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The Most Powerful Name in Corporate News

Space Robotic Technology and Planetary Missions



John Thornton
CEO

CEOCFO: *Mr. Thornton, would you tell us the overall concept of Astrobotic Technology?*

Mr. Thornton: Astrobotic is a Lunar logistics company. We are like a FedEx to the moon. We take packages from around the world, we bolt them on our lander and we fly them to the moon and destinations on the way to the moon.

CEOCFO: *What is on the way to the moon?*

Mr. Thornton: There are two destinations called translunar injection which is being thrown towards the moon and the second is lunar orbit.

CEOCFO: *Are there any other companies that provide this service or are you then one?*

Mr. Thornton: There are a couple other companies that provide similar kinds of services. There is a competitor on the west coast and there are some companies that also offer trips to lunar orbit but not have flown yet and as far as I can tell, none have as many contracts as we have.

CEOCFO: *How much traffic is there?*

Mr. Thornton: The kinds of people that will fly with us are those that are doing science and exploration on the moon, those that want to advance their nations' status in the world community. There are those that want to demonstrate technologies and show that it is possible to operate on the moon so then it can be possible to go beyond. There are those that want to go to the moon as a stepping-stone to Mars. There are those interested in resources on the moon and how they can be potentially harvested in the future and turned into useful resources for people. There are education groups and marketing experience groups that want to give their customers and their brand a special kind of experience that is not possible any other way.

CEOCFO: *Would you give us an example?*

Mr. Thornton: We have five contracts right now to take things to the moon or data relating to it. The first is a company called Celestus and they want to send human ashes to the surface of the moon for permanent internment. The second is the Google Lunar XPRIZE which we consider a customer because they are interested in inspiration and the way that people think about the moon. The third is NASA interested in data relating to the moon and they are interested in data relating to landing and integration and how those spacecraft work and operate on the way there and data from the moon itself. We have a contract with a company from Japan called AstroScale. They have partnered with a drink company that creates a drink called Pacardi Sweat. It is a drink that will be the first drink to land on the moon, so this is a marketing experience. What they are doing is sending a time capsule and it is a time capsule, which is a collection of the dreams of Japanese children that will go to the moon and live there in the time capsule until someone comes and opens it and reads the messages inside. We also have a contract with Team Hakuto, a Japanese XPRIZE team, who plans to send two rovers to the Moon to compete the prize and to explore a potential entrance to a moon cave.

CEOCFO: *What are the challenges?*

Mr. Thornton: The moon is a challenging environment and it takes considerable effort to get there in the first place. The mission starts on Falcon 9 launch vehicle from Florida that we intend to purchase from SpaceX. It is a 200 ft. tall, million lb., force thrust vehicle and that throws our lander towards the moon into what is called a translunar injection trajectory. The launch vehicle throws 2500 kilograms towards the Moon and four days later we land on the moon and deploy the payloads. On the way to the Moon our lander will do trajectory correction maneuvers along the way to make sure that we

are lined up just right. We fire our engines and slow down and break into a lunar orbit and then we fire our engines again and slow down and descend to the surface. The last few hundred meters of the descent are especially interesting; that is when our sensing and hazard detection avoidance turns on and we are looking for rocks, craters, slopes and anything that can interfere with a safe landing down on the surface. It all happens autonomously, very quickly in real-time and there is no human in the loop during that. Our vehicle will be capable of landing within a hundred meters of the target and we will land safely and reliably down on the surface. There are substantial challenges just to get there in the first place. Flying in space and operating anything in space there are some inherent issues as well including vacuum and the thermal environment. Because there is not atmosphere like here on earth, things like fans do not work so you have to change the way you cool and manage heat in space. The moon's surface is especially challenging. There are three main environmental challenges that the spacecraft will face. One is radiation that comes from the sun. There is no magnetic sphere around the moon, which deflects the radiation as we have here on earth. There are micro-meteorites that bombard the moon continuously. Here on earth we have an atmosphere that protects us from that so they burn up in the atmosphere and we see something beautiful in the sky. When you go to the moon all of those small bits of rock come straight down to the surface and even dust particles traveling in at orbital velocity can be a problem down on the surface. The third is the thermal extremes. The lit part of the moon that we see at night in the sky can be upwards of 120 degrees Celsius, which is approximately 250 degrees Fahrenheit on the surface. When the sun goes down, it gets down to liquid nitrogen cold so it gets down to minus 180 degrees Celsius. This is why our first destination goes to a place called Locus Mortis which could have an entrance to a cave underneath the surface. If you are in a cave, you protected from the environment you are protected naturally from the radiation, the micro meteorites and the thermal extremes. We go to Lacus Mortis to lay the foundation of settlement on the moon.

