, stress, am I ready, have we done everything, have I studied everything there

512

00:22:12,490 --> 00:22:14,330

is to study.

513

00:22:14,330 --> 00:22:15,740

That is looming over the horizon.

514

00:22:15,740 --> 00:22:18,800

You know, we know that we're getting very close.

515

00:22:18,800 --> 00:22:21,270

We've done everything -- we know everything behind us is complete.

516

00:22:21,270 --> 00:22:25,179

And all the T's are crossed and the eyes are dotted, like they should be.

517

00:22:25,179 --> 00:22:28,880

There's still a lot of work ahead of us that we have to get done in what appears to be

518

00:22:28,880 --> 00:22:32,140

a shorter and shorter time because the calendar doesn't stop for us.

519

00:22:32,140 --> 00:22:33,140

Sure.

520

00:22:33,140 --> 00:22:38,159

It just keeps going whether we're finish or not, and we're shooting for a target date.

521

00:22:38,159 --> 00:22:40,950

That's always been the case with the rockets, you pick a date and you say, we're going to

522

00:22:40,950 --> 00:22:43,530

be ready then, you know, and sometimes you are--

523

00:22:43,530 --> 00:22:44,530

Sure.

524

00:22:44,530 --> 00:22:45,660

--sometimes you're not.

525

00:22:45,660 --> 00:22:53,900

But in this case, we have a pretty good feeling that we're going to get there and it's happening

526

00:22:53,900 --> 00:22:58,840

within the next months or so for us, a little over a month.

527

00:22:58,840 --> 00:23:03,169

There's still a lot of wickets we have to jump through.

528

00:23:03,169 --> 00:23:09,810

It's kind of difficult to keep the pace that we have been keeping because everything has

529

00:23:09,810 --> 00:23:11,170

to be finished.

530

00:23:11,170 --> 00:23:12,170

Yeah.

531

00:23:12,170 --> 00:23:15,620

And we have to get comfortable with everything
and everything has to work right between now

532

00:23:15,620 --> 00:23:21,420

and then, because if anything goes funny,
then it inserts questions and uncertainty

533

00:23:21,420 --> 00:23:22,970

into the schedule and we don't know.

534

00:23:22,970 --> 00:23:23,970

Sure.

535

00:23:23,970 --> 00:23:29,460

But if everything works as planned between
now and then, and we knock out all our scheduled

536

00:23:29,460 --> 00:23:33,610

activities as we have, we're going to get
there.

537

00:23:33,610 --> 00:23:37,780

And it's -- we're going to get across that
finish line having not much left to give because

538

00:23:37,780 --> 00:23:39,740

we're going to give it all we got getting
there.

539

00:23:39,740 --> 00:23:43,910

It's just like a runner, they say, "Don't
save it for after the race.

540

00:23:43,910 --> 00:23:45,410

Use it up while you're there."

541

00:23:45,410 --> 00:23:46,410

Right.

542

00:23:46,410 --> 00:23:47,410

And get through the finish line.

543

00:23:47,410 --> 00:23:48,410

Time for a final.

544

00:23:48,410 --> 00:23:49,799

It's time for the sprint at the end.

545

00:23:49,799 --> 00:23:55,480

So, we're getting ready for that last sprint
and I'm very much looking forward to getting

546

00:23:55,480 --> 00:24:00,730

our launch in the air and seeing the results
of all those years of hard work pay off.

547

00:24:00,730 --> 00:24:04,470

And as we approach launch date, how are you
feeling about it?

548

00:24:04,470 --> 00:24:08,250

I'm -- it's kind of interesting and I got
mixed feelings.

549

00:24:08,250 --> 00:24:10,779

You know, yes, I'm nervous because, yeah,
I'm going to have to perform.

550

00:24:10,779 --> 00:24:15,169

I might have to have a bad day and be there
and be crisp and be right because there--

551

00:24:15,169 --> 00:24:16,169

Yeah.

552

00:24:16,169 --> 00:24:19,350

--are people in that ship who are counting
on me or there are people on that pad who

553

00:24:19,350 --> 00:24:24,200

are counting on me to have their back.

554

00:24:24,200 --> 00:24:28,080

On the other side, we've been practicing this and developing these procedures for a couple

555

00:24:28,080 --> 00:24:29,220

of years now.

556

00:24:29,220 --> 00:24:31,110

And we think we got it down.

557

00:24:31,110 --> 00:24:33,150

Obviously, there's always room for improvement.

558

00:24:33,150 --> 00:24:36,220

But we think we're in the 90 some percent ready stage.

559

00:24:36,220 --> 00:24:42,480

So, I -- if it were to happen, we could deal with it.

560

00:24:42,480 --> 00:24:47,299

Of course, the nervousness is still there.

561

00:24:47,299 --> 00:24:50,730

As -- again, kind of, factoring in the humanity of this whole thing.

562

00:24:50,730 --> 00:24:52,080

That's perfectly understandable.

563

00:24:52,080 --> 00:24:56,870

So, this coming -- upcoming flight, the Orbital Flight Test is un-crewed and then will be

564

00:24:56,870 --> 00:25:00,580

followed sometime thereafter by the Crewed Flight Test.

565

00:25:00,580 --> 00:25:05,091

And I believe, I heard you had a interesting story with one of the crew members, Boeing

566

00:25:05,091 --> 00:25:06,600

astronaut Chris Ferguson.

567

00:25:06,600 --> 00:25:07,669

I've heard there's some good stories.

568

00:25:07,669 --> 00:25:10,299

You guys have worked together in the past, is that true?

569

00:25:10,299 --> 00:25:11,299

Yes.

