



Journey to Mars

2015 Comic Con International
San Diego, California

1
00:00:10,730 --> 00:00:17,259
Hello, Comic Con.

2
00:00:17,259 --> 00:00:24,800
And welcome to Journey to Mars and The Martian.

3
00:00:24,800 --> 00:00:25,930
My name's Aditya Sood.

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00:00:25,930 --> 00:00:30,949
I am one of the producers on the upcoming
film, The Martian.

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00:00:30,949 --> 00:00:39,640
And we have an incredible, incredible panel
today, really excited to talk to you guys.

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00:00:39,640 --> 00:00:47,730
Maybe before we kick things off, I got a little
something to show you if you're interested.

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00:00:47,730 --> 00:00:59,289
We should cue them, or I can do it in charades.

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00:00:59,289 --> 00:01:04,009
You don't seem interested enough.

9
00:01:04,009 --> 00:01:07,250
Okay.

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00:01:07,250 --> 00:01:09,330
Every human being has a basic instinct.

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00:01:09,330 --> 00:01:11,560
To help each other out.

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00:01:11,560 --> 00:01:16,970
If a hiker gets lost in the mountains, people

coordinate a search.

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00:01:16,970 --> 00:01:25,479

If an earthquake levels the city, people all over the world send emergency supplies.

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00:01:25,479 --> 00:01:28,130

This instinct is found in every culture.

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00:01:28,130 --> 00:01:30,650

Without exception.

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00:01:30,650 --> 00:01:39,880

At around 4:30am our satellites detected a storm approaching the ARES 3 mission side

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00:01:39,880 --> 00:01:40,880

on Mars.

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00:01:40,880 --> 00:01:51,360

The storm had escalated to severe and we had no choice but to abort the mission.

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00:01:51,360 --> 00:02:05,539

But, during the evacuation, astronaut Marc Watney was killed.

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00:02:05,539 --> 00:02:16,099

I'm entering this log for the record. This is Marc Watney, and I'm still alive, obviously.

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00:02:16,099 --> 00:02:19,200

I have no way to contact NASA or my crew mates.

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00:02:19,200 --> 00:02:24,489

But, even if I could, it would take four years for another manned mission to reach me, and

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00:02:24,489 --> 00:02:27,209

I'm in a Hab designed to last 31 days.

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00:02:27,209 --> 00:02:31,090

So, in the face of overwhelming odds, I'm left with only one option.

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00:02:31,090 --> 00:02:35,069

I'm gonna have to science the **** out of this.

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00:02:35,069 --> 00:02:38,409

Okay, let's do the math.

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00:02:38,409 --> 00:02:42,590

I got to figure out how to grow four years worth of food, here, on a planet where nothing

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00:02:42,590 --> 00:02:43,650

grows.

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00:02:43,650 --> 00:02:48,280

But, if I can't figure out a way to make contact with NASA, none of this matters anyway.

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00:02:48,280 --> 00:02:50,879

Houston be advised.

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00:02:50,879 --> 00:02:55,209

We've got a video message.

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00:02:55,209 --> 00:02:59,530

It's directed to the crew.

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00:02:59,530 --> 00:03:01,269

Play it.

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00:03:01,269 --> 00:03:05,599

Mark Watney is still alive.

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00:03:05,599 --> 00:03:06,750
In your face, Neil Armstrong.

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00:03:06,750 --> 00:03:08,670
We left him behind.

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00:03:08,670 --> 00:03:11,060
Let's go get our boy.

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00:03:11,060 --> 00:03:13,450
This is something NASA rejected.

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00:03:13,450 --> 00:03:15,359
So, we're talking mutiny.

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00:03:15,359 --> 00:03:19,060
And if we mess up the supply rendez-vous,
we die.

41
00:03:19,060 --> 00:03:25,800
If we mess-up the earth gravity assist, we
die.

42
00:03:25,800 --> 00:03:33,239
It's space, it doesn't cooperate.

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00:03:33,239 --> 00:03:45,340
I guarantee you, that at some point, everything
is gonna go south on you.

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00:03:45,340 --> 00:03:49,400
And you're gonna say "this is it".

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00:03:49,400 --> 00:03:53,270
"This is how I end."

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00:03:53,270 --> 00:04:07,919
Is it possible that he's still alive?

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00:04:07,919 --> 00:04:21,880

So, before we get started, I just want to say, you know, in my line of work, I get to

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00:04:21,880 --> 00:04:25,480

hang out with some of the, like, pretty cool and interesting people.

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00:04:25,480 --> 00:04:30,280

And I'll be honest, we get a little blasé about it, and I go and I, like, see my cousins.

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00:04:30,280 --> 00:04:32,820

And they tell me, like, oh my God, you know blah, blah, blah.

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00:04:32,820 --> 00:04:33,950

And I'm like, yeah, why not?

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00:04:33,950 --> 00:04:38,460

He's just like a regular--I have not been more star struck than I was backstage with

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00:04:38,460 --> 00:04:43,460

these guys because they actually do real work and truly, truly amazing things.

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00:04:43,460 --> 00:04:47,120

So, you guys are in for a real treat today.

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00:04:47,120 --> 00:04:53,310

So, all right.

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00:04:53,310 --> 00:04:57,170

So, let me introduce our panel.

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00:04:57,170 --> 00:05:04,370

First, Jim Green, the Director of Planetary

Science for NASA, he's in charge of planetary

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00:05:04,370 --> 00:05:05,370
exploration.

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00:05:05,370 --> 00:05:07,220
He's a Mars expert.

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00:05:07,220 --> 00:05:13,300
He was also a technical consultant on The
Martian and helped us in ways that you cannot

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00:05:13,300 --> 00:05:18,530
even possibly imagine.

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00:05:18,530 --> 00:05:25,690
And he--you know, he is basic--by the way,
he also doesn't just do Mars.

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00:05:25,690 --> 00:05:30,590
He does pretty much the entire solar system,
and I know I promised him I would just keep

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00:05:30,590 --> 00:05:35,420
it to Mars, but he's also involved with the
Pluto flyby.

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00:05:35,420 --> 00:05:38,790
Maybe that's something you guys have heard.

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00:05:38,790 --> 00:05:40,740
And we have Todd May.

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00:05:40,740 --> 00:05:50,270
Todd is--he's just building the next spaceship
that's actually going to take us to Mars.

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00:05:50,270 --> 00:05:53,970
You guys may have heard of it.

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00:05:53,970 --> 00:05:56,080

It's the space launch system.

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00:05:56,080 --> 00:06:02,130

He is--I mean it's incredible what--and he'll tell you more about it.

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00:06:02,130 --> 00:06:07,100

But, the SLS, when it's completed, is actually going to be more powerful than the Saturn

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00:06:07,100 --> 00:06:10,580

V rocket.

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00:06:10,580 --> 00:06:15,940

And then we have Victor Glover.

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00:06:15,940 --> 00:06:22,430

Victor Glover, as of yesterday, is an astronaut officially.

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00:06:22,430 --> 00:06:34,570

And he's--he and the members of his class aren't just any astronauts.

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00:06:34,570 --> 00:06:40,290

They are actually the class that most likely will be among the first people to walk on

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00:06:40,290 --> 00:06:50,450

Mars.

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00:06:50,450 --> 00:07:01,430

And finally, we have Andy Weir, the author of The Martian, or as I like to say, the guy

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00:07:01,430 --> 00:07:05,350

who got us into this mess.

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00:07:05,350 --> 00:07:10,740
And Andy, you know, is, besides being an amazing
guy, is an amazing novelist and I think has

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00:07:10,740 --> 00:07:16,450
created something that, you know, not--already
as a book is going to be an all-time classic.

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00:07:16,450 --> 00:07:20,290
And hopefully, we've done him proud with our
film.

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00:07:20,290 --> 00:07:21,930
All right.

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00:07:21,930 --> 00:07:24,380
So, let's start.

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00:07:24,380 --> 00:07:31,060
Jim, why don't you tell us a little bit about
Mars?

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00:07:31,060 --> 00:07:32,080
My pleasure.

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00:07:32,080 --> 00:07:38,240
You know, what I'd like to do, since Mars
is one of our destinations beyond low-Earth

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00:07:38,240 --> 00:07:40,562
orbit, we'll go to this planet.

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00:07:40,562 --> 00:07:42,200
It's a beautiful planet.

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00:07:42,200 --> 00:07:48,810
And as Andy has glimpsed into the near future
and shown us what humans can do, I want to

91
00:07:48,810 --> 00:07:50,640
give you a little background about Mars.

92
00:07:50,640 --> 00:07:57,820
So, if you want to go to Mars, yeah, then
you need to learn to be a Martian.

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00:07:57,820 --> 00:08:03,470
So, in the few minutes I have, I thought I'd
talk a little bit about this beautiful planet,

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00:08:03,470 --> 00:08:04,570
this beautiful red planet.

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00:08:04,570 --> 00:08:07,970
This, of course, is what it looks like today.

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00:08:07,970 --> 00:08:08,970
It's very arid.

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00:08:08,970 --> 00:08:16,800
It has a very small atmosphere, only about
a percent or so of the Earth's atmosphere.

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00:08:16,800 --> 00:08:18,370
It's not like ours.

99
00:08:18,370 --> 00:08:24,090
It's primarily carbon dioxide, but it has
a whole series of trace gasses, and we've

100
00:08:24,090 --> 00:08:29,700
been examining Mars for more than 50 years
now, with a whole series of probes.

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00:08:29,700 --> 00:08:36,529
Now, as you know, we have two rovers that
are actively working right now on the surface,

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00:08:36,529 --> 00:08:39,140

Opportunity and Curiosity.

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00:08:39,140 --> 00:08:43,459

And they are finding amazing things.

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00:08:43,459 --> 00:08:50,759

Curiosity is sitting in an ancient riverbed,
a place that we now know that tells us a lot

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00:08:50,759 --> 00:08:58,269

about Mar's past because three and a half
billion years ago, Mars looked like this.

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00:08:58,269 --> 00:09:04,389

It looked much more Earth-like than it ever
did in its history.

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00:09:04,389 --> 00:09:06,920

This environment could have been habitable.

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00:09:06,920 --> 00:09:09,160

It had a significant amount of water.

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00:09:09,160 --> 00:09:15,040

In fact, the Northern Hemisphere was probably
more than half ocean.

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00:09:15,040 --> 00:09:20,269

This is an enormous change in the environment,
that it occurred over time.

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00:09:20,269 --> 00:09:24,829

And our spacecraft are indeed looking at it
to try to determine how this happened.

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00:09:24,829 --> 00:09:27,470

So, where did the water go?

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00:09:27,470 --> 00:09:30,329

What indeed happened to Mars over time?

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00:09:30,329 --> 00:09:32,939

Let me see if I can get the next one.

