The Challenges of Getting to Mars: Getting a Rover Ready for Launch

...zero and liftoff!

(music)
We are wrapping up the last of the vehicle tests and we're getting ready to make it a real spacecraft here before too long.

(music)

It's gonna be a big push but that's kind of how the end game goes. We try to get things ready and every last thing has to be done and be done right. It takes a lot of time and a lot of effort to do it.

(music)

We have a lot of work to do in the next few months.

Although the vehicle is in Florida and we've stacked it together just in the last couple of days the rover has got its rocket jet pack on it, and the jet pack and the rover together have been put in the back shell of the vehicle. Right now we're putting the cruise stage on top.

In some sense, that process is pretty straight forward. The challenge we have here in Pasadena is finishing up all our testing- all of our testing in our test bed and on the equipment and going through and looking at all the problems we had in our test program and make sure that all the problems we found were all solved, and that we know what we're gonna do and how we're gonna fly it.

(background sound) 'Three, two, one, fire!'
(music/sound of sliding down cable and wheels locking)
(background sound) 'Everyone stand by...'

Testing is a lot like renovating your house, you can enumerate some very large obvious things to do and then when you do them, it becomes clear that there's some second order secondary things to do. And then when you do those, you discover third order, fourth order, ad infinitum.

We require our system to be able to be robust to survive a number of different kinds of faults both internal faults, things breaking on the spacecraft, or uh... loss of sun data coming into the sun sensor- a variety of unfortunate circumstances we try to make our design robust to.

(Rob Manning) Not only have we driven the rover, we've moved its arm- put it all through its paces but it's been in a thermal vacuum chamber and kept very cold. Parts of it have been on a centrifuge. We've done drop tests, pull tests, drive tests, load tests, stress tests just amazing amount of testing this vehicle has gone through.

We've done shorting tests- taken the vehicle and shorted electronics. We've looked to see that the radials all work together and that the rover doesn't interact with itself in bad ways. We've tried every way of operating the vehicle using the software literally thousands and thousands of hours of software testing.

It's been just an amazing several years really of constant testing and development finding problems, fixing those problems and going on to the next problem.

(Joel Krajewski) The system is sufficiently complex that anything you change has to be done with great care and caution and then tested thoroughly, because of the potential for side effects-unintended consequences of the fix.

The first rule of engineering this late in the game is, 'Do no harm.''

(Rob Manning) This is a very, very complicated beast. This is by far the most complex thing we've ever built.

It's almost hard to imagine how complex it is and in fact if you get close up to the vehicle, you can see the richness of detail. In fact, this vehicle almost has fractal-like complexity. The more you look at it, the more details that you uncover and you have to make sure when you're building this thing and testing it and designing it that those interactions are well understood and that there is nothing about the system that will interfere with itself.

This has been a real challenge that we've had and so every minute of the time we've had, we've been using that time with incredible intensity. So hopefully we'll take a big breath in mid-November before we launch and be able to relax and let this vehicle get off the ground and finally say goodbye.

I think she's ready to go!

(music)

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