570

00:25:11,299 --> 00:25:14,059

He and I went to flight school together back in the Navy.

571

00:25:14,059 --> 00:25:20,320

We were in the same training squadron for F-14's back in 1986.

572

00:25:20,320 --> 00:25:22,690

And we go way back.

573

00:25:22,690 --> 00:25:28,730

We have some embarrassing pictures of ourselves that every now and again, I'll drag out and

574

00:25:28,730 --> 00:25:30,070

we get a chuckle out of.

575

00:25:30,070 --> 00:25:31,070

[Chuckles]

576

00:25:31,070 --> 00:25:32,070

Very good.

577

00:25:32,070 --> 00:25:33,299

So, yeah, it seems like there -- this is a big world.

578

00:25:33,299 --> 00:25:37,350

There's a lot going on but it seems like it can be a pretty small world as well as this

579

00:25:37,350 --> 00:25:41,120

paths kind of come and go and across each other unexpectedly.

580

00:25:41,120 --> 00:25:42,710

That's a true statement.

581

00:25:42,710 --> 00:25:48,909

I -- the people who love this job as much as we do, tend to stick to around and they

582

00:25:48,909 --> 00:25:53,570

feel great ownership and responsibility for what they're doing.

583

00:25:53,570 --> 00:26:00,770

I have never seen anywhere else that but here, that level of dedication and focus on the

584

00:26:00,770 --> 00:26:01,770

mission.

585

00:26:01,770 --> 00:26:05,660

I mean, I -- I've had military background and I've had other such things but here, more

586

00:26:05,660 --> 00:26:11,640

than anywhere else, I see everybody pulling
in the same direction and they don't want

587

00:26:11,640 --> 00:26:13,360

to be the person that fails.

588

00:26:13,360 --> 00:26:17,820

They -- and not because they don't want to
be seen as failing but because they don't

589

00:26:17,820 --> 00:26:19,610

want to fail their buddies.

590

00:26:19,610 --> 00:26:25,289

They know that we have friends on those ships
and everybody is counting on them and you

591

00:26:25,289 --> 00:26:27,400

don't want to let your friends down.

592

00:26:27,400 --> 00:26:31,150

You find that in the best organizations and
I'm sure you see that in your Navy Seals and

593

00:26:31,150 --> 00:26:33,140

other such folks like that.

594

00:26:33,140 --> 00:26:36,131

Where you know they're counting on you and
you will do your darndest not to let them

595

00:26:36,131 --> 00:26:37,150

down.

596

00:26:37,150 --> 00:26:38,170

Yeah.

597

00:26:38,170 --> 00:26:42,600

As I look at the Commercial Crew Program from outside, that is what I continue to see time

598

00:26:42,600 --> 00:26:48,529

and time again of long hours, hard days, lots of effort, all kind of with that goal in my

599

00:26:48,529 --> 00:26:49,529

mind.

600

00:26:49,529 --> 00:26:53,279

So, Steve, appreciate you being here and I hope very much that on launch day, you are

601

00:26:53,279 --> 00:26:56,960

incredibly bored and have very little to do.

602

00:26:56,960 --> 00:26:58,380

I hope for the same.

603

00:26:58,380 --> 00:26:59,500

Thank you.

604

00:26:59,500 --> 00:27:00,500

[Music]

605

00:27:00,500 --> 00:27:03,960

The overall flight test is major step on the road certification.

606

00:27:03,960 --> 00:27:07,130

Here is Gennaro Caliendo with more.

607

00:27:07,130 --> 00:27:11,720

I'm in the booth now with Gennaro Caliendo, who -- let me see if I get this right here.

608

00:27:11,720 --> 00:27:12,720

Uh-hmm.

609

00:27:12,720 --> 00:27:17,640

The Certification Manager for the Boeing Starliner or I think, you might have said that there

610

00:27:17,640 --> 00:27:19,270

is more two than just Starliner.

611

00:27:19,270 --> 00:27:20,270

Correct.

612

00:27:20,270 --> 00:27:23,309

There's two pieces of it or actually there's more than two pieces but you've got the Starliner

613

00:27:23,309 --> 00:27:27,090

which sits on top of the Atlas V, which its launch vehicle.

614

00:27:27,090 --> 00:27:30,260

The two together form the whole part of the system.

615

00:27:30,260 --> 00:27:35,299

Of course, the system includes ground -- the ground processing equipment, as well as the

616

00:27:35,299 --> 00:27:39,070

launch system and it's all included and that's what we certify.

617

00:27:39,070 --> 00:27:43,760

We don't certify just the Starliner, we don't just the Atlas V. It's the entire system.

618

00:27:43,760 --> 00:27:44,760

Yeah.

619

00:27:44,760 --> 00:27:45,760

And I think--

620

00:27:45,760 --> 00:27:46,760

From start to finish.

621

00:27:46,760 --> 00:27:47,760

I think that's a great point.

622

00:27:47,760 --> 00:27:49,190

And I appreciate you bringing that up just because people, when they think of a rocket

623

00:27:49,190 --> 00:27:51,070

launch, they typically only think of the rocket.

624

00:27:51,070 --> 00:27:52,070

Uh-hmm.

625

00:27:52,070 --> 00:27:56,760

But ultimately, there's a ton of work on the ground to be able to fuel, and process, and

626

00:27:56,760 --> 00:27:58,620

handle, and support all the aspects--

627

00:27:58,620 --> 00:27:59,620

Correct.

628

00:27:59,620 --> 00:28:02,649

--of launch and then, even the emergencies that are -- that might be encountered.

629

00:28:04,649 --> 00:28:03,649

Right.