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00:09:32,939 --> 00:09:33,939

Here we go.

116

00:09:33,939 --> 00:09:39,490

Well, the water not only evaporated away,
but it also went underground.

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00:09:39,490 --> 00:09:46,269

And what we're looking at is four images over
a Mars year looking down the side of a crater.

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00:09:46,269 --> 00:09:52,980

And what I want to point out are these long,
what look like, linear streaks that come out,

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00:09:52,980 --> 00:09:54,990

and they come out during the summer.

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00:09:54,990 --> 00:10:01,370

And what that is, it's water, we believe briny
water, coming out of aquifers after the sun

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00:10:01,370 --> 00:10:06,670

has heated the plug of water that's holding
it back, sublimating it away.

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00:10:06,670 --> 00:10:10,700

And what is pouring down the sides of these
craters.

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00:10:10,700 --> 00:10:12,810

We find this in Valles Marineris.

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00:10:12,810 --> 00:10:16,089

We find it in many other locations on Mars.

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00:10:16,089 --> 00:10:22,350

So, indeed, Mars was a very wet environment in the past, and it has a significant amount

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00:10:22,350 --> 00:10:25,629

of water in the future for us to be able to use.

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00:10:25,629 --> 00:10:27,570

And that's the really good thing.

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00:10:27,570 --> 00:10:32,860

So, when humans go to Mars, rather than bringing all their water, we'll tell them, "Bring a

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00:10:32,860 --> 00:10:35,379

straw because we know where to go."

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00:10:35,379 --> 00:10:36,630

And we can get it.

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00:10:36,630 --> 00:10:40,050

So, here's a topographical map of Mars.

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00:10:40,050 --> 00:10:42,769

In the bluish area are the low areas.

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00:10:42,769 --> 00:10:49,620

This is where indeed the water oceans would be, and in fact where the blue and the green

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00:10:49,620 --> 00:10:55,670

meets, these are the shores, the ancient shores where clays are found and where, perhaps,

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00:10:55,670 --> 00:10:59,029

life started about three and a half billion years ago.

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00:10:59,029 --> 00:11:04,629

We don't know that for a fact, but we would love to find that out, and our missions are

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00:11:04,629 --> 00:11:07,339

indeed making progress in this area.

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00:11:07,339 --> 00:11:11,380

The only two that are operating right now, of course, are in the blue.

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00:11:11,380 --> 00:11:16,040

They're Opportunity and Curiosity, and these are the locations that they are.

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00:11:16,040 --> 00:11:23,790

Now, Andy's book takes place north of where Pathfinder is, in that bluish area.

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00:11:23,790 --> 00:11:31,660

So, Ares 3 was sitting in the ancient ocean floor of Mars.

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00:11:31,660 --> 00:11:37,970

And of course, that's a beautiful area to be at because there are also resources.

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00:11:37,970 --> 00:11:42,480

There's water underground in that particular area, so quite a beautiful area.

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00:11:42,480 --> 00:11:48,480

Curiosity, when it landed, it took its hand lens and took 54 images of itself.

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00:11:48,480 --> 00:11:56,720

And of course, what that meant was it created its first selfie, posted it on its Facebook

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00:11:56,720 --> 00:11:58,200

Web site.

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00:11:58,200 --> 00:12:00,200

And so, we all could enjoy it.

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00:12:00,200 --> 00:12:03,980

But, it moved on, and of course, it looked at the soils.

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00:12:03,980 --> 00:12:09,310

It has some of the most advanced astrobiological instruments we've ever launched.

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00:12:09,310 --> 00:12:15,709

And when it drilled into the soils, what it found was not red Mars.

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00:12:15,709 --> 00:12:18,119

It was gray Mars.

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00:12:18,119 --> 00:12:21,410

It told us about the past of Mars.

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00:12:21,410 --> 00:12:22,790

And what did it find?

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00:12:22,790 --> 00:12:28,129

It found carbon and hydrogen and oxygen and phosphorous and sulfur.

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00:12:28,129 --> 00:12:31,629

Those were all the basic ingredients to life.

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00:12:31,629 --> 00:12:38,939

So, this area, like the Earth, three and a half billion years ago could have started

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00:12:38,939 --> 00:12:39,939

life.

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00:12:39,939 --> 00:12:46,540

So, this is a fabulous planet to explore and to continue to do our science in.

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00:12:46,540 --> 00:12:53,449

Currently, our orbiters, as you can see here, we have quite a few that are operating, some

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00:12:53,449 --> 00:12:55,379

from European Space Agency.

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00:12:55,379 --> 00:13:00,050

We have another one called MOM, which is also from the Indian Space Agency.

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00:13:00,050 --> 00:13:04,600

But, we have the Mars Reconnaissance Orbiter, and we have Mars Express.

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00:13:04,600 --> 00:13:11,899

And of course, now as you can see, we have Opportunity and Curiosity.

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00:13:11,899 --> 00:13:15,730

What we're going to launch next year are two major missions.

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00:13:15,730 --> 00:13:16,730

One is Insight.

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00:13:16,730 --> 00:13:18,329

It's going to get down.

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00:13:18,329 --> 00:13:19,329

It's not a rover.

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00:13:19,329 --> 00:13:25,220

It will sit down on the ground of Mars and will make seismic measurements.

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00:13:25,220 --> 00:13:28,040

We want to know how active the planet.

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00:13:28,040 --> 00:13:30,059

Are there marsquakes?

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00:13:30,059 --> 00:13:35,720

We can from orbit observe avalanches going on, on Mars.

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00:13:35,720 --> 00:13:37,220

What is the cause of that?

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00:13:37,220 --> 00:13:42,570

Is the interior of the planet still very active that do produce marsquakes?

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00:13:42,570 --> 00:13:48,829

Or is it because of impacts from the nearby asteroid belt that sometimes impacts Mars

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00:13:48,829 --> 00:13:49,829

itself?

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00:13:49,829 --> 00:13:53,300

Then, of course, we have our upcoming rovers.

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00:13:53,300 --> 00:13:59,800

ESA has what's called ExoMars, but we have the rover called Mars 2020 that we're currently

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00:13:59,800 --> 00:14:00,800

building right now.

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00:14:00,800 --> 00:14:06,709

Now, in the book, Andy used this beautifully, indeed, in terms of the orbiters that were

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00:14:06,709 --> 00:14:12,839

there and used that basic infrastructure that we have and really brought us that immediate

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00:14:12,839 --> 00:14:16,769

imagination as to what we might be doing on the surface of Mars.

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00:14:16,769 --> 00:14:21,800

Here is that upcoming rover called Mars 2020 that we're building.

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00:14:21,800 --> 00:14:28,790

What's really great about this is we have a Norwegian instrument underneath the pan

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00:14:28,790 --> 00:14:33,519

of the rover that is a ground-penetrating radar.

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00:14:33,519 --> 00:14:35,389

It's going to be looking for those aquifers.

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00:14:35,389 --> 00:14:42,579

But, in addition to that, we have perhaps our first human exploration instrument, and

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00:14:42,579 --> 00:14:45,209

it is called MOXIE.

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00:14:45,209 --> 00:14:48,579

And let me show an image of MOXIE, if I could.

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00:14:48,579 --> 00:14:49,579

There we go.

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00:14:49,579 --> 00:14:52,310

As you can see, it's not a very large instrument.

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00:14:52,310 --> 00:14:57,570

But, what it does is it brings in that CO₂, and it pops of an oxygen.

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00:14:57,570 --> 00:15:03,420

And it, for the first time as Andy points out in the book, is an oxygenator.

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00:15:03,420 --> 00:15:07,959

And so, these are the kind of things that we want to learn how to use and do on Mars

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00:15:07,959 --> 00:15:11,149

for us to be able to, in the long run, make it there.

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00:15:11,149 --> 00:15:13,410

So, what is the plan?

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00:15:13,410 --> 00:15:20,519

To go to Mars, it takes science, it takes exploration, and it takes technology.

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00:15:20,519 --> 00:15:25,829

In low-Earth orbit, we're doing a number of things right now with Space Station.

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00:15:25,829 --> 00:15:32,230

We have one of the Kelly brothers that is on Station right now that is staying for a

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00:15:32,230 --> 00:15:36,410

year because that's approximately the time it will take to go to Mars and learn to be

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00:15:36,410 --> 00:15:40,429

able to work and live in space over that long period time.

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00:15:40,429 --> 00:15:44,459

We also have the SLS that we're currently building.

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00:15:44,459 --> 00:15:50,269

That is the rocket that will take humans there, and we need a lot of equipment and support

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00:15:50,269 --> 00:15:51,899

capability to go there.

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00:15:51,899 --> 00:15:57,259

But, indeed, we also are going to continue to go on with our scientific experiments,

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00:15:57,259 --> 00:15:59,690

our scientific robots, if you will.

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00:15:59,690 --> 00:16:05,160

So, when humans are on Mars, they will not only be communicating with those orbiting

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00:16:05,160 --> 00:16:10,759

assets that we have there, but they'll have their pet rovers like Curiosity alongside

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00:16:10,759 --> 00:16:13,610

them making measurements as we go along.

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00:16:13,610 --> 00:16:20,769

And so, indeed, this is our future, and the evolution of a Martian starts from exploring

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00:16:20,769 --> 00:16:28,420

with our robotics and onto our human explorers.

211

00:16:28,420 --> 00:16:39,660

And so, with that, Todd?

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00:16:39,660 --> 00:16:40,699

Thank you, Jim.

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00:16:40,699 --> 00:16:42,480

Hey, I'll just tell you guys.

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00:16:42,480 --> 00:16:52,089

It is--I am so geeked out about being out here and being on this stage that--with Andy

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00:16:52,089 --> 00:16:57,690

Weir and the [unintelligible] the guys that wrote The Martian, and then Leonard Nemo's

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00:16:57,690 --> 00:16:59,249

son was just up here.

217

00:16:59,249 --> 00:17:01,819

You see my shirt?

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00:17:01,819 --> 00:17:03,589

It actually says turkey.

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00:17:03,589 --> 00:17:07,480

I thought it said trekkie when I bought it.

220

00:17:07,480 --> 00:17:12,089

So, you heard a lot about the robotic program.

221

00:17:12,089 --> 00:17:14,160

I'll humanize it a little bit for you.

222

00:17:14,160 --> 00:17:18,650

And then, of course, Victor's going to make it even more humanized for you.

223

00:17:18,650 --> 00:17:23,569

There's actually a little part in Andy's book, and I won't give away any details, but where

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00:17:23,569 --> 00:17:26,169

they say, "All over the Earth, they gathered."

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00:17:26,169 --> 00:17:30,289

There was an event, and people gathered all over the Earth.