“I think what we are doing is changing space in the way we think about the moon in a very big dramatic way. If the moon is suddenly accessible and available to the people around the world, it changes our perspective.” - John Thornton

CEOCFO: *Have you gone before or are you still putting all this together?*

Mr. Thornton: We have not gone yet. Currently our goal is to fly in the second half of 2016 but the way it works is we are filling the manifest right now and we are not going to leave port with an empty cargo hole, we are going to make sure the manifest is complete before we fly.

CEOCFO: *Who are your customers?*

Mr. Thornton: It is companies, research and development organizations, scientists and space agencies. Many space agencies do not have a domestic ability to fly to the moon and do not have their own launch vehicles or spacecraft. There are research organizations that are doing fundamental research development and science and exploration. We provide the tools to go and fly. One way to think about us as a company is that in the gold rush, there were the prospectors, the people out trying to strike it rich and then there were the companies that were providing the picks and shovels and the Conestoga wagons. We are the ones providing the infrastructure that is necessary for robotic exploration operations on the surface of the moon.

CEOCFO: *From a business point of view, how do you configure a cost?*

Mr. Thornton: It is like any business. You need to find a sweet spot to understand your risk and understand your internal costs and you need to understand what the customer can actually pay in terms of price. Our price point is very low as a starting point, which is unique for this space. The way it works is typically if you are a scientist and want to do something on the moon, you would have to convince the world that you have the best science experiment and then go to your local space agency and convince them to spend upwards of \$300 million to fly and land on the moon. With our service, that same scientist can come to us and buy by the kilogram or per lb. on our lander and fly for a fraction of that \$300 million so they do not even have to go to the highest levels of authority. It is to the point where a few million dollars could fly and land a real experiment rather than several hundred million dollars. Our starting price is \$550 thousand per lb. or \$1.2 million per kilogram. It might be expensive to individuals but to space agencies and corporations around the world it is a very good price point.

CEOCFO: *Would you tell us about MoonMail™?*

Mr. Thornton: MoonMail™ is our first foray into trying to connect the individual to the moon. It is the first time that anyone in the world can spend a few hundred dollars and potentially have the ability to fly something of their own to the surface of the moon such as mementos and keepsakes that would forever go to the moon and be part of a time capsule there. It has been interesting to see the response to that and it is remarkable the kinds of connections that people have with the moon

and the emotional attachments and meanings. The Moon is something that is always above us in the night sky and people draw a lot of inspiration and meaning from it. We have some truly touching stories of the people sending objects to the moon.

CEOCFO: *Why are you so sure you can do it?*

Mr. Thornton: There are many big things going on in space that make it possible. The technology is largely available commercially and the cost to launch is coming down dramatically. What used to cost \$10 thousand per lb. could within a year or two approach the \$1000 per lb. if the SpaceX Falcon Heavy flies. The cost is coming down and the technology is available. Space is no longer a realm of rocket scientists in white lab coats but is the space for commerce and it is a \$300 plus billion industry that is routinely traveled to and used in our every day lives. We are extending the human reach to the moon and opening up the new frontier there.

CEOCFO: *Do you have the funding to get to the point where people are paying or are you seeking investment?*

Mr. Thornton: We have been funded to date with a mix of investment, technical contracts and payload payments for flight. From here, we are looking for more payloads to be manifested and technology contracts in related areas and we are open to additional investment.

CEOCFO: *Why pay attention to Astrobotic today?*

Mr. Thornton: I think what we are doing is changing space in the way we think about the moon in a very big dramatic way. If the moon is suddenly accessible and available to the people around the world, it changes our perspective. There was a time when the New World was a new world and it was so far away and out of reach that it took nations to send ships across the ocean to go and explore. Then suddenly, many more people came and it became accessible and it became a new continent that people settled and great riches resulted. We see the same pattern with the moon; we believe the moon is the next continent and is the next place for people to ultimately go and have value and settle on the surface of the moon. We need to start now and we need to start with the moon because it is in our own backyard.

Interview conducted by: Lynn Fosse, Senior Editor, CEOCFO Magazine

Astrobotic Technology

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