630

00:28:04,649 --> 00:28:10,540

And for instance at Pad 41, where the Atlas

V is going to launch from, we actually worked

631

00:28:10,540 --> 00:28:14,429

with the commercial provider and in this case, it was Boeing.

632

00:28:14,429 --> 00:28:19,460

Through their subcontractor, ULA, United Launch Alliance, which launches the Atlas V for Boeing,

633

00:28:19,460 --> 00:28:22,010

to create a system whereby we can access it.

634

00:28:22,010 --> 00:28:25,899

You know, the 41 has been there forever and it's been used predominantly for unmanned

635

00:28:25,899 --> 00:28:34,080

satellites and interplanetary, kind of, missions, ULA's used to over the years for commercial

636

00:28:34,080 --> 00:28:38,460

as well as NASA missions, as well as DOD missions.

637

00:28:38,460 --> 00:28:39,460

And so we have to—

638

00:28:39,460 --> 00:28:40,460

Sure--

639

00:28:40,460 --> 00:28:43,270

So they had to actually modify it to support launching crews and that meant, building a

640

00:28:43,270 --> 00:28:47,059

big tower, so if anybody goes out there, you'll see those big towers that allows the crews

641

00:28:47,059 --> 00:28:54,390

to actually climb up to the top and ingress
the CST 100, which sits on top of the vehicle.

642

00:28:54,390 --> 00:28:56,950

As well as provide for any emergencies.

643

00:28:56,950 --> 00:29:00,960

Those are in our requirements and I guess,
we can talk about requirements here to allow

644

00:29:00,960 --> 00:29:03,490

the crews to get off in emergency.

645

00:29:03,490 --> 00:29:07,909

For those who have seen the Shuttles fly,
you may have seen some of the emergency systems

646

00:29:07,909 --> 00:29:09,450

that were out at the launch pad.

647

00:29:09,450 --> 00:29:10,450

Right.

648

00:29:10,450 --> 00:29:14,070

They're installing or have installed something
very similar to that but it also has a kind

649

00:29:14,070 --> 00:29:19,520

of a flavor of if you've ever taken these
-- I'm trying to think of the word, this,

650

00:29:19,520 --> 00:29:20,520

sort of, rides.

651

00:29:20,520 --> 00:29:21,520

The zip line?

652

00:29:21,520 --> 00:29:22,520

Zip lines.

653

00:29:22,520 --> 00:29:23,520

Kind of rides, yeah.

654

00:29:23,520 --> 00:29:24,520

And things like that.

655

00:29:24,520 --> 00:29:25,520

Thank you.

656

00:29:25,520 --> 00:29:26,520

Similar but different.

657

00:29:26,520 --> 00:29:27,900

Similar but different because their role is different, obviously.

658

00:29:27,900 --> 00:29:28,900

Sure.

659

00:29:28,900 --> 00:29:32,100

Again, in the way of an emergency, they actually put one of those zip line systems where people

660

00:29:32,100 --> 00:29:34,220

can escape in an emergency.

661

00:29:34,220 --> 00:29:39,299

That would mean the flight crews as well as ground crews that are out there and they can

662

00:29:39,299 --> 00:29:43,980

transport them very quickly from that level down to the ground and then into protective

663

00:29:43,980 --> 00:29:47,929

vehicles until the emergency passes or they can drive themselves out.

664

00:29:47,929 --> 00:29:52,679

Those emergency vehicles are ones that, actually,
we provide to them as a government provided

665

00:29:52,679 --> 00:29:55,059

service or government provided equipment.

666

00:29:55,059 --> 00:30:01,309

It's the same vehicles that we use for, I
think, it's Constellation -- Exploration now,

667

00:30:01,309 --> 00:30:02,309

right.

668

00:30:02,309 --> 00:30:03,309

Not Constellation, it's the old word.

669

00:30:03,309 --> 00:30:04,309

Yeah, EGS?

670

00:30:04,309 --> 00:30:05,309

Yeah, EGS.

671

00:30:07,309 --> 00:30:06,309

Yeah.

672

00:30:07,309 --> 00:30:08,309

So -- and I want kind of back track because
your title is Certification Manager.

673

00:30:08,309 --> 00:30:09,309

Correct.

674

00:30:09,309 --> 00:30:11,929

And, so, I've heard the phrase thrown around
burning down paper.

675

00:30:11,929 --> 00:30:12,929

Uh-hmm.

676

00:30:12,929 --> 00:30:15,510

When I first say that we're not actually lighting paper on fire, right?

677

00:30:17,510 --> 00:30:16,510

Correct.

678

00:30:17,510 --> 00:30:18,510

Okay.

679

00:30:18,510 --> 00:30:19,510

So we're not--

680

00:30:19,510 --> 00:30:20,510

That's absolutely correct.

681

00:30:20,510 --> 00:30:21,510

We're not burning paperwork here but this is a phrase—

682

00:30:21,510 --> 00:30:22,510

Right.

683

00:30:22,510 --> 00:30:23,510

--we use.

684

00:30:23,510 --> 00:30:24,510

So, can you, kind of, talk about what does that mean and, kind of, as a Certification

685

00:30:24,510 --> 00:30:25,510

Manager, what's your job?

686

00:30:25,510 --> 00:30:26,640

So, my job is to lead a small team on the NASA side.

687

00:30:26,640 --> 00:30:31,340

You know, the thing about certification is in the commercial world that has a slightly

688

00:30:31,340 --> 00:30:33,020

different flavor for us as NASA people.

689

00:30:33,020 --> 00:30:37,049

In the past, we had a set of requirements that we used to call level one or very high

690

00:30:37,049 --> 00:30:39,240

level requirements.