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00:17:30,289 --> 00:17:36,779

This photograph was taken in Saigon shortly after Neil Armstrong and Buzz landed on the

227

00:17:36,779 --> 00:17:43,159

moon, and the reason I'm showing it, because I got a chance--I actually was sitting console

228

00:17:43,159 --> 00:17:47,070

for the Phoenix Lander mission back in a previous life.

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00:17:47,070 --> 00:17:51,909

And Buzz Aldrin spoke that night, and he talked about coming back from the Moon and getting

230

00:17:51,909 --> 00:17:54,059

papers from around the world that said, "We did it."

231

00:17:54,059 --> 00:17:55,980

It didn't say, "Buzz did it.

232

00:17:55,980 --> 00:17:56,980

Neil did it.

233

00:17:56,980 --> 00:17:57,980

The Americans did it."

234

00:17:57,980 --> 00:18:00,250

It said, "We, the human race."

235

00:18:00,250 --> 00:18:05,450

And again, without saying too much about the book, there's a theme in there about humankind

236

00:18:05,450 --> 00:18:08,020

and the human spirit.

237

00:18:08,020 --> 00:18:16,429

But, that was the Moon, and at some point here in the near future, if this clicker will

238

00:18:16,429 --> 00:18:22,940

work, click, click, there we go.

239

00:18:22,940 --> 00:18:24,860

We're going to see this on Mars.

240

00:18:24,860 --> 00:18:31,169

I love this picture because it was painted by a scientist friend of mine, Dr. Dan Durda

241

00:18:31,169 --> 00:18:34,940

from Southwest Research Institute, and he's a geologist.

242

00:18:34,940 --> 00:18:40,169

One of the things you will learn about Mark Watney, the hero of The Martian, is that he

243

00:18:40,169 --> 00:18:41,740

was a botanist.

244

00:18:41,740 --> 00:18:47,020

And so, the idea of a scientist, and exploration and science working together, you actually

245

00:18:47,020 --> 00:18:52,730

saw in that picture that Jim just showed the intertwining of technology, exploration, and

246

00:18:52,730 --> 00:18:54,659

science together.

247

00:18:54,659 --> 00:18:58,090

We used engineering and technology to make the machines.

248

00:18:58,090 --> 00:19:03,590

But, we use our scientific minds, like geology and scientists, to discover.

249

00:19:03,590 --> 00:19:10,539

It is great to work for a space agency, and the three of us do here, whose mission statement

250

00:19:10,539 --> 00:19:15,039

is to reach new heights and reveal the unknown so that what we do and learn can benefit all

251

00:19:15,039 --> 00:19:17,029

mankind.

252

00:19:17,029 --> 00:19:25,370

That is not--I guarantee you that's not what's over the door of the postal service.

253

00:19:25,370 --> 00:19:29,519

And so, this idea of what we do being for all of us here, for all of you, for all of

254

00:19:29,519 --> 00:19:33,919

us, and so, yes, we're going to Mars.

255

00:19:33,919 --> 00:19:38,670

I actually had an astronaut who said something to me a couple days ago.

256

00:19:38,670 --> 00:19:41,410

And he said it in front of a bunch of people, so I'll say it again.

257

00:19:41,410 --> 00:19:46,789

He says, "I was in the White House a few days, and the President said, 'We're going to Mars.'"

258

00:19:46,789 --> 00:19:56,210

That's a pretty cool thing to hear.

259

00:19:56,210 --> 00:19:57,620

And we are.

260

00:19:57,620 --> 00:20:03,220

And as Jim said, there's a whole bunch of things that work together to get us there.

261

00:20:03,220 --> 00:20:07,409

I'll talk about this chart slightly differently, and that is that the left side here is kind

262

00:20:07,409 --> 00:20:09,330

of Earth dependent.

263

00:20:09,330 --> 00:20:10,870

We have humans in orbit today.

264

00:20:10,870 --> 00:20:13,500

They've been up there for more than a decade.

265

00:20:13,500 --> 00:20:16,990

But, we're hours away from Earth if we need to get home.

266

00:20:16,990 --> 00:20:20,550

Mars, you're going to be months or over a year.

267

00:20:20,550 --> 00:20:21,550

You're going to be Earth independent.

268

00:20:21,550 --> 00:20:24,830

And that is a hard thing to do.

269

00:20:24,830 --> 00:20:28,870

And as you know from the book once you get there, it's also very hard to get home.

270

00:20:28,870 --> 00:20:34,100

But, in the middle ground in there is what we call the proving, where you're not quite

271

00:20:34,100 --> 00:20:36,620

Earth independent, but you're not quite Earth dependent.

272

00:20:36,620 --> 00:20:39,940

You're in an area where you could come back in days or weeks.

273

00:20:39,940 --> 00:20:44,850

And so, the SLS, when it first launches, it's going to be launching in cislunar space.

274

00:20:44,850 --> 00:20:46,549

The first time, we put humans on it.

275

00:20:46,549 --> 00:20:49,419

The second flight, we're actually going to set a distance record.

276

00:20:49,419 --> 00:20:53,490

We'll go out into deep retrograde orbit on the back side of the moon, and we'll be out

277

00:20:53,490 --> 00:20:56,059

in that proving ground area once again.

278

00:20:56,059 --> 00:20:59,870

And then from there, we put all those building blocks that Jim talked about together to get

279

00:20:59,870 --> 00:21:00,929

folks to Mars.

280

00:21:00,929 --> 00:21:07,059

But, if you're going to send a human to Mars, rovers are fairly needy.

281

00:21:07,059 --> 00:21:09,020

You know, they need a couple hundred watts of power.

282

00:21:09,020 --> 00:21:13,389

But, if we're going to send Victor and some of his friends to Mars for a long period of

283

00:21:13,389 --> 00:21:16,640

time, they need a lot of stuff.

284

00:21:16,640 --> 00:21:20,080

And if you're going to take a lot of stuff out into deep space and into Mars, you're

285

00:21:20,080 --> 00:21:23,710

going to need a large, capable ship to be able to get you out there.

286

00:21:23,710 --> 00:21:25,040

I literally left.

287

00:21:25,040 --> 00:21:29,899

We were in the middle of our final design review of the space launch system this week.

288

00:21:29,899 --> 00:21:33,610

I will chair a board in about a week and a half, and we will say, "We are go for design

289

00:21:33,610 --> 00:21:35,440

certification phase."

290

00:21:35,440 --> 00:21:38,470

We are building it as we speak today.

291

00:21:38,470 --> 00:21:49,820

The rocket you see before you has the brand-new Orion capsule,

292

00:21:49,820 --> 00:21:54,149

which you may have seen in December launched aboard Delta 4 to get a test flight under

293

00:21:54,149 --> 00:21:55,750

its belt.

294

00:21:55,750 --> 00:22:00,389

The boosters on the side look a lot like the solid rocket boosters from the shuttle program.

295

00:22:00,389 --> 00:22:02,470

They are, except they've got an extra segment.

296

00:22:02,470 --> 00:22:08,149

So, they've got about 25 percent more power, 3.5 million pounds of thrust coming out of

297

00:22:08,149 --> 00:22:09,530

those things.

298

00:22:09,530 --> 00:22:12,620

The engines on the bottom are the RS25 engines.

299

00:22:12,620 --> 00:22:16,500

They're essentially engines that actually have flown on the shuttle before.

300

00:22:16,500 --> 00:22:18,450

We have 16 of them in our fleet.

301

00:22:18,450 --> 00:22:20,080

They are proven engines.

302

00:22:20,080 --> 00:22:26,279

These things are Ferraris, 18--the equivalent of 18 Hoover Dams coming out of the bottom

303

00:22:26,279 --> 00:22:27,279

of that.

304

00:22:27,279 --> 00:22:30,580

They can empty a swimming pool in 25 seconds.

305

00:22:30,580 --> 00:22:35,389

They're made out of materials like monel and inconel that can go from cryogenic temperatures

306

00:22:35,389 --> 00:22:37,840

to 6,000 degree in half a second.

307

00:22:37,840 --> 00:22:42,789

We are actually starting to make these rocket parts now out of--of course, everybody's been

308

00:22:42,789 --> 00:22:44,240

hearing about 3D printing.

309

00:22:44,240 --> 00:22:46,299

We call it selective laser melting.

310

00:22:46,299 --> 00:22:50,929

We're actually--yeah, we have to put a NASA name on it.

311

00:22:50,929 --> 00:22:59,070

But, we are making rocket parts now on 3D printers, which is pretty amazing.

312

00:22:59,070 --> 00:23:03,331

That's part of what makes this thing more affordable than we've been in the past.

313

00:23:03,331 --> 00:23:07,269

The center you see there, the core, that's a 27 1/2 foot core.

314

00:23:07,269 --> 00:23:11,290

It's made with friction-stir welding machines down in Michoud.

315

00:23:11,290 --> 00:23:13,840

We have the world's largest friction-stir welder.

316

00:23:13,840 --> 00:23:19,490

It's over 200 feet tall, and it is accurate to within two ten-thousandths of an inch.

317

00:23:19,490 --> 00:23:22,970

We can pop these things out off of just six machines.

318

00:23:22,970 --> 00:23:25,590

We make the core structure.

319

00:23:25,590 --> 00:23:30,540

And then on top of that, you see the ICPS in between the Orion and that core stage.

320

00:23:30,540 --> 00:23:32,490

That's essentially a Delta 4 upper stage.

321

00:23:32,490 --> 00:23:37,620

By the time we get to the second launch, we may go ahead and put the upper stage on it.

322

00:23:37,620 --> 00:23:42,220

Once we do that, we're going to have a rocket that is more powerful than the Saturn V and

323

00:23:42,220 --> 00:23:55,600

can put 40 metric tons in the cislunar space.

324

00:23:55,600 --> 00:24:01,980

And since this is Comic Con, okay, there's a little shout out.

325

00:24:01,980 --> 00:24:07,380

Actually, though, what you need to know about this stuff, I've kind of hinted at it.

326

00:24:07,380 --> 00:24:09,179

This is real hardware.

327

00:24:09,179 --> 00:24:15,669

We have about 60 percent of the articles at Michoud, these big, giant pieces you see on

328

00:24:15,669 --> 00:24:18,070

the right of the core stage, the flight units.

329

00:24:18,070 --> 00:24:23,220

We have all the qualification units, all the Pathfinder units already built, all the rings,

330

00:24:23,220 --> 00:24:24,289

all the dome segments.

331

00:24:24,289 --> 00:24:28,500

As I said, this--we have 16 flight engines ready to go.

332

00:24:28,500 --> 00:24:34,870

On the left there, we've actually tested the new motor four times now, three development

333

00:24:34,870 --> 00:24:37,720

motor firings and one qualification motor firing.

334

00:24:37,720 --> 00:24:39,480

We've got one more qual motor firing.

