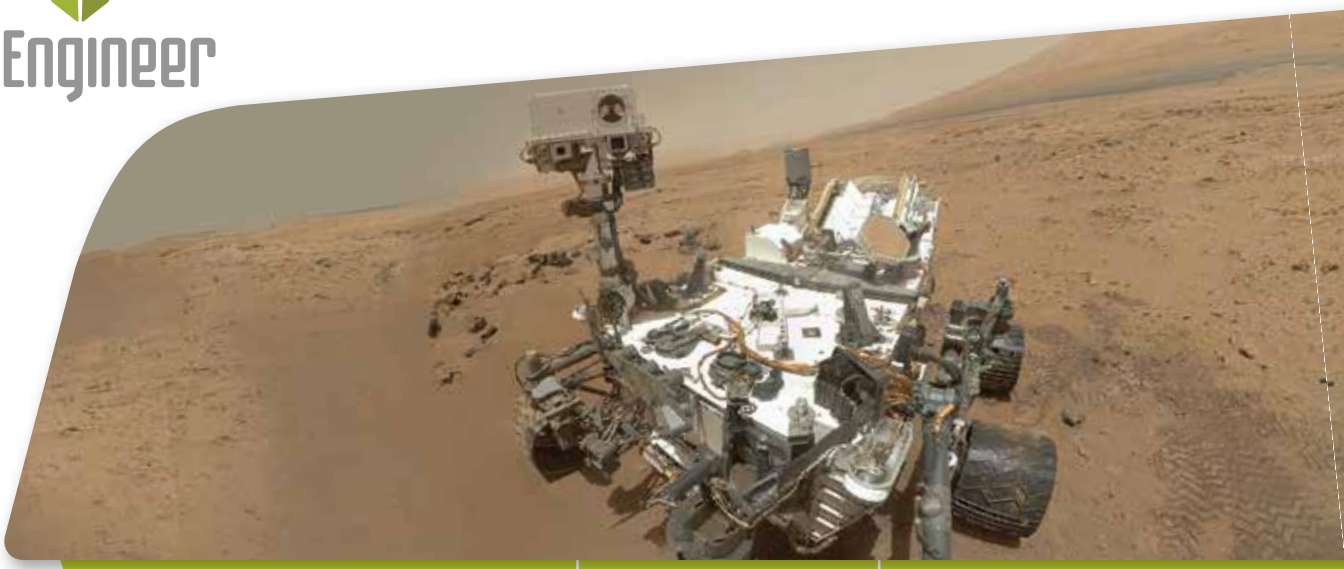

CHALLENGE:
Designing and building products on non-negotiable schedules with extreme life requirements that have zero margin for error.

SOLUTION:
SOLIDWORKS 3D CAD and SOLIDWORKS Simulation from GoEngineer.

RESULTS:
Concepts and designs can be validated within hours instead of days. Sophisticated yet simple-to-use design tools reduce overall cycle times.

FAILURE IS NOT AN OPTION - GOENGINEER PROVIDES POWERFUL TOOLS TO ENABLE PRODUCT DEVELOPMENT THAT IS OUT OF THIS WORLD

The desire to understand celestial bodies and "to boldly go where no man has gone before" transcends time and cultural boundaries.

Early Egyptians, Babylonians, Mayans, and Native Americans are among those who showed great interest in planets, stars, and other life beyond Earth. Celestial-themed films are popular around the globe, with Avatar and Star Wars boasting some of the largest audiences worldwide.

Long at the forefront of scientific space exploration is NASA's Jet Propulsion Laboratory (JPL). Mars 2020 will investigate the Martian surface, seeking the signs of ancient life, and help to prepare for future human expeditions by assessing the planet's natural hazards and resources.

Motiv Space Systems

JPL contracted with Motiv Space Systems (Pasadena, CA) to engineer and fabricate the Robotic Arm for its Mars 2020 rover. "Motiv Space Systems is focused on motion-control solutions for the space market," says Vice President of Operations, Brett Lindenfeld. "This basically covers the spectrum from mechanical engineering mechanisms and deployments all the way to drive electronics, motor drivers, and much more."

Among the many engineering challenges when designing mechanisms for operation on planet Mars is the severe cold temperature and extreme temperature changes. "When you think about how various parts will expand and contract differently, there are some intricacies to consider," says Michael Hagman, Motiv Space Systems Project Engineer for the Robotic Arm, "especially with big temperature swings."

Proof-of-concepts are critical for space equipment, because, once the rover lands on Mars, there is no turning back. "We're sending equipment to a place where it cannot be fixed; everything has to be perfect," says Hagman. "All mechanisms have extreme life requirements and everything has to be tested several times."

When it comes to 3D CAD technology to design parts and components that will operate problem-free, Motiv Systems relies on SOLIDWORKS from local reseller GoEngineer. "SOLIDWORKS' sophisticated yet simple-to-use solutions allow for the efficient development of complex robotic systems undertaken at Motiv," says Lindenfeld. "And with the utilization of SOLIDWORKS Simulation, we are able to validate concepts in hours, versus days."

Motiv Robotics

Motiv Space Systems also has a subsidiary business called Motiv Robotics. The company licensed a robot invented by JPL and Caltech for the DARPA Robotics Challenge. Spurred by the Fukushima nuclear disaster, DARPA (Defense Advanced Research Projects Agency) organized a robotics development competition.

"... with the utilization of SOLIDWORKS Simulation, we are able to validate concepts in hours, versus days."

– BRETT LINDENFELD, VP of Operations, Motiv Systems

The goal: Challenge engineers to come up with a robot that could do a number of tasks, such as drive a four-wheel buggy and get out of the buggy, open doors, cut through walls, pick up tools, turn valves, and climb stairs—all tasks that would have prevented further environmental damage after the Fukushima incident.

"Motive Robotics is leveraging this base technology and applying it to a line of industrial and commercial robotics," says Lindenfeld. "We know that we can make a lot of derivative robotic capability from that architecture—capabilities that will be appealing and useful to commercial and industrial markets."

As one might imagine, the Motiv Robotics engineering team is faced with a large number of unique challenges. Consider robotic limb configuration: There are 28 degrees of freedom for mobility, or four limbs with 7 degrees of freedom per limb, plus whatever degrees of freedom that a customer wants at the robot's end effectors, such as wheels or other components.

"In the realm of robotics, everything is customized, and our customers want a specific solution each time," says Senior Electro-Mechanical Robotics Engineer, Chris McQuin. "That requires tailoring each design to customer needs." SOLIDWORKS enables Chris and his team to quickly make and modify 3D designs, and with SOLIDWORKS' built-in simulation capabilities, the Motiv Robotics design team can make quick design changes that don't compromise the robustness of the system.

Smaller, Faster, Cheaper

"SOLIDWORKS, as far as I'm concerned, is the best product for fast design cycles," says McQuin. "And when we do have issues, GoEngineer is always very responsive to our questions. I also attend GoEngineer webinars to get up to speed on the latest and greatest SOLIDWORKS features and functions."

The world of robotics constantly presents new and exciting challenges to Motiv Space Systems. New ideas can be leveraged on existing robotic architecture or can be adapted in completely new ways. The continual push is always smaller, lighter, faster, and cheaper, so it's important to keep up with current technologies for product development.

"Motiv relies on SOLIDWORKS 3D CAD and its associated simulation tools in all aspects of our projects and product development, from the Mars Rover Robotic Arm and camera lenses to the development of next generation ground robot concepts supporting unmanned or robotic-assisted emergency response systems