691

00:30:39,240 --> 00:30:44,039

And then, we would create sub tier requirements or level two, and three, and four.

692

00:30:44,039 --> 00:30:45,039

Okay.

693

00:30:45,039 --> 00:30:46,610

That would actually decompose a top level requirement.

694

00:30:46,610 --> 00:30:53,570

So, for instance if you said, which we do today, transport for people to the station

695

00:30:53,570 --> 00:30:56,409

and return them safely home, that would be your top level requirement.

696

00:30:56,409 --> 00:30:57,409

Okay.

697

00:30:57,409 --> 00:31:01,919

And then, what we would do, ordinarily, if it was a heritage NASA program, we would -- we

698

00:31:01,919 --> 00:31:05,539

would take that top level requirement and we would decompose it down into components,

699

00:31:05,539 --> 00:31:07,250

pieces, parts of that.

700

00:31:07,250 --> 00:31:10,630

In this world, in commercial, we leave it at the high level and we let the provider

701

00:31:10,630 --> 00:31:11,990

actually decompose it.

702

00:31:11,990 --> 00:31:16,669

Now, that particular requirement it's -- in itself, we give them -- we give the commercial

703

00:31:16,669 --> 00:31:20,740

providers some flavor of what we expect in there but we leave it up to the provider to

704

00:31:20,740 --> 00:31:21,909

actually decompose it.

705

00:31:21,909 --> 00:31:25,280

So, in that particular one, well, it sounds like transport crew and return them safely

706

00:31:25,280 --> 00:31:27,000

seems very, very generic.

707

00:31:27,000 --> 00:31:31,350

There are words within our requirements set that says this is what we expect it to be.

708

00:31:31,350 --> 00:31:37,100

In that case, it's all about ascent trajectories,

and entry trajectories, entry descent and

709

00:31:37,100 --> 00:31:38,540

landing, and rendezvous and docking.

710

00:31:38,540 --> 00:31:39,590

It's all part of that.

711

00:31:39,590 --> 00:31:43,549

And so the commercial provider then provides the details behind all of that.

712

00:31:43,549 --> 00:31:48,190

When we say burning down paper, what we mean is the contractor, in this case Boeing, in

713

00:31:48,190 --> 00:31:53,100

my case Boeing will supply the evidence, the actual physical documentation.

714

00:31:53,100 --> 00:31:57,899

Now, you know, we're living in a new, sort of, millennium and paper is an abstract kind

715

00:31:57,899 --> 00:31:58,899

of thing--

716

00:31:58,899 --> 00:31:59,899

Sure.

717

00:31:59,899 --> 00:32:00,899

So--

718

00:32:00,899 --> 00:32:01,899

Yeah, even paper is a fluid term--

719

00:32:01,899 --> 00:32:02,899

Even paper is, kind of, a fluid term.

720

00:32:02,899 --> 00:32:03,899

Right.

721

00:32:03,899 --> 00:32:04,899

So, they deliver a lot of this electronically to us.

722

00:32:04,899 --> 00:32:05,899

Sure.

723

00:32:05,899 --> 00:32:09,440

And we review it electronically and we look to see if meets the intent of what we were

724

00:32:09,440 --> 00:32:10,440

doing.

725

00:32:10,440 --> 00:32:16,910

So, in a test flight world where we are today, not all the requirements are active or required

726

00:32:16,910 --> 00:32:18,169

for a particular test flight.

727

00:32:18,169 --> 00:32:19,169

So--

728

00:32:19,169 --> 00:32:20,169

Give me for instance.

729

00:32:20,169 --> 00:32:21,169

What does that mean?

730

00:32:21,169 --> 00:32:27,840

So, we have approximately -- there is somewhere in the neighborhood of 280 requirements that

731

00:32:27,840 --> 00:32:34,080

we said these are safety in performance requirements that are out there for Boeing, in this case

732

00:32:34,080 --> 00:32:35,670
to meet.

733

00:32:35,670 --> 00:32:36,670
Is that like the tier one level?

734

00:32:36,670 --> 00:32:37,670
Yeah.

735

00:32:37,670 --> 00:32:38,670
Two hundred and eighty of those?

736

00:32:38,670 --> 00:32:39,670
Two hundred and eighty of those.

737

00:32:39,670 --> 00:32:40,670
And then, they have--

738

00:32:40,670 --> 00:32:41,670
Okay.

739

00:32:41,670 --> 00:32:45,440
--an additional somewhere in the neighborhood of close to 500 and change of performance

740

00:32:45,440 --> 00:32:49,620
from the safety requirements that are required to fly to the ISS.

741

00:32:49,620 --> 00:32:52,990
Those would be our international space station programs requirements.

742

00:32:52,990 --> 00:32:53,990
Okay.

743

00:32:53,990 --> 00:32:59,260

So, between the two, we have approximately, almost nearly 800 total requirements that

744

00:32:59,260 --> 00:33:03,760

they have to satisfy, which may sound like a lot to most people but when you think about

745

00:33:03,760 --> 00:33:07,650

it and you compare it to some of the other programs, they're probably -- those requirements

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00:33:07,650 --> 00:33:09,149

are then decomposed into--

747

00:33:09,149 --> 00:33:10,149

Sure.

748

00:33:10,149 --> 00:33:12,220

--thousands of smaller lower level requirements.

749

00:33:12,220 --> 00:33:13,220

Right.

750

00:33:13,220 --> 00:33:19,960

We don't necessarily require the decomposition at our level, but we do require them to decompose

751

00:33:19,960 --> 00:33:21,929

them and then roll them back up for us.