335

00:24:39,480 --> 00:24:42,370

Then it's on to building the flight unit.

336

00:24:42,370 --> 00:24:45,830

And so, I'm going to show you a quick video here real--and get you a little excited about

337

00:24:45,830 --> 00:24:59,230

this thing.

338

00:24:59,230 --> 00:25:52,509

And then I'm out.

339

00:25:52,509 --> 00:26:22,700

[Video Presentation]

It's actually louder than that in person,

340

00:26:22,700 --> 00:26:23,700

I imagine.

341

00:26:23,700 --> 00:26:24,700

It is.

342

00:26:24,700 --> 00:26:25,700

We like our smoke and fire.

343

00:26:25,700 --> 00:26:31,259

So, I will say that Andy's book kind of starts, you know, and you've already got him on Mars.

344

00:26:31,259 --> 00:26:34,520

And if you've ever read Failure Is Not an Option, it's kind of the first chapter's like,

345

00:26:34,520 --> 00:26:36,019

and then one day a rocket appears.

346

00:26:36,019 --> 00:26:37,570

And then the hard stuff begins.

347

00:26:37,570 --> 00:26:42,460

I want to let you guys know there are folks, thousands of people in 46 states around this

348

00:26:42,460 --> 00:26:45,500

country that are assembling this rocket today.

349

00:26:45,500 --> 00:26:48,940

And they have their pocket protectors, and they have their calculators.

350

00:26:48,940 --> 00:26:51,059

And they're checking it twice.

351

00:26:51,059 --> 00:26:53,820

And we're getting this rocket ready for Victor.

352

00:26:53,820 --> 00:27:00,720

With that, I'll hand it off.

353

00:27:00,720 --> 00:27:06,080

So, Victor, I want to ask the most important

question.

354

00:27:06,080 --> 00:27:08,630

Are you going to be the first man on Mars?

355

00:27:08,630 --> 00:27:11,100

I sure hope so.

356

00:27:11,100 --> 00:27:13,159

Seriously, get your photos now.

357

00:27:13,159 --> 00:27:17,950

This is like a Babe Ruth rookie card.

358

00:27:17,950 --> 00:27:24,650

Well, tell us a little bit about, you know, about the astronaut training.

359

00:27:24,650 --> 00:27:30,309

And how do you even prepare for going a place that no one has ever gone before, to coin

360

00:27:30,309 --> 00:27:31,309

a phrase.

361

00:27:31,309 --> 00:27:39,090

First of all, can we give a shout out to the sound guy, because that was--and I'm going

362

00:27:39,090 --> 00:27:44,429

to answer your question and get to the astronaut training stuff.

363

00:27:44,429 --> 00:27:46,440

But, I mean how amazing is it?

364

00:27:46,440 --> 00:27:48,490

We're in one of the most beautiful cities in America.

365

00:27:48,490 --> 00:27:49,860

The weather is great.

366

00:27:49,860 --> 00:27:51,230

But, we're in here.

367

00:27:51,230 --> 00:27:52,730

The room is packed.

368

00:27:52,730 --> 00:27:56,890

Fred Flintstone is here.

369

00:27:56,890 --> 00:28:00,519

And I'm sure there's a Ninja Turtle out there somewhere too.

370

00:28:00,519 --> 00:28:02,390

And we're here talking about going to Mars.

371

00:28:02,390 --> 00:28:03,750

I mean that--it's amazing.

372

00:28:03,750 --> 00:28:04,750

That's amazing.

373

00:28:04,750 --> 00:28:05,750

And so--.

374

00:28:05,750 --> 00:28:07,860

--Fred's excited about that--.

375

00:28:07,860 --> 00:28:09,809

--And Fred is happy.

376

00:28:09,809 --> 00:28:10,809

Fred's worked up.

377

00:28:10,809 --> 00:28:11,809

Yabba dabba doo.

378

00:28:11,809 --> 00:28:12,809

It's--this is amazing.

379

00:28:12,809 --> 00:28:14,340

It's great to be here.

380

00:28:14,340 --> 00:28:18,710

And, you know, I haven't been with NASA that long.

381

00:28:18,710 --> 00:28:19,960

Next month will be two years.

382

00:28:19,960 --> 00:28:22,640

So, we just finished astronaut candidate training.

383

00:28:22,640 --> 00:28:27,190

Actually, yesterday our class, the eight of us, the 2013 astronaut candidate class was

384

00:28:27,190 --> 00:28:29,570

officially pinned astronauts.

385

00:28:29,570 --> 00:28:32,760

And so, we have eight new astronauts on Team America.

386

00:28:32,760 --> 00:28:39,820

And, yes, yeah, that's pretty neat.

387

00:28:39,820 --> 00:28:48,470

And just today, they announced the names of the first astronauts to fly on the commercial

388

00:28:48,470 --> 00:28:49,600

crew vehicles.

389

00:28:49,600 --> 00:28:53,519

And that's very important, bringing the launch capability back to American soil, getting

390

00:28:53,519 --> 00:28:59,490

astronauts to the Space Station.

391

00:28:59,490 --> 00:29:03,240

All amazing things, and we're doing all of this stuff.

392

00:29:03,240 --> 00:29:08,150

And then Todd's going to get us out beyond lower Earth orbit.

393

00:29:08,150 --> 00:29:09,649

And those missions fit together.

394

00:29:09,649 --> 00:29:14,120

They work together, all towards getting us going to Mars.

395

00:29:14,120 --> 00:29:21,930

What we do is train to work and live in space, whether it's in low-Earth orbit or on the

396

00:29:21,930 --> 00:29:26,559

way to the Moon to test out the system, that proving ground that's going to get us--we

397

00:29:26,559 --> 00:29:29,720

got to go halfway to Mars before we go all the way to Mars.

398

00:29:29,720 --> 00:29:34,100

And so, our job is to get good at working and living in space.

399

00:29:34,100 --> 00:29:39,100

And, you know, it's amazing that living on the Space Station for over a decade, you know,

400

00:29:39,100 --> 00:29:41,680

it's been manned for 15 years, and we're still learning things.

401

00:29:41,680 --> 00:29:44,860

And we will until that system is no longer in use.

402

00:29:44,860 --> 00:29:47,900

We're learning to use it more effectively as a national laboratory.

403

00:29:47,900 --> 00:29:50,220

The science that's going on up there is invaluable.

404

00:29:50,220 --> 00:29:52,720

We're learning things about basic physics.

405

00:29:52,720 --> 00:29:57,379

You know, water droplets form differently up there, and mist behaves differently up

406

00:30:01,090 --> 00:29:58,379

there.

407

00:30:01,090 --> 00:30:04,289

And we're learning things about basic elements, things that we take for granted, watching

408

00:30:04,289 --> 00:30:05,820

a fire burn here on Earth.

409

00:30:05,820 --> 00:30:12,500

And so, learning to use that system more effectively is feeding into our ability to develop systems

410

00:30:12,500 --> 00:30:17,190

and to understand the effects of long-duration space flight on the human body.

411

00:30:17,190 --> 00:30:22,490

And that's probably the most important thing because you ask these smart guys to my right

412

00:30:22,490 --> 00:30:24,870

and this smart guy to my left, he understands it as well.

413

00:30:24,870 --> 00:30:25,870

The weak link in the chain is us.

414

00:30:25,870 --> 00:30:28,880

We are the hard thing to get to Mars.

415

00:30:28,880 --> 00:30:32,940

We're already there with robots, with instruments in space.

416

00:30:32,940 --> 00:30:34,680

But, to put us there is a challenge.

417

00:30:34,680 --> 00:30:35,680

And we understand that.

418

00:30:35,680 --> 00:30:39,250

And there's a lot we have to learn about how we can get us there.

419

00:30:39,250 --> 00:30:44,759

And so, you know, we have a very unique office.

420

00:30:44,759 --> 00:30:46,910

We've got folks from all different kinds of backgrounds.

421

00:30:46,910 --> 00:30:48,700

I'm a military pilot.

422

00:30:48,700 --> 00:30:52,659

I was officemates with this really amazing engineer that every time I speak to him, it

423

00:30:52,659 --> 00:30:56,870

makes me want to go home and pick up my calculus book and study.

424

00:30:56,870 --> 00:31:00,520

And every time I have a conversation with him, I walk away from it, and I close the

425

00:31:00,520 --> 00:31:01,520

door.

426

00:31:01,520 --> 00:31:05,179

And I just go, man, I just had a conversation where the guy says, "You know that one time

427

00:31:05,179 --> 00:31:06,179

I was in space."

428

00:31:06,179 --> 00:31:08,509

He's one of the smartest guys that I know.

429

00:31:08,509 --> 00:31:13,690

And it's amazing that we're talking about working and living in space.

430

00:31:13,690 --> 00:31:17,380

And it wasn't until I showed up at NASA that I realized that we've done that.

431

00:31:17,380 --> 00:31:18,830

We've done that for over a decade.

432

00:31:18,830 --> 00:31:19,830

We lived there.

433

00:31:19,830 --> 00:31:20,830

We are out there.

434

00:31:20,830 --> 00:31:24,710

And it's--you know, Mark Kelly is up there right now on that one-year mission, helping

435

00:31:24,710 --> 00:31:27,780

us get better at living and working in space.

436

00:31:27,780 --> 00:31:28,780

And it's amazing.

437

00:31:28,780 --> 00:31:31,080

And we'll talk some more about those things in detail.

438

00:31:31,080 --> 00:31:32,700

But, you know, it's just amazing.

439

00:31:32,700 --> 00:31:33,700

And I'm new.

440

00:31:33,700 --> 00:31:35,990

So, this is still cool to me.

441

00:31:35,990 --> 00:31:43,259

I can't believe I'm actually really sitting here talking to you about flying in space.

442

00:31:43,259 --> 00:31:46,279

It's amazing.

443

00:31:46,279 --> 00:31:54,490

All right, Andy, first of all, congratulations on the success of the book, by the way, the

444

00:31:54,490 --> 00:31:58,519

number one New York Times bestseller last week.

445

00:31:58,519 --> 00:31:59,519

Yep.

446

00:31:59,519 --> 00:32:01,139

Thank you.

447

00:32:01,139 --> 00:32:04,639

Thank you very much.

448

00:32:04,639 --> 00:32:06,999

I don't know how many--how many of you guys have read the book?

449

00:32:06,999 --> 00:32:07,999

Come on.

450

00:32:07,999 --> 00:32:08,999

All right.

451

00:32:08,999 --> 00:32:13,929

How many of you guys are going to read the book after this panel?

452

00:32:13,929 --> 00:32:15,559

I don't know how much you know about--.

453

00:32:15,559 --> 00:32:16,749

--I see some sales there.

454

00:32:16,749 --> 00:32:17,749

Huh?

