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Cassini scientists holding their breaths

By Robyn Suriano
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CAPE CANAVERAL - Larry Esposito's professional life has been wrapped around Saturn for almost 15 years.

Come Monday, his work on NASA's Cassini mission to explore the ringed planet will be pinned on 42 minutes.

That's how long it will take a Titan 4B rocket to lift the spacecraft off Earth, carry it into orbit for a very brief time, and then send it on the journey to Saturn.

It's also just enough time to put hundreds of scientists into a tizzy while they watch the first risky part of the mission - the launch.

"When you see so much of your personal effort sitting out there on the launch pad, naturally you feel a mixture of excitement and anxiety," said Esposito, an astronomy professor at the University of Colorado. "Everyone knows these rockets are filled with explosives, and sometimes they fail."

Cassini's mission is scheduled to start between 4:55 and 7:15 a.m. EDT (0855-1115 GMT) Monday from Cape Canaveral Air Station. Forecasters say there is a 60 percent chance that weather will be good, with potentially high winds as their main concern.

Dozens of scientists from around the world have been arriving in Brevard County since last week to watch the liftoff and celebrate the mission's interplanetary beginning.

Many of them have been working on the project for a decade or more - and they'll have to wait another 6 years after launch before Cassini reaches its target 880 million miles away.

"It's a major part of my career," said Steve Wall, an optical engineer at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "I look at it as being part of a Columbus-type crew: You sign up for a long period of time on something that you know will be exciting, but the payoff won't come for many years later."

After arriving at Saturn in 2004, Cassini is to begin a four-year investigation of the gas planet, its intricate rings and its cratered moons.

The \$3.4-billion mission is the last "big science" trip of its kind. After this, NASA will fly smaller and much cheaper probes to study the planets.

Cassini carries 12 science instruments: a probe that will be dropped on Saturn's moon Titan and two heavy-duty antennas so the spacecraft can talk with Earthlings from deep space.

The mission's goals include picking apart Saturn's icy rings, scouring its atmosphere, examining its magnetic field and investigating some of the 18 moons that circle the planet.

Ultimately, there's a lot more than Cassini riding on the Titan rocket.

The spacecraft carries NASA prestige and scientific careers along with it. The significance is not lost on Cassini's scientists.

"My job during launch is to stand and yell, 'Go! Go! Go!,'" said Bill Johnson, lead engineer for the radar system that Cassini will use to map the moon Titan.

"It's an intense time. You can see all that power in the rocket, and you know there's the potential for disaster once it starts doing its thing, but at that point, it's out of your hands. You may as well enjoy the launch."

Target: Saturn moon

Among Cassini's most sought-after targets is Titan, Saturn's largest moon.

Titan's nitrogen-rich atmosphere is puzzling to scientists, who want to see whether the primitive air resembles the atmosphere that gave rise to life on Earth 4 billion years ago.

To that end, a probe built by the European Space Agency will be dispatched by Cassini to crash through Titan's atmosphere.

Deploying parachutes and collecting information the whole way down, the probe, named "Huygens," will send back the first closeup images of the moon's encrusted, orange surface.

Although scientists have been training telescopes on Titan for decades, the only way to learn more about the moon is to visit it, they say. Good views previously have been hidden by Titan's thick, hazy atmosphere.

Sushil Atreya, a planetary scientist at the University of Michigan, is part of the science team for two instruments on Huygens designed to analyze the atmospheric gases as the probe makes its three-hour dive to the surface.

Those three hours will provide more information than years of study from Earth-based telescopes.

"The only way to really know what's there is to go and make measurements," Atreya said. "Nothing on Earth can approach that."

Like those who focus on Titan, scientists who study planetary rings are getting an unparalleled opportunity to gather information with Cassini.

With four years' worth of closeup examinations, scientists will learn more about the rings' composition and nature, providing clues to where they came from.

Despite extensive data from NASA's earlier Voyager missions in the 1980s, the rings remain a mystery to scientists who are hungry for new information.

"There are lots of things going on in those rings that we don't understand," said Steve Edberg, a Cassini scientist at JPL. "If you want to learn about rings, Saturn is definitely the planet to study. All four of the gas giants have them, but far and away, Saturn's are the most magnificent."

The trademark rings are one reason the planet is so visually appealing, scientists say.

"It's just so unusual to see this flat, round thing floating out there, not touching the planet anywhere," said Jeff Cuzzi, a scientist at NASA's Ames Research Center in Mountain View, Calif. "It's just so unique. There are other planets with rings, of course, but Saturn's are the best at what they do."

Once Cassini is on its journey, the scientists will return to their respective universities and laboratories to wait out the half-dozen years of travel time.

After a decade of planning, designing and building NASA's most complicated spacecraft, what will they do with the time?

Work, work, work.

"There's no pause here," Esposito said. "Within days of launch, we'll be working to figure out how to get the best scientific return during the mission. We have some very complex planning to do."

For now, though, they have just one thing to do: wait for liftoff, then breathe easy again 42 minutes later.

"Many have dedicated their careers over the last 15 years just to get to this point successfully," said Wesley Huntress Jr., NASA's administrator for space science. "And we have another 11 to go, and so by all means, let's go."

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