Aethon Automates Hospital Logistics

With little direct competition and the backing of the Bosch Group, the automated developer of healthcare facility delivery systems looks to expand business.

By Mikell Taylor

Aethon has positioned itself as a leader in automated healthcare facility delivery systems, also known as "courier robots." The company's robot, called the TUG, is part of an integrated system designed to increase the efficiency of healthcare workers. With installations in more than 100 hospitals throughout the United States and recent funding from a number of venture partners, Pittsburgh-based Aethon Inc. is poised to grow rapidly within the healthcare industry—and potentially branch out into new markets.

Aethon's products and services automate hospital logistics, including the delivery of food, supplies, and medication.

TUG Delivers

Aethon was founded in 2001, and its first commercial product was the TUG robot, launched in 2005. The 55-lb. robot can manage a payload weighing up to 500 lbs.—typically a hospital cart—and can autonomously drive it down hospital hallways, through automatic doors, and up and down elevators. The TUG is used to deliver food, medication, and supplies throughout different parts of hospitals and other healthcare facilities on either a scheduled basis or on demand, at the request of a healthcare worker logged on to the system.

Using a three-dimensional map preloaded into the robot, a set of laser rangefinders, and dead reckoning based on the robot's motion, the TUG can self-localize within the building in reference to the map. No external references, like fiducials, magnetic strips, or beacons, need to be installed. Obstacle avoidance—of walls, people, and other TUGs—is achieved with ultrasonic and infrared sensors in addition to the laser rangefinders. The robots automatically recharge at charging stations and can run 10 hours at a time on a single charge. With a large enough fleet and the right redundancy system, 24/7 operation is possible even throughout a large facility—a metric that shifts of human workers have difficulty achieving efficiently.

Additional Capabilities

Aethon's TUG systems are capable of 24/7 operations, even in large facilities.

As part of an integrated asset management system, the TUG can also carry a wireless antenna that detects RFID tags on a variety of hospital supplies. Using these tags, the TUG can locate or reference any asset at the request of a hospital worker. Aethon claims this reduces time spent locating lost supplies or the costs of renting replacements for lost equipment. The company also states that installations of TUG systems can achieve a 20 to 50 percent return on investment.

According to Aethon, the company has also spent considerable time developing its software, TUGOS, and recently released a new version that adds several features to TUG robots. For example, with better optimization, the new release allows navigation algorithms to run faster and improves the robots' agility. For the new release, the company rewrote the motor control to support efficient use of more powerful motors and larger tires, increasing the TUG's mobility options and supporting a greater variety of environments and scenarios.

A separate add-on software capability, MedEx, is designed specifically to track pharmaceutical deliveries and securely record the "chain of custody" for drugs in a hospital. This technology, which requires that anyone unloading a medication cart use a biometric scan to unlock it, enables better regulatory compliance within healthcare facilities and addresses the problem of "lost" medications and potential theft.

Bosch Partnership

On March 31, 2010, Aethon announced a new round of venture funding and the establishment of a strategic partnership with the round leader, Robert Bosch Venture Capital GmbH, the venture arm of global technology and services supplier the Bosch Group. The $6.6 million round also included funds from previous investors, primarily healthcare-focused venture groups. In a statement, Aethon president and CEO Aldo Zini indicated that the new funding and the ability to leverage Bosch's expertise in design, manufacturing, and worldwide marketing, will assist in the near term with Aethon's new product development and expansions.

The funding from, and partnership with, Bosch will expand Aethon's business considerably.

What, precisely, Aethon's new products will do remains to be seen. Aethon is firmly entrenched in the healthcare facility market, which—especially for tasks like pharmaceutical delivery—is a particularly well-regulated environment, and efforts to meet regulatory requirements are often expensive. Because of this investment, Aethon has little incentive at this point to actively seek out new markets outside of healthcare.

Limited Competition

Within the courier robot field, Aethon has few technological competitors and even fewer well-commercialized competitors. One example is the SpeciMinder robot, designed by CCS Robotics on a MobileRobots mobility platform. SpeciMinder delivers specimens and samples around healthcare research laboratories. Though the SpeciMinder navigates similarly, it lacks the add-on capabilities, such as RFID tag reading, that make the Aethon TUG more versatile. In addition, the SpeciMinder is not in high-volume production.

Aethon does have competition, but the market is wide open.

Another competitive product is the QC Bot from Vecna Robotics, which has far more in common with the TUG than the SpeciMinder, including RFID reading and a similar payload capability. The QC Bot also integrates with Vecna's hospital kiosk systems—a type of system integration that Aethon could easily work toward as well. While the QC Bot is most technologically similar to the TUG, it is not fully commercialized or widely deployed.

New Markets

When considering potential new markets for Aethon, it is important to realize that its product is not simply a robot, but an entire system. The RFID tag infrastructure, map building, and user controls are all part of a significant system to be integrated and maintained. While it may not compel a healthcare facility to entirely redo its infrastructure, it does require an investment in a particular way of operating. This is similar to the issues Kiva Systems faces with its warehouse automation robots: Warehouse stock and material flow must to be reordered to conform to the way the Kiva system operates. In both of these cases, Kiva and Aethon are selling an integrated process solution, not merely a single piece of hardware, and thus approval to adopt the system must come from the highest echelons of a client organization.

Aethon has had success in the facilities in which the TUG robots currently operate, and will benefit from Bosch's marketing reach outside of North America. However, if

Aethon is to branch out beyond healthcare applications for its current system, or develop new products for healthcare facility automation, it will have to again demonstrate that the system is an acceptable financial risk for early adopters to implement and evaluate.

Through the Bosch relationship, Aethon can reach beyond the North American market.

Regulatory Approval

Aethon, as a pioneer in healthcare robotics, is also—willingly or otherwise—at the forefront of an effort to define the field. This is especially important in terms of regulatory compliance. The United States Food and Drug Administration (FDA) has faced challenges in approving medical devices, such as robots, that do not fall under existing categorizations. The da Vinci surgical robot, for example, had to be approved as a "telemanipulated surgical device," not as a robot.

Robotics companies involved in the healthcare industry have begun collaborating to help the FDA define the various types of robotic systems used in hospitals and medical facilities to improve the formation of regulatory requirements. One suggested category for courier robots like Aethon's TUG is "hospital augmentation system." If the FDA does establish formal categories for robotic systems, Aethon must be actively involved in that process to ensure its product line remains compliant and to maintain the value of its research and development investment.

Both the U.S. FDA and robotics companies struggle with the approval process for robotics technology for healthcare.

Looking Ahead

Moving forward, the most likely immediate expansion for Aethon is, like Vecna, integration with other existing hospital systems such as kiosks. The recently closed venture round will enable Aethon to advance both its hardware and software product lines and develop new applications in a relatively unchallenged field—robotic couriers in the healthcare industry. RBR

The Bottom Line

- Aethon provides an integrated hospital courier system based on its robot, the TUG, as well as software capabilities to enable RFID tag-based material tracking and chain-of-custody management of pharmaceutical deliveries.
- The QC Bot from Vecna Robotics and the SpeciMinder from CCS Robotics are the two closest competitors to the TUG, but neither has been produced in numbers that currently threaten Aethon's dominance.
- A recent $6.6 million in venture funding, led by Bosch, will help Aethon increase production capabilities to develop new products and service markets outside of North America.
- Given Aethon's investment in complying with healthcare facility regulations, it is unlikely the company will branch out of the healthcare field when developing new products and applications. The company, therefore, must stay abreast of ongoing FDA regulatory requirements specific to healthcare robotics.