455

00:32:17,749 --> 00:32:18,749

I see some sales there.

456

00:32:18,749 --> 00:32:20,559

It's looking good.

457

00:32:20,559 --> 00:32:23,630

I don't know how much you know about the story behind the book.

458

00:32:23,630 --> 00:32:30,039

But, I will tell you it is almost or maybe even more exciting that Mark Watney's journey

459

00:32:30,039 --> 00:32:34,289

of how, Andy, how you took--I mean why don't you tell us a little bit about how this all

460

00:32:34,289 --> 00:32:35,289

came about?

461

00:32:35,289 --> 00:32:36,289

All right.

462

00:32:36,289 --> 00:32:37,480

Well, these are a pretty tough act to follow here.

463

00:32:37,480 --> 00:32:47,059

We've got, like, makes blockbuster movies, makes space probes, makes rockets, flies rockets.

464

00:32:47,059 --> 00:32:50,879

Sometimes I put pants on during the day to write.

465

00:32:50,879 --> 00:32:52,749

Sometimes, no.

466

00:32:52,749 --> 00:33:01,210

So, yeah, I'm glad I could follow you four.

467

00:33:01,210 --> 00:33:06,330

The story behind the story on The Martian is kind of, you know, as Aditya says, a story

468

00:33:06,330 --> 00:33:08,600

in itself.

469

00:33:08,600 --> 00:33:13,700

I always wanted to be a writer ever since I was a kid, but I also like eating regular

470

00:33:13,700 --> 00:33:16,070

meals, and I don't want to live under an overpass.

471

00:33:16,070 --> 00:33:20,070

So, when the time came to choose a profession, I ended up being a computer programmer, which

472

00:33:20,070 --> 00:33:24,320

I like and I was good at, well, eventually.

473

00:33:24,320 --> 00:33:28,730

And to give you an indication of how long I was programming computers, I was one of

474

00:33:28,730 --> 00:33:34,419

the programmers on Warcraft II.

475

00:33:34,419 --> 00:33:38,980

That's a long time ago.

476

00:33:38,980 --> 00:33:43,700

As time went on, I did get--at one point, I worked for AOL.

477

00:33:43,700 --> 00:33:50,700

And I got laid off, and along with 800 of my closest friends when they merged with Netscape,

478

00:33:50,700 --> 00:33:54,620

once again revealing how old I am.

479

00:33:54,620 --> 00:33:59,669

And it ended up being a really good severance package because I had stock options, and I

480

00:33:59,669 --> 00:34:01,710

was forced to sell them because I'd been laid off.

481

00:34:01,710 --> 00:34:03,540

I had something like 60 days to sell them.

482

00:34:03,540 --> 00:34:05,210

So, I just sold them.

483

00:34:05,210 --> 00:34:09,100

And that turned out to be AOL's all-time high stock price.

484

00:34:09,100 --> 00:34:13,870

So, I assure you I would not have made a wise financial decision left to my own devices.

485

00:34:13,870 --> 00:34:15,780

But, events conspired.

486

00:34:15,780 --> 00:34:17,379

So, I had some money.

487

00:34:17,379 --> 00:34:20,870

And I said, "Like, oh, I'm going to spend--I'm going to take my shot.

488

00:34:20,870 --> 00:34:22,710

I'm going to try to be a full-time author."

489

00:34:22,710 --> 00:34:23,710

Okay.

490

00:34:23,710 --> 00:34:28,760

So, I took three years off, or rather just didn't go look for another job for three years,

491

00:34:28,760 --> 00:34:30,730

and I wrote a book.

492

00:34:30,730 --> 00:34:36,110

And that book is not The Martian.

493

00:34:36,110 --> 00:34:40,429

And it's the standard story for authors, couldn't get an agent, couldn't get any publishers

494

00:34:40,429 --> 00:34:41,919

interested, wasn't that great a book.

495

00:34:41,919 --> 00:34:43,419

It was actually my second book.

496

00:34:43,419 --> 00:34:45,470

My first book really sucked.

497

00:34:45,470 --> 00:34:48,790

That was--I wrote that in college before the days of the Internet.

498

00:34:48,790 --> 00:34:53,169

So, it doesn't exist out in the digital realm, thank God.

499

00:34:53,169 --> 00:35:00,210

But, anyway, so, after three years, I went

back to work as a software engineer.

500

00:35:00,210 --> 00:35:03,970

That wasn't a big failure for me because I liked doing it.

501

00:35:03,970 --> 00:35:06,210

And I decided I'll do writing as a hobby.

502

00:35:06,210 --> 00:35:08,620

The Internet was just starting to come into its own.

503

00:35:08,620 --> 00:35:09,710

People could have their own Web sites.

504

00:35:09,710 --> 00:35:12,690

And I thought, okay, here's an avenue where I can write.

505

00:35:12,690 --> 00:35:13,690

I can have an audience.

506

00:35:13,690 --> 00:35:15,740

And I don't need to get published or anything.

507

00:35:15,740 --> 00:35:17,560

I mean it's not going to be a profession.

508

00:35:17,560 --> 00:35:18,560

But, it'll be a hobby.

509

00:35:18,560 --> 00:35:22,320

So, I spent the next 10 years writing.

510

00:35:22,320 --> 00:35:25,060

I made a Web comic called "Casey and Andy".

511

00:35:25,060 --> 00:35:27,540

I made another Web comic called "Cheshire Crossing".

512

00:35:27,540 --> 00:35:30,950

And then I made a whole bunch of narrative short fiction.

513

00:35:30,950 --> 00:35:35,690

I made one short story called "The Egg" that a lot of you may have heard of.

514

00:35:35,690 --> 00:35:42,470

Dead silence, okay, so, I did make a story called "The Egg."

515

00:35:42,470 --> 00:35:48,560

And I also was writing three different serials at the same time, where I would just post

516

00:35:48,560 --> 00:35:50,930

chapters to my Web site one at a time.

517

00:35:50,930 --> 00:35:58,869

One of them was about a mermaid living in the 19th century in New England.

518

00:35:58,869 --> 00:36:03,910

Another one is--was like hardcore sci-fi about aliens and telepaths and stuff like that.

519

00:36:03,910 --> 00:36:05,559

And the third one was The Martian.

520

00:36:05,559 --> 00:36:11,250

So, I was posting The Martian chapter by chapter to my Web site when I felt like it.

521

00:36:11,250 --> 00:36:12,740

I got feedback from my readers.

522

00:36:12,740 --> 00:36:17,160

I had about 3,000 regular readers at that time, based on the size of my mailing list,

523

00:36:17,160 --> 00:36:19,819

and they're all hardcore nerds like me.

524

00:36:19,819 --> 00:36:23,920

And so, they would--whenever there was anything wrong in the book, anything scientifically

525

00:36:23,920 --> 00:36:29,130

inaccurate, they would be like, excuse me.

526

00:36:29,130 --> 00:36:32,490

So, I called them beta readers because they would find all the bugs.

527

00:36:32,490 --> 00:36:33,609

And it was great.

528

00:36:33,609 --> 00:36:37,990

I could go back and fix things, and also getting all the feedback helped really motivate me

529

00:36:37,990 --> 00:36:39,140

to finish it up.

530

00:36:39,140 --> 00:36:43,550

So, when I finished, I figured like, okay, I'm done, no big deal.

531

00:36:43,550 --> 00:36:44,580

I've finished this book.

532

00:36:44,580 --> 00:36:46,850

Now I'm going to go work on my other serials.

533

00:36:46,850 --> 00:36:51,640

And I started to get e-mail from people saying,
"Hey, I loved your--I loved The Martian.

534

00:36:51,640 --> 00:36:55,760

But, I hate reading it on your Web site,"
which is reasonable because my Web site sucks,

535

00:36:55,760 --> 00:36:59,020

"And can you make an e-reader version?"

536

00:36:59,020 --> 00:37:00,200

So, I went ahead and did that.

537

00:37:00,200 --> 00:37:04,030

I made an e-reader version, and I posted it
to my site and said, "There you go.

538

00:37:04,030 --> 00:37:06,200

There's an e-pub version and a mobi version.

539

00:37:06,200 --> 00:37:08,200

Every e-reader reads at least one of those.

540

00:37:08,200 --> 00:37:09,410

Knock yourselves out."

541

00:37:09,410 --> 00:37:10,630

Then I got other e-mails.

542

00:37:10,630 --> 00:37:14,770

"Andy, I love that there is an e-reader version
available.

543

00:37:14,770 --> 00:37:17,070

But, I'm not very technically savvy.

544

00:37:17,070 --> 00:37:21,450

And I just don't know how to download a thing from the Internet and put it on my e-reader.

545

00:37:21,450 --> 00:37:23,510

Can you just put it up on Kindle?"

546

00:37:23,510 --> 00:37:25,760

So, I figured out how to do that.

547

00:37:25,760 --> 00:37:26,760

It's pretty easy.

548

00:37:26,760 --> 00:37:29,540

You just go to Kindle Direct Publishing.

549

00:37:29,540 --> 00:37:31,710

KDP is what I used.

550

00:37:31,710 --> 00:37:32,970

You can post it up there.

551

00:37:32,970 --> 00:37:36,320

They hold onto it for 24 hours just to have a human look at it to make sure you're not

552

00:37:36,320 --> 00:37:39,369

posting a bunch of goat porn.

553

00:37:39,369 --> 00:37:42,580

But, don't judge.

554

00:37:42,580 --> 00:37:44,130

Don't judge.

555

00:37:44,130 --> 00:37:52,170

Anyway, once you--once it gets out there, then, you know, then it's for sale.

556

00:37:52,170 --> 00:37:53,390

You're not allowed to give it away for free, though.

557

00:37:53,390 --> 00:37:55,619

You have to charge at least 99 cents.

558

00:37:55,619 --> 00:37:56,960

They want to make their money.

559

00:37:56,960 --> 00:37:59,780

So, they get the lion's share of the price.

560

00:37:59,780 --> 00:38:02,170

I set it to 99 cents, the absolute minimum.

561

00:38:02,170 --> 00:38:04,310

I wanted to give it away for free, right?

562

00:38:04,310 --> 00:38:08,200

And so, I was pulling down a cool 30 cents a copy.

563

00:38:08,200 --> 00:38:10,000

Yeah, you know it.

564

00:38:10,000 --> 00:38:11,920

It got around.

565

00:38:11,920 --> 00:38:13,359

It got really good reviews.

566

00:38:13,359 --> 00:38:14,960

People gave it good reviews.

567

00:38:14,960 --> 00:38:18,490

It started working its way up to the--into the top sellers lists.

568

00:38:18,490 --> 00:38:23,500

It made it up to number one in sci-fi, number one in a few different categories.

569

00:38:23,500 --> 00:38:28,310

And that got the attention of Crown Publishing, which is an in-print of Random House.