752

00:33:21,929 --> 00:33:23,149

All right?

753

00:33:23,149 --> 00:33:24,659

So, when you talk about this because--

754

00:33:24,659 --> 00:33:25,659

Uh-hmm.

755

00:33:25,659 --> 00:33:28,190

--kind of, you made this point of, like, in a heritage program, which I think is a great

756

00:33:28,190 --> 00:33:29,190

way to describe it.

757

00:33:29,190 --> 00:33:30,190

Uh-hmm.

758

00:33:30,190 --> 00:33:32,740

You have, maybe, thousands more requirements as a part of it.

759

00:33:32,740 --> 00:33:37,470

So, does that really make our job easier or does it make our job harder because I could,

760

00:33:37,470 --> 00:33:40,590

kind of, see that going either way because we're a little bit more hands off.

761

00:33:40,590 --> 00:33:41,590

Right.

762

00:33:41,590 --> 00:33:44,260

So, yeah, Josh, that's a really good question.

763

00:33:44,260 --> 00:33:48,120

In some cases, it makes it easier and in some other cases, it does make it much more difficult

764

00:33:48,120 --> 00:33:53,809

because you leave it up to the provider to figure it out and then you have our people,

765

00:33:53,809 --> 00:33:58,169

which have a lot of heritage history, and so they have certain expectations of what

766

00:33:58,169 --> 00:33:59,200
needs to be delivered.

767

00:33:59,200 --> 00:34:01,580
So, there's a lot of give and take that goes along with that--

768

00:34:01,580 --> 00:34:02,580
Right.

769

00:34:02,580 --> 00:34:05,159
--of what we expected versus what they delivered.

770

00:34:05,159 --> 00:34:10,700
And so, sometimes those two aren't very -- they don't flow very well together.

771

00:34:10,700 --> 00:34:11,700
Sure.

772

00:34:11,700 --> 00:34:16,399
So, it's been a lot of back and forth between us and the commercial provider to figure out

773

00:34:16,399 --> 00:34:17,960
what the right level is.

774

00:34:17,960 --> 00:34:21,760
And once we get to that right level and we're satisfied they meet the intent, then we're

775

00:34:21,760 --> 00:34:24,610
good to go and we move on to the next one.

776

00:34:24,610 --> 00:34:31,579
Now, not all of those close to 800 requirements

are required for each of these test flights.

777

00:34:31,579 --> 00:34:35,470

So, we have a sub-set of those -- subset of those that are required.

778

00:34:35,470 --> 00:34:37,450

What we call the minimum requirements.

779

00:34:37,450 --> 00:34:41,149

In the case of space station, that's mostly all of them.

780

00:34:41,149 --> 00:34:42,149

Yeah.

781

00:34:42,149 --> 00:34:43,149

[Laughing]

782

00:34:43,149 --> 00:34:44,149

Because in order to approach the, the spacecraft--

783

00:34:44,149 --> 00:34:45,260

We take very good care of the space station.

784

00:34:45,260 --> 00:34:50,220

Yeah, in the case of our requirements where you have an unmanned vehicle that's going

785

00:34:50,220 --> 00:34:55,100

to fly here, OFT, Orbital Flight Test, there's nobody onboard, there's certain subsets of

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00:34:55,100 --> 00:35:00,480

those that we don't necessarily require to be completed, simply because you don't have

787

00:35:00,480 --> 00:35:01,480

people onboard.

788

00:35:01,480 --> 00:35:08,150

For instance, the most obvious one is a requirement that we have for launch abort or abort systems,

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00:35:08,150 --> 00:35:09,980

not just launch abort but abort systems.

790

00:35:09,980 --> 00:35:10,980

Yeah.

791

00:35:10,980 --> 00:35:15,400

Since no one is onboard, we don't necessarily require the abort system requirement to be

792

00:35:15,400 --> 00:35:16,400

satisfied.

793

00:35:16,400 --> 00:35:17,400

Okay.

794

00:35:17,400 --> 00:35:19,880

We leave that risk up to the commercial partner.

795

00:35:19,880 --> 00:35:20,880

Okay.

796

00:35:20,880 --> 00:35:25,619

In this particular case, I don't know if a lot of people know, but Boeing will have the

797

00:35:25,619 --> 00:35:31,210

-- they have an abort system onboard but they only have part of it actually functioning.

798

00:35:31,210 --> 00:35:32,250

And that's on the launch vehicle.

799

00:35:32,250 --> 00:35:34,440

It's the emergency detection system.

800

00:35:34,440 --> 00:35:43,320

It will follow along and it will record events in the event of an abort trigger getting -- a

801

00:35:43,320 --> 00:35:44,860

red line getting triggered.

802

00:35:44,860 --> 00:35:47,859

It will record it and -- but it won't abort the vehicle.

803

00:35:47,859 --> 00:35:48,859

Okay.

804

00:35:48,859 --> 00:35:50,800

The spacecraft itself won't have the capability to abort.

805

00:35:50,800 --> 00:35:52,089

The big launch abort engines--

806

00:35:52,089 --> 00:35:53,089

Okay.

807

00:35:53,089 --> 00:35:55,230

For those of you that saw the pad abort test here not too long ago.

808

00:35:55,230 --> 00:35:56,230

Yeah, great test.

809

00:35:56,230 --> 00:36:00,020

Those big engines that you saw that lit to launch the vehicle off the top, they won't

810

00:36:00,020 --> 00:36:01,250

be active on this flight.

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00:36:01,250 --> 00:36:05,830

They -- in fact, they won't even be there
for the simple reasons that it's just not

812

00:36:05,830 --> 00:36:06,830

required.