570

00:38:28,310 --> 00:38:32,900

And there's an editor at Crown named Julian Pavia, and he was thinking about reading it.

571

00:38:32,900 --> 00:38:33,900

He wasn't sure.

572

00:38:33,900 --> 00:38:37,100

And he was talking to a colleague of his named David Fugate.

573

00:38:37,100 --> 00:38:40,541

And Julian said, "Like, well, I don't know if I should bother reading it."

574

00:38:40,541 --> 00:38:41,541

You know, he's an editor.

575

00:38:41,541 --> 00:38:43,210

He's got to read a billion books all the time.

576

00:38:43,210 --> 00:38:45,160

And so, he's like, "I don't know if I should read this."

577

00:38:45,160 --> 00:38:48,480

It seems popular, but at the same time, it might just be kind of engineering porn.

578

00:38:48,480 --> 00:38:49,680

I don't know."

579

00:38:49,680 --> 00:38:51,900

And so, he said, "David, what do you think?"

580

00:38:51,900 --> 00:38:54,870

And David said, "Well, I'll read it, and I'll let you know."

581

00:38:54,870 --> 00:38:55,940

So, David read it.

582

00:38:55,940 --> 00:38:56,940

He liked it.

583

00:38:56,940 --> 00:38:58,660

And he said, "Yes, Julian, you should read it."

584

00:38:58,660 --> 00:39:00,730

Andy, do you need an agent?"

585

00:39:00,730 --> 00:39:05,400

And so, I said, "You know, after three years of not being able to get an agent, one comes

586

00:39:05,400 --> 00:39:06,440

knocking on my door."

587

00:39:06,440 --> 00:39:09,190

And so, I'm like, "Yes."

588

00:39:09,190 --> 00:39:11,280

And then so, he became my agent.

589

00:39:11,280 --> 00:39:13,480

And then he turned around and said, "Hey, Julian, how much are you going to give us

590

00:39:13,480 --> 00:39:15,550
for that book?"

591
00:39:15,550 --> 00:39:18,530
So, that was cool.

592
00:39:18,530 --> 00:39:21,010
And then--so, then we had a book deal going
on.

593
00:39:21,010 --> 00:39:23,349
You know, they were negotiating the book deal.

594
00:39:23,349 --> 00:39:25,990
And then, Fox came for the movie rights.

595
00:39:25,990 --> 00:39:28,760
Well, actually, he's not Fox.

596
00:39:28,760 --> 00:39:30,970
He's Simon Kinberg Productions.

597
00:39:30,970 --> 00:39:33,880
But, Fox came for the movie rights right around
this same time.

598
00:39:33,880 --> 00:39:35,840
And I'm like, "Oh, talk to my agent."

599
00:39:35,840 --> 00:39:40,420
And so, these negotiations were going on at
the same time.

600
00:39:40,420 --> 00:39:43,220
The movie rights deal and the book deal were
going on at the same time.

601
00:39:43,220 --> 00:39:45,730
Meanwhile, I'm still working as a software

engineer.

602

00:39:45,730 --> 00:39:50,990

So, I'm in my cubicle, fixing bugs, then stepping away to take a call about my movie deal, and

603

00:39:50,990 --> 00:39:54,840

then coming back to my cubicle, finish up that bug.

604

00:39:54,840 --> 00:39:57,830

It was a very surreal time.

605

00:39:57,830 --> 00:40:03,500

And in the end, the print deal and the film deal were agreed upon four days apart.

606

00:40:03,500 --> 00:40:06,829

So, that was quite a week for me.

607

00:40:06,829 --> 00:40:12,859

So, then it was just really interesting to be a spectator in the whole movie making process.

608

00:40:12,859 --> 00:40:14,410

The book went great.

609

00:40:14,410 --> 00:40:16,349

You know, it got released.

610

00:40:16,349 --> 00:40:19,130

It made it to the New York Times best seller list.

611

00:40:19,130 --> 00:40:23,970

And then later on--thank you, thank you, woo person.

612

00:40:23,970 --> 00:40:27,609

Then when the paperback came out, it made another appearance on the list.

613

00:40:27,609 --> 00:40:30,930

When that trailer came out, that's when it bumped it up to number one.

614

00:40:30,930 --> 00:40:31,930

Thank you.

615

00:40:31,930 --> 00:40:34,950

That's what 10 million people seeing a trailer will do.

616

00:40:34,950 --> 00:40:36,000

Yeah, that's it.

617

00:40:36,000 --> 00:40:39,869

It turns out there's sort of a correlation between a movie being made of your book and

618

00:40:39,869 --> 00:40:41,630

increased sales.

619

00:40:41,630 --> 00:40:46,260

So, then--but, it's interesting.

620

00:40:46,260 --> 00:40:52,180

When they first come for your book, movie studios buy film options like breath mints.

621

00:40:52,180 --> 00:40:56,500

I mean they will buy hundreds of film options for every movie that actually gets made.

622

00:40:56,500 --> 00:41:00,031

So, at the time they came for the movie rights, it wasn't like, oh, wow, this is going to

623

00:41:00,031 --> 00:41:01,031

be a movie.

624

00:41:01,031 --> 00:41:05,380

It's like, eh, we want to make sure nobody else can buy it.

625

00:41:05,380 --> 00:41:08,510

And then bit by bit, it just kept getting more and more likely.

626

00:41:08,510 --> 00:41:10,140

There's no point where you pop the champagne.

627

00:41:10,140 --> 00:41:17,990

It was just like, oh, okay, we have Drew Goddard, who is, you know, a big-time Hollywood writer.

628

00:41:17,990 --> 00:41:19,359

He wrote Clover Field.

629

00:41:19,359 --> 00:41:20,890

He directed Cabin in the Woods.

630

00:41:20,890 --> 00:41:23,030

He wrote a bunch of episodes of Buffy and Lost.

631

00:41:23,030 --> 00:41:24,500

He's a big name.

632

00:41:24,500 --> 00:41:26,290

He was going to write and direct it.

633

00:41:26,290 --> 00:41:28,230

So, he wrote the screenplay.

634

00:41:28,230 --> 00:41:32,580

And then, he was set to direct, but then he

got offered the director's chair for the next

635

00:41:32,580 --> 00:41:33,580

Spiderman movie.

636

00:41:33,580 --> 00:41:35,460

So, he left to do that.

637

00:41:35,460 --> 00:41:38,869

So--and then, right around the same time,
Matt Damon took an interest in playing the

638

00:41:38,869 --> 00:41:39,869

lead.

639

00:41:39,869 --> 00:41:42,249

And the studio is like, "That's interesting.

640

00:41:42,249 --> 00:41:43,650

That's something we care about.

641

00:41:43,650 --> 00:41:45,549

That's good to know.

642

00:41:45,549 --> 00:41:46,549

We want to know that."

643

00:41:46,549 --> 00:41:48,280

Now they have a star, but no director.

644

00:41:48,280 --> 00:41:50,650

And then Ridley Scott came in and said he'd
direct.

645

00:41:50,650 --> 00:41:53,650

And the studio is like, "That's interesting."

646

00:41:53,650 --> 00:41:56,250

So, that really made them stand up and take notice.

647

00:41:56,250 --> 00:41:58,400

And then, things just started falling into place.

648

00:41:58,400 --> 00:42:01,000

And Aditya can tell you kind of some of the background there.

649

00:42:01,000 --> 00:42:05,109

But, it's my understanding a lot of stars worked for less than they would normally do

650

00:42:05,109 --> 00:42:07,619

because they just wanted to be part of the project.

651

00:42:07,619 --> 00:42:10,160

So, we got this unbelievable cast.

652

00:42:10,160 --> 00:42:14,390

And I'm just sitting there going, "I don't know what the hell I did right.

653

00:42:14,390 --> 00:42:16,569

But, I'm glad.

654

00:42:16,569 --> 00:42:17,569

Don't poke it.

655

00:42:17,569 --> 00:42:19,380

I don't know what's going to--."

656

00:42:19,380 --> 00:42:21,250

I'll be really honest.

657

00:42:21,250 --> 00:42:24,960

I mean the speed at which this came together is pretty unprecedented.

658

00:42:24,960 --> 00:42:30,030

And, you know, and you, Andy, as a first-time novelist and this is the first movie deal

659

00:42:30,030 --> 00:42:33,640

he had, and so, every step of the way, I didn't want to get him too excited.

660

00:42:33,640 --> 00:42:36,250

But, it was actually kind of incredible what was going on.

661

00:42:36,250 --> 00:42:39,830

So, I would always downplay it with Andy a little bit.

662

00:42:39,830 --> 00:42:41,359

And Andy is such a rational guy.

663

00:42:41,359 --> 00:42:45,930

He was like, "Well, let me just figure out the percentage chance of this actually being

664

00:42:45,930 --> 00:42:46,930

a real thing."

665

00:42:46,930 --> 00:42:50,190

And the next thing you know, you know, we have this incredible cast, this incredible

666

00:42:50,190 --> 00:42:53,400

filmmaker, Ridley Scott, and hopefully a really great movie.

667

00:42:53,400 --> 00:42:54,470

Yeah, we'll see.

668

00:42:54,470 --> 00:42:56,599

Speaking of which, I have something else to show.

669

00:42:56,599 --> 00:43:01,240

I don't know if you guys were interested in--.

670

00:43:01,240 --> 00:43:04,430

[Music]

671

00:43:04,430 --> 00:43:23,970

I don't even know which language that is?

672

00:43:23,970 --> 00:43:24,970

That Armenian?

673

00:43:24,970 --> 00:43:25,970

Ah ***** me.

674

00:43:25,970 --> 00:43:27,670

Ok, that's gotta go in there.

675

00:43:27,670 --> 00:43:36,119

Hi kids this is Marc Watney, astronaut I were about six hours before I launch on the Hermes

676

00:43:36,119 --> 00:43:47,950

and I've been asked by the good folks at NASA to introduce you to some are crewmates.

677

00:43:47,950 --> 00:43:53,600

Here I which I'm happy to do so, hello earthlings
Marc Watney here I'm your personal guide

678

00:43:53,600 --> 00:43:55,600

on this tour up the Hermes.

679

00:43:55,600 --> 00:43:57,430

***** Astronaut I can do...

680

00:43:57,430 --> 00:43:58,430

[laughter]

681

00:43:58,430 --> 00:44:00,420

We still rolling...

682

00:44:00,420 --> 00:44:09,230

This is pilot Rick Martinez doing the pre-flight checks as you can see he's using some pretty

683

00:44:09,230 --> 00:44:11,390

sophisticated math to get us to Mars.

684

00:44:11,390 --> 00:44:13,640

You got enough fingers there Rick?

685

00:44:13,640 --> 00:44:15,130

Just balancing my checkbook.

686

00:44:15,130 --> 00:44:18,440

Hi there, I am commander Melissa Lewis.

687

00:44:18,440 --> 00:44:20,819

Doctor Chris Beck flight surgeon.

688

00:44:20,819 --> 00:44:22,900

My name is Alex Vogel.

689

00:44:22,900 --> 00:44:25,480

I'm a German astronaut.

690

00:44:25,480 --> 00:44:29,349

I'm Beth Johanssen, the computer expert.

691

00:44:29,349 --> 00:44:30,640

That's it?

692

00:44:30,640 --> 00:44:33,869

***** siked about going to Mars.

693

00:44:33,869 --> 00:44:36,200

Nice that's a hell of an answer, to the entire world

694

00:44:36,200 --> 00:44:39,990

Gentleman, why don't you tell the viewers what's cooking?

695

00:44:39,990 --> 00:44:40,990

Yoke.

696

00:44:40,990 --> 00:44:42,280

Something, chewy.

697

00:44:42,280 --> 00:44:45,339

And you Herr Vogal

698

00:44:45,339 --> 00:44:46,339

Sausage?

699

00:44:46,339 --> 00:44:47,339

German?

700

00:44:47,339 --> 00:44:48,339

Awesome.

701

00:44:48,339 --> 00:44:58,190

Hello commander big year ahead maybe you could tell us what inspired you to take it all.

702

00:44:58,190 --> 00:44:59,190

Sure.

703

00:44:59,190 --> 00:45:03,420

Laura Clark, Christa McAuliffe and of course
Eileen Collins.

704

00:45:03,420 --> 00:45:10,250

And you're not going to get a better answer
than that.

705

00:45:10,250 --> 00:45:13,540

Seriously Rick how do we get there?

706

00:45:13,540 --> 00:45:15,720

Well you basically point the bird in that
direction you wait 150 days, 36 million miles

707

00:45:15,720 --> 00:45:18,300

later should be at Mars.

708

00:45:18,300 --> 00:45:20,470

Oh wait.

709

00:45:20,470 --> 00:45:22,650

That's Uranus.

710

00:45:22,650 --> 00:45:24,460

Okay, that's Mars.

711

00:45:24,460 --> 00:45:26,819

Hey, Hey don't believe a word they say.

712

00:45:26,819 --> 00:45:27,819

You're one of the good ones.

713

00:45:27,819 --> 00:45:28,819

Thanks.

714

00:45:28,819 --> 00:45:29,819

Wait who says that about me?

715

00:45:29,819 --> 00:45:30,819

This isn't over you and me, we're going to talk later.

716

00:45:30,819 --> 00:45:42,030

Alright, everyone just a few minutes now before we leave from Mars.

717

00:45:42,030 --> 00:45:50,180

I hope you enjoyed your tour the Hermes and see what a stellar crew we have say goodbye

718

00:45:52,180 --> 00:45:51,180

crew.

719

00:45:52,180 --> 00:45:53,180

Everyone's a comedian.

720

00:45:53,180 --> 00:45:54,510

Alright, we want to say goodbye.

721

00:45:54,510 --> 00:46:00,369

We want to wish everybody here on Earth an amazing year while we're gone.

722

00:46:00,369 --> 00:46:01,579

Let's go cubs.

723

00:46:01,579 --> 00:46:05,869

Actually how about holding off on winning that world title till I'm back on earth.

724

00:46:05,869 --> 00:46:06,869

That shouldn't be a problem.

725

00:46:06,869 --> 00:46:09,069

Shut up Martinez is a Yankee fan.

726

00:46:09,069 --> 00:46:16,110

Anyway I will have a wonderful year
I just remember what we do up there were doing

727

00:46:16,110 --> 00:46:20,230
for everyone here on Earth it's going to be
an amazing journey for all of us we're all

728

00:46:20,230 --> 00:46:21,230
in this together.

729

00:46:21,230 --> 00:46:22,230
Mom, dad, love you.

730

00:46:22,230 --> 00:46:34,460
I miss you and first thing we do when we get
back is go to Gino's for some deep dish.

731

00:46:34,460 --> 00:46:37,060
Watney out.

732

00:46:37,060 --> 00:46:46,520
All right, guys, I think we have time for
a couple of questions, if--I don't know who

733

00:46:46,520 --> 00:46:48,559
has the mic, if anyone has any questions.

734

00:46:48,559 --> 00:46:51,380
Yeah, come to the mics in the center of the
room.

735

00:46:51,380 --> 00:46:52,380
Mad dash.

736

00:46:52,380 --> 00:46:53,380
Hi, guys.

737

00:46:53,380 --> 00:46:58,170
My name is Amanda [sp].

738

00:46:58,170 --> 00:46:59,309

I am a big fan of all of you guys.

739

00:46:59,309 --> 00:47:08,050

I initially wanted to be you guys when I grew up, discovered I was bad at math, and then

740

00:47:08,050 --> 00:47:13,030

now want to be Andy when I grow up.

741

00:47:13,030 --> 00:47:14,970

So--.

742

00:47:14,970 --> 00:47:19,700

--I'm glad I could be your silver medal.

743

00:47:19,700 --> 00:47:21,010

Thanks.

744

00:47:21,010 --> 00:47:24,520

You're on the right track.

745

00:47:24,520 --> 00:47:32,050

So, in being in the last panel and also the panel last year, when Buzz Aldrin was here,

746

00:47:32,050 --> 00:47:37,609

which was also awesome, there's been kind of this somewhat discussion of how there's

747

00:47:37,609 --> 00:47:44,270

kind of this trend towards science fiction being more like science and the nerdy fan

748

00:47:44,270 --> 00:47:47,250

boys with their "excuse me, that's not right".

749

00:47:47,250 --> 00:47:52,620

And one of my dreams is to be famous enough
and have something successful enough that

750

00:47:52,620 --> 00:47:56,420

Neil deGrasse Tyson told me I'm wrong on Twitter.

751

00:47:56,420 --> 00:48:06,549

In going toward that goal, are there any resources
you guys recommend for research for writers,

752

00:48:06,549 --> 00:48:12,400

for people who are just interested in the
stuff that isn't as publicly known that we

753

00:48:12,400 --> 00:48:18,040

might not know about, stuff that a basic Google
search wouldn't turn up.

754

00:48:18,040 --> 00:48:21,890

A more detailed Google search.

755

00:48:21,890 --> 00:48:27,299

Basically, when I wrote The Martian, I didn't
know anyone in aerospace.

756

00:48:27,299 --> 00:48:28,299

I was on my own.

757

00:48:28,299 --> 00:48:29,470

It took me about three years.

758

00:48:29,470 --> 00:48:33,520

I probably spent about half that time researching,
and all of it was just Google.

759

00:48:33,520 --> 00:48:41,420

Seriously, and about 90 percent of the results
ended up being Wikipedia pages.

760

00:48:41,420 --> 00:48:42,800

So really, it's all out there.

761

00:48:42,800 --> 00:48:44,490

It's just, you know, you've got to dig it up.

762

00:48:44,490 --> 00:48:52,410

Yeah, the internet really provides an unbelievable resource to be able to do a phenomenal amount

763

00:48:52,410 --> 00:48:56,450

of original research at a level.

764

00:48:56,450 --> 00:49:02,950

And what Andy has done of course is always checked a lot of those facts too.

765

00:49:02,950 --> 00:49:06,820

And so, it's a library at your home.

766

00:49:06,820 --> 00:49:10,080

You can't beat it.

767

00:49:10,080 --> 00:49:14,160

Okay, thank you so much.

768

00:49:14,160 --> 00:49:18,829

Hi, my question is more for Todd.

769

00:49:18,829 --> 00:49:25,119

When Space X unfortunately had their anomaly last week, the dragon spaceship actually survived

770

00:49:25,119 --> 00:49:30,369

the explosion, but they weren't able to deploy the parachutes because that would be inside

771

00:49:30,369 --> 00:49:33,089

the capsule and deployed by astronauts.

772

00:49:33,089 --> 00:49:41,490

For Orion's abort capabilities, will ground control be able to deploy parachutes in the

773

00:49:41,490 --> 00:49:42,940

case of an anomaly?

774

00:49:42,940 --> 00:49:48,859

I think for the Orion abort, that's going to be done by the crew.

775

00:49:48,859 --> 00:49:54,010

So, basically, there's very few signals between the rocket and Orion itself.

776

00:49:54,010 --> 00:49:57,450

The rocket can say I'm having a bad day.

777

00:49:57,450 --> 00:49:59,250

You need to get off.

778

00:49:59,250 --> 00:50:01,630

And quickly.

779

00:50:01,630 --> 00:50:07,740

Yeah, but essentially it's designed so that the launch boards knows to pull away from

780

00:50:07,740 --> 00:50:16,290

the rocket and then the chutes deploy and bring it home safely.

781

00:50:16,290 --> 00:50:18,809

Good question.

782

00:50:18,809 --> 00:50:21,359

You're particularly vested in that knowledge
I think.

783
00:50:21,359 --> 00:50:22,359
Hello.

784
00:50:22,359 --> 00:50:23,359
Okay, wow.

785
00:50:23,359 --> 00:50:25,589
You guys are all so cool.

786
00:50:25,589 --> 00:50:28,470
Okay, so, Andy, yours is my new favorite book
now.

787
00:50:28,470 --> 00:50:29,470
Thank you.

788
00:50:29,470 --> 00:50:31,320
I'm getting it signed on Saturday.

789
00:50:31,320 --> 00:50:32,380
Okay.

790
00:50:32,380 --> 00:50:33,380
But--.

791
00:50:33,380 --> 00:50:34,380
By Andy--?

792
00:50:34,380 --> 00:50:35,980
Yeah, by Andy.

793
00:50:35,980 --> 00:50:38,350
Yeah, see there's this guy outside.

794
00:50:38,350 --> 00:50:39,810

He gave me \$3.

795

00:50:39,810 --> 00:50:41,089

He wanted to sign it.

796

00:50:41,089 --> 00:50:44,349

But the question is more for the three of you in the middle, who according to Andy,

797

00:50:44,349 --> 00:50:46,300

actually put your pants on at your home.

798

00:50:46,300 --> 00:50:48,690

I also put my pants on at home.

799

00:50:48,690 --> 00:50:49,690

Oh, okay.

800

00:50:49,690 --> 00:50:50,690

So there's four.

801

00:50:50,690 --> 00:50:51,690

Okay.

802

00:50:51,690 --> 00:50:52,690

Got it.

803

00:50:52,690 --> 00:50:53,690

Okay, so--.

804

00:50:53,690 --> 00:50:57,720

It even has a zipper.

805

00:51:01,020 --> 00:50:58,720

I don't need to see.