813

00:36:06,830 --> 00:36:07,830

Sure.

814

00:36:07,830 --> 00:36:12,810

But when we get to CFT, that requirement will
certainly be part of the next set of requirements

815

00:36:12,810 --> 00:36:15,020

for Crewed Flight Test.

816

00:36:15,020 --> 00:36:18,300

Yeah, and before we start recording today,
you made a comment to me--

817

00:36:18,300 --> 00:36:19,300

Uh-hmm.

818

00:36:19,300 --> 00:36:20,300

--which was really intriguing.

819

00:36:20,300 --> 00:36:21,300

Uh-hmm.

820

00:36:21,300 --> 00:36:23,240

That ultimately, there are these things that
have to meet before we'll let you go try and

821

00:36:23,240 --> 00:36:24,340

fly the space station.

822

00:36:24,340 --> 00:36:25,340

Right.

823

00:36:25,340 --> 00:36:29,839

But ultimately, those aren't actually the certification that you're really after.

824

00:36:29,839 --> 00:36:31,500

And that comes later down the road.

825

00:36:31,500 --> 00:36:34,760

Can you talk more about kind of what do -- what's the -- really the end goal here?

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00:36:34,760 --> 00:36:37,530

Yeah, the end goal is to certify the entire system.

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00:36:37,530 --> 00:36:38,530

All right?

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00:36:38,530 --> 00:36:42,800

You've got a commercial crew transportation system, that's the launch vehicle, the spacecraft,

829

00:36:42,800 --> 00:36:52,040

the ground systems, the personnel, the communications systems, the launch control centers, the mission

830

00:36:52,040 --> 00:36:53,040

control centers.

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00:36:53,040 --> 00:36:56,780

They're all part of the entire system, not one piece of it.

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00:36:56,780 --> 00:37:01,340

And so, ultimately these requirements that we have out there have piece parts associated

833

00:37:01,340 --> 00:37:05,420

with all of those aspects of a system.

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00:37:05,420 --> 00:37:09,560

And so, we wind up getting to a point where we want to certify the entire end product.

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00:37:09,560 --> 00:37:12,740

And that's done through what we call the certification review.

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00:37:12,740 --> 00:37:18,750

And that's typically done or in our case, it will be done post two test flights.

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00:37:18,750 --> 00:37:23,220

And the two test flights, the first one here coming up here in December is the unmanned

838

00:37:23,220 --> 00:37:26,080

or un-crewed version of the vehicle.

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00:37:26,080 --> 00:37:29,690

The next one would be the crewed version sometime early next year.

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00:37:29,690 --> 00:37:34,420

And then, post that they'll be a significant review where we look at all that data.

841

00:37:34,420 --> 00:37:39,170

We look at how the vehicles worked, and how it functioned, and how well it performed.

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00:37:39,170 --> 00:37:43,740

And then, we'll have the final sign off which is called certification review, which means

843

00:37:43,740 --> 00:37:46,380
the system is now certified to fly.

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00:37:46,380 --> 00:37:51,390
And then, post that, we'll have what we call
a post certification missions, PCMs.

845

00:37:51,390 --> 00:37:52,390
And--

846

00:37:52,390 --> 00:37:53,390
Awesome.

847

00:37:53,390 --> 00:37:57,740
We'll be flying the crews on a fairly regular
basis to station about once every six months

848

00:37:57,740 --> 00:37:58,740
or so.

849

00:37:58,740 --> 00:37:59,740
Yeah.

850

00:37:59,740 --> 00:38:04,010
And one of the things we talked about in our
office and I'm just kind of curious to get

851

00:38:04,010 --> 00:38:10,190
your thoughts on the challenges that this
presents, is that at no point in history has

852

00:38:10,190 --> 00:38:11,930
anybody ever done what we're trying to do.

853

00:38:11,930 --> 00:38:12,930
Correct.

854

00:38:12,930 --> 00:38:16,280
Because we're -- people probably -- they may

not realize that we're marrying commercial

855

00:38:16,280 --> 00:38:19,310

and government in a way that this has never happened before.

856

00:38:19,310 --> 00:38:20,310

Right.

857

00:38:20,310 --> 00:38:21,480

Do you guys feel that?

858

00:38:21,480 --> 00:38:24,609

Is that something that's like, feels like, an impossible hurdle?

859

00:38:24,609 --> 00:38:27,400

Is it just like, "Hey, like, this is a cool challenge to undertake?"

860

00:38:27,400 --> 00:38:29,290

What's the feeling amongst you and your team?

861

00:38:29,290 --> 00:38:33,430

Oh, absolutely, it's -- some days, it's really cool to be a part of it.

862

00:38:33,430 --> 00:38:37,329

Another day is it's really, really challenging because of where a lot of us come from.

863

00:38:37,329 --> 00:38:41,420

You know, I've been in this business about 30 years, over 30 years.

864

00:38:41,420 --> 00:38:47,630

And a lot of the people I work with have a significant amount of time in this business.

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00:38:47,630 --> 00:38:52,240

Some of us have background in shuttle, some of us had background in station, International

866

00:38:52,240 --> 00:38:53,470

Space Station.

867

00:38:53,470 --> 00:38:58,560

Others have background in the Launch Services Program.

868

00:38:58,560 --> 00:39:03,410

And then, someone like me who has a little bit of all of that, it becomes -- it's difficult

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00:39:03,410 --> 00:39:06,700

because in all those other programs, with the exception of maybe the Launch Services

870

00:39:06,700 --> 00:39:10,510

Program because they did do some hybrid of the model we're doing now.

871

00:39:10,510 --> 00:39:11,510

We've owned the hardware.

872

00:39:11,510 --> 00:39:12,520

We've owned the requirements.

873

00:39:12,520 --> 00:39:13,520

Yeah.

874

00:39:13,520 --> 00:39:19,630

We've had taken all of the liability and responsibility to ensure the safety of this vehicle.

875

00:39:19,630 --> 00:39:21,960

Not to say that that's not what's going to happen here.

876

00:39:21,960 --> 00:39:24,790

That is absolutely 100% going to happen here.

877

00:39:24,790 --> 00:39:27,329

We will ultimately make sure the vehicle is safe to fly crews.

878

00:39:27,329 --> 00:39:32,200

The difference is where we draw the line between us and the commercial partner.

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00:39:32,200 --> 00:39:38,010

This is a true shared -- what we call a shared accountability between ourselves and the commercial

880

00:39:38,010 --> 00:39:42,671

partner, where we allow them to kind of work a lot of the down and in details.

881

00:39:42,671 --> 00:39:47,641

And we looked at the primary safety and performance requirements at the top, which is what I was

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00:39:47,641 --> 00:39:48,910

sort of alluding to before.

883

00:39:48,910 --> 00:39:49,910

Right.

884

00:39:49,910 --> 00:39:50,910

All right.

885

00:39:50,910 --> 00:39:52,940

And so, we don't dive down nearly as deep.

886

00:39:52,940 --> 00:39:57,310

So, some days it's very challenging because of our expectations of what that is.

887

00:39:57,310 --> 00:40:02,099

And other days, it's really a lot of fun to work with these partners to see how creative

888

00:40:02,099 --> 00:40:03,099

they can get.

889

00:40:03,099 --> 00:40:05,650

Yeah, so, probably the last question for you here.

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00:40:05,650 --> 00:40:06,650

Yeah.

891

00:40:06,650 --> 00:40:07,650

Where are you going to get to be on launch day?

892

00:40:07,650 --> 00:40:09,250

Are you working or are you just get to be a spectator?

893

00:40:09,250 --> 00:40:10,250

No.

894

00:40:10,250 --> 00:40:11,250

I'm probably going to help you guys out, I think.

895

00:40:11,250 --> 00:40:12,250

Oh, good.

896

00:40:12,250 --> 00:40:15,310

I work for the systems engineering immigration office.

897

00:40:15,310 --> 00:40:17,580

Most of our work will be done before launch day.

898

00:40:17,580 --> 00:40:18,580

Very good.

899

00:40:18,580 --> 00:40:20,700

In fact, all of it should be done before launch day.

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00:40:20,700 --> 00:40:21,700

[Laughing]

901

00:40:21,700 --> 00:40:24,390

And so I don't have an active role in the control centers.

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00:40:24,390 --> 00:40:29,330

As a matter of fact, as part of the model we follow, NASA isn't really actively working

903

00:40:29,330 --> 00:40:30,330

the countdowns.

904

00:40:30,330 --> 00:40:31,330

Uh-hmm.

905

00:40:31,330 --> 00:40:32,470

They are there in a support role.

906

00:40:32,470 --> 00:40:36,210

We are certainly there in the go-no-go -- final no--go-no-go role.

907

00:40:36,210 --> 00:40:37,210

Sure.

908

00:40:37,210 --> 00:40:41,690

And then, we'll have some technical expertise that will be listening in on the nets, on

909

00:40:41,690 --> 00:40:46,210

the voice nets, and the loops to hear for any kind of issues that might be occurring

910

00:40:46,210 --> 00:40:47,600

during countdown.

911

00:40:47,600 --> 00:40:50,690

That group of people is a very small number.

912

00:40:50,690 --> 00:40:52,079

It's not very large.

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00:40:52,079 --> 00:40:57,460

And they will be strategically positioned in the ASOC where ULA launches the vehicle

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00:40:57,460 --> 00:40:58,460

from.

915

00:40:58,460 --> 00:41:02,280

We'll have some people and believe it or not, mission control center Houston because the

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00:41:02,280 --> 00:41:08,380

Boeing model is actually using our NASA people to, in sort of a sub-contractor role--

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00:41:08,380 --> 00:41:09,380

Sure.

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00:41:09,380 --> 00:41:12,450

--to actually fly the vehicle for them.

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00:41:12,450 --> 00:41:17,280

They are working directly for Boeing.

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00:41:17,280 --> 00:41:18,280

Uh-hmm.

921

00:41:18,280 --> 00:41:20,670

And so they don't necessarily work directly for us.

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00:41:20,670 --> 00:41:21,670

However--

923

00:41:21,670 --> 00:41:22,670

Interesting.

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00:41:22,670 --> 00:41:23,670

--in this interesting hybrid role--

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00:41:23,670 --> 00:41:24,670

Yeah, [Laughs]

926

00:41:24,670 --> 00:41:25,680

--they do have, and own, and contain NASA badges.

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00:41:25,680 --> 00:41:26,680

Huh.

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00:41:26,680 --> 00:41:29,930

They are mostly NASA and NASA support contractors.

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00:41:29,930 --> 00:41:36,060

This is kind of a unique approach for the Boeing model and it's unique for us.

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00:41:36,060 --> 00:41:39,910

But actually, you know, in some ways, it buys down a little bit of risk because they're

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00:41:39,910 --> 00:41:44,650

using heritage people to fly the vehicle for them in a sub-contractor role.

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00:41:44,650 --> 00:41:47,210

Now, they ultimately answer directly to Boeing.

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00:41:47,210 --> 00:41:48,210

And then--

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00:41:48,210 --> 00:41:49,210

Right.

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00:41:49,210 --> 00:41:53,010

--we then provide through our commercial crew program the final go to actually fly to space

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00:41:53,010 --> 00:41:55,660

station along with our ISS partners.

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00:41:55,660 --> 00:41:59,570

It seems like every time I talk to somebody about this program, there's more complexities

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00:41:59,570 --> 00:42:00,590

that kind of pop up.

939

00:42:02,590 --> 00:42:01,590

Yeah.

940

00:42:02,590 --> 00:42:05,160

Which I love and again, it just shows the resolve of our people and the commercial companies

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00:42:05,160 --> 00:42:07,260

were working alongside of to get the job done.

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00:42:07,260 --> 00:42:08,260

Yeah.

943

00:42:08,260 --> 00:42:09,260

Yes.

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00:42:09,260 --> 00:42:10,260

So, then, it absolutely is.

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00:42:10,260 --> 00:42:14,579

And so our role is, sort of, in a much smaller oversight sort of role.

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00:42:14,579 --> 00:42:21,250

And we're going to support the team involved from making that last minute go or final go

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00:42:21,250 --> 00:42:26,569

to fly with a handful of people, as opposed to what you may have seen in the past with

948

00:42:26,569 --> 00:42:27,940

say the LCC over here.

949

00:42:27,940 --> 00:42:33,490

We had several hundred people and we were actively working the countdown not to say

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00:42:33,490 --> 00:42:36,829

that Boeing/ULA won't have a similar number of people.

951

00:42:36,829 --> 00:42:38,680

Although, I don't think they'll have as many.

952

00:42:38,680 --> 00:42:40,610

They'll just be located here in ASOC.

953

00:42:40,610 --> 00:42:42,920

They'll be located in Mission Control Center Houston.

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00:42:42,920 --> 00:42:46,710

And then, we'll have our people in various places looking over their shoulder and just

955

00:42:46,710 --> 00:42:50,600

making sure that everything goes as planned.

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00:42:50,600 --> 00:42:54,690

Those people are going to be highly experienced people that have been working closely with

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00:42:54,690 --> 00:43:00,820

Boeing over the last -- in some cases, eight or nine years, so they understand the architecture

958

00:43:00,820 --> 00:43:01,820

very, very well.

959

00:43:01,820 --> 00:43:03,800

They understand -- they've been working very closely.

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00:43:03,800 --> 00:43:08,050

They understand any of the issues or concerns that have come up during the whole develop

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00:43:08,050 --> 00:43:12,050

-- design development and test program that Boeing's gone through and we've been there

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00:43:12,050 --> 00:43:13,680

side-by-side with them.

963

00:43:13,680 --> 00:43:15,440

It's just not going to be a huge number.

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00:43:15,440 --> 00:43:20,870

My role, even though, I've been there the last eight or nine years with them, will be

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00:43:20,870 --> 00:43:23,190
mostly done since I'm mostly the paper guy.

966
00:43:23,190 --> 00:43:24,190
[Laughing]

967
00:43:24,190 --> 00:43:28,210
And I'll be sitting there probably helping
you guys, maybe, take some people around on

968
00:43:28,210 --> 00:43:29,210
launch day.

969
00:43:29,210 --> 00:43:30,210
Great.

970
00:43:30,210 --> 00:43:31,210
Yeah.

971
00:43:31,210 --> 00:43:32,210
Good.

972
00:43:32,210 --> 00:43:33,210
Well, Gennaro, obviously, you have a busy
couple of weeks ahead of you--

973
00:43:33,210 --> 00:43:34,210
Yeah.

974
00:43:34,210 --> 00:43:35,210
I sure do.

975
00:43:35,210 --> 00:43:36,210
So I'm going to let you get out of here.

976
00:43:36,210 --> 00:43:37,210
But I appreciate your time and we're looking
forward to seeing this thing fly.

977
00:43:37,210 --> 00:43:38,210
All right.

978
00:43:38,210 --> 00:43:39,210
So am I, believe me.

979
00:43:39,210 --> 00:43:40,210
[Laughing]

980
00:43:40,210 --> 00:43:41,210
And so are we.

981
00:43:41,210 --> 00:43:42,390
Thanks.

982
00:43:42,390 --> 00:43:44,830
I'm Joshua Santora and that's our show.

983
00:43:44,830 --> 00:43:46,540
Thanks for stopping by the Rocket Ranch.

984
00:43:46,540 --> 00:43:51,270
And special thanks to our guests, Steve Payne
and Gennaro Caliendo.

985
00:43:51,270 --> 00:43:56,000
To learn more about the Commercial Crew Program
visit [NASA.gov/commercial crew](https://www.nasa.gov/commercial-crew).

986
00:43:56,000 --> 00:43:59,530
And to learn more about everything going on
at the Kennedy Space Center go to [NASA.gov/kennedy](https://www.nasa.gov/kennedy).

987
00:43:59,530 --> 00:44:05,369
Check out NASA's other podcast to learn more
about what's happening at all of our centers

988
00:44:05,369 --> 00:44:08,970

at [NASA.gov/podcast](https://www.nasa.gov/podcast).

989

00:44:08,970 --> 00:44:11,569

A special shout out to our producer, John Sackman.

990

00:44:11,569 --> 00:44:14,680

Our sound engineers, Michelle Stone and Lorne Mathre.

991

00:44:14,680 --> 00:44:16,130

Editor, Chris Chamberlain.

992

00:44:16,130 --> 00:44:20,130

And special thanks to Marie Lewis, Tori Mclendon, and Jenn Wolfinger.