806

00:51:01,020 --> 00:51:06,869

But, based on all of the calculations I know

Andy did for this and all of his, you know,

807

00:51:06,869 --> 00:51:13,270

beta readers, do you think that this book could be kind of more like before you go to

808

00:51:13,270 --> 00:51:17,130

Mars book to read for the astronauts who actually end up going to Mars?

809

00:51:17,130 --> 00:51:30,310

Like, this is the worst case scenario, be prepared, type of thing?

810

00:51:30,310 --> 00:51:31,770

I will tell you this.

811

00:51:31,770 --> 00:51:37,109

About a year ago, which I was already a consultant on the film and I'd been doing a few things.

812

00:51:37,109 --> 00:51:43,819

I went to JSC and I gave a talk at--to the Astronaut Corp and then later on in that day,

813

00:51:43,819 --> 00:51:48,730

I had an opportunity to talk to the Center Director, who's also an astronaut, Ellen Ochoa.

814

00:51:48,730 --> 00:51:52,460

And the first thing I did when I sat down and we just chit-chatted, I said, hey have

815

00:51:52,460 --> 00:51:53,460

you read The Martian?

816

00:51:53,460 --> 00:51:55,039

And she goes, no, I haven't read The Martian.

817

00:51:55,039 --> 00:51:58,050

And so, I told her a little bit about it,
and that was it.

818

00:51:58,050 --> 00:52:02,089

And about two months later, I get his fabulous
email from Ellen.

819

00:52:02,089 --> 00:52:03,819

Jim, I read The Martian.

820

00:52:03,819 --> 00:52:06,380

It's now required reading.

821

00:52:06,380 --> 00:52:09,660

So, maybe that's your answer.

822

00:52:09,660 --> 00:52:10,660

Thank you.

823

00:52:10,660 --> 00:52:12,900

We have a reading list and it is on it.

824

00:52:12,900 --> 00:52:13,900

It's flown around the office.

825

00:52:13,900 --> 00:52:17,450

It's a great read, and I think it's just indicative,
you know, in society at large.

826

00:52:17,450 --> 00:52:22,500

I mean, The Big Bang Theory, you know there
are lots of indicators that this movie--the

827

00:52:22,500 --> 00:52:27,270

success of the book, that we want our intellect
challenged as well as our emotion.

828

00:52:27,270 --> 00:52:34,770

And so I think it's a great question that you asked and most of us have read it.

829

00:52:34,770 --> 00:52:35,770

I loved it.

830

00:52:35,770 --> 00:52:36,770

Thanks.

831

00:52:36,770 --> 00:52:37,770

I'll add one more thing to that.

832

00:52:37,770 --> 00:52:43,309

In our world, we're pretty OCD about all the things that could go wrong, but a lot of us

833

00:52:43,309 --> 00:52:48,170

all went to the same schools and learned the same types of things.

834

00:52:48,170 --> 00:52:54,299

One of the things about an artist and authors and things like that are that they think differently

835

00:52:54,299 --> 00:52:55,770

about problems.

836

00:52:55,770 --> 00:53:00,030

And one of the things I said about scientists and engineers complementing each other, the

837

00:53:00,030 --> 00:53:07,079

fact that Mark Watney was a botanist, he solved the problem of how to get food for himself

838

00:53:07,079 --> 00:53:15,780

so that this idea of being able to crowd source information in a way that your normal engineer

839

00:53:15,780 --> 00:53:18,589
ain't going to see things, I think, gives
you a better solution.

840
00:53:18,589 --> 00:53:20,220
And so, from that perspective, I agree.

841
00:53:20,220 --> 00:53:22,819
I think it should be required reading.

842
00:53:22,819 --> 00:53:23,960
I'm a big fan.

843
00:53:23,960 --> 00:53:29,440
You guys probably have heard of STEM, Science,
Technology, Engineering, and Math of this

844
00:53:29,440 --> 00:53:30,440
new movement.

845
00:53:30,440 --> 00:53:35,400
So, there's a new movement called STEAM, right?

846
00:53:35,400 --> 00:53:39,540
It adds the Arts to it.

847
00:53:39,540 --> 00:53:40,540
Add the arts.

848
00:53:40,540 --> 00:53:41,540
Absolutely.

849
00:53:41,540 --> 00:53:45,220
And so there's an aspect to me of design beauty
in the A portion of STEAM that we really do

850
00:53:45,220 --> 00:53:46,220
need.

851

00:53:46,220 --> 00:53:50,720

And so, Andy, I'm for one--I think most of the problems we can run into, you've probably

852

00:53:50,720 --> 00:53:51,849

thought about already.

853

00:53:51,849 --> 00:53:57,079

So, if we don't have the book, you're probably going to be in Mission Control helping us

854

00:53:57,079 --> 00:53:58,170

as a liaison.

855

00:53:58,170 --> 00:54:00,170

We'll probably be on the ticket here.

856

00:54:00,170 --> 00:54:02,450

So, anyway, thank you for that.

857

00:54:02,450 --> 00:54:03,450

Well, thanks.

858

00:54:03,450 --> 00:54:10,510

Just one final thought on that, just people often ask me, ooh, does you know, NASA ask

859

00:54:10,510 --> 00:54:12,190

your advice on the subject?

860

00:54:12,190 --> 00:54:14,780

I'm like, guys, I'm an enthusiast.

861

00:54:14,780 --> 00:54:15,839

These guys are experts.

862

00:54:15,839 --> 00:54:17,990

There is a big difference.

863

00:54:17,990 --> 00:54:23,560

My job is just to entertain you guys, and I hope I do that, but there's a huge gulf

864

00:54:23,560 --> 00:54:27,339

of knowledge and training between me and the people who actually know what they're doing.

865

00:54:27,339 --> 00:54:30,539

And so, don't draw a false equivalency here.

866

00:54:30,539 --> 00:54:31,539

That's all.

867

00:54:31,539 --> 00:54:35,700

All right, I think we've got time for one last question.

868

00:54:35,700 --> 00:54:40,200

I just want to thank you guys because we're a race of explorers, and we haven't been as

869

00:54:40,200 --> 00:54:43,930

aggressive as we could be, and I know you're putting some real feet to this.

870

00:54:43,930 --> 00:54:50,750

So, thanks for getting this out to our sister planets.

871

00:54:50,750 --> 00:54:56,880

The internet has been abuzz with the Mars Mission regarding solar radiation and solar

872

00:54:56,880 --> 00:54:57,880

storms.

873

00:54:57,880 --> 00:55:05,970

Can you address what protections to the crew so that they make it to Mars and back?

874

00:55:05,970 --> 00:55:09,210

Not a problem.

875

00:55:09,210 --> 00:55:15,829

So, indeed, one of the things that we've done, when we send things to Mars, is have radiation

876

00:55:15,829 --> 00:55:19,859

detectors on them so that we understand the environment they're in.

877

00:55:19,859 --> 00:55:26,260

And we also do original research in how to protect humans from cell damage.

878

00:55:26,260 --> 00:55:32,339

And it turns out, there's now a variety of materials, there's even concepts of being

879

00:55:32,339 --> 00:55:34,430

incased in water.

880

00:55:34,430 --> 00:55:37,880

Of course what we're doing is we constantly look at the sun.

881

00:55:37,880 --> 00:55:42,589

We constantly predict when another flare will occur, when another coronal mass ejection

882

00:55:42,589 --> 00:55:48,650

will occur, which does indeed accelerate particles to high energies and could harm people that

883

00:55:48,650 --> 00:55:49,809

are in the capsule.

884

00:55:49,809 --> 00:55:54,210

And so, our forecasting ability is also getting much better.

885

00:55:54,210 --> 00:55:59,170

So, all of these things are pointing in the right direction and as our scientists learn

886

00:55:59,170 --> 00:56:05,480

to forecast and as our medical researchers learn how to protect the body, that's converging

887

00:56:05,480 --> 00:56:11,570

I believe, into some concrete plans that will--that we'll be using as we go to Mars.

888

00:56:11,570 --> 00:56:15,950

We also have operational limits on how much time you can spend in space and so there's

889

00:56:15,950 --> 00:56:20,549

also the mitigation of, you know, once you've spent so many days in space, you're limited

890

00:56:20,549 --> 00:56:23,329

to how much more flying you can do.

891

00:56:23,329 --> 00:56:24,730

That's something that we watch closely.

892

00:56:24,730 --> 00:56:27,780

We're definitely going to have to reevaluate and think about how we do that, but it's to

893

00:56:27,780 --> 00:56:31,630

minimize the risk of lifelong problems to the crew member.

894

00:56:31,630 --> 00:56:36,530

So, there's also operational constraints that we put to mitigate that problem.

895

00:56:36,530 --> 00:56:41,690

Indications are from the radiation detector on the Curiosity mission as it went to Mars,

896

00:56:41,690 --> 00:56:45,460

once we've analyzed the data, that it is a survivable trip.

897

00:56:45,460 --> 00:56:48,030

Now, there's an increased risk in cancer.

898

00:56:48,030 --> 00:56:50,369

Both ways, right?

899

00:56:50,369 --> 00:56:51,930

Both ways.

900

00:56:51,930 --> 00:56:52,930

Okay.

901

00:56:52,930 --> 00:56:56,900

Well, you know, NASA does take that philosophy.

902

00:56:56,900 --> 00:57:01,069

This is another thing I really like about the book and that is indeed, we don't plan

903

00:57:01,069 --> 00:57:02,700

on leaving anyone there.

904

00:57:02,700 --> 00:57:08,270

So, it is a plan to be able to go, but also to return.

905

00:57:08,270 --> 00:57:13,099

And that's a critical ailment of the whole

NASA philosophy.

906

00:57:13,099 --> 00:57:19,660

All right, well, Jim?

907

00:57:19,660 --> 00:57:26,029

So, not to have a spoiler, but indeed there's a capability that we've put out on the web.

908

00:57:26,029 --> 00:57:27,200

It's called "Mars Track".

909

00:57:27,200 --> 00:57:32,980

If you go to the NASA booth and you pick up one of these brochures, you can go through

910

00:57:32,980 --> 00:57:38,250

your browser and be able to browse Mars at reasonably high resolution.

911

00:57:38,250 --> 00:57:44,730

We're constantly improving it, and Mark Watney's trip is going to be available for you to also

912

00:57:44,730 --> 00:57:46,039

take that journey.

913

00:57:46,039 --> 00:57:48,779

All right, guys.

914

00:57:48,779 --> 00:57:50,380

Well, thank you so much.

915

00:57:50,380 --> 00:57:54,010

Give it up for this panel.

916

00:57:54,010 --> 00:57:59,930

Thank you, very much.

917

00:57:59,930 --> 00:58:07,430

Go see The Martian October 2nd, but even more,
let's go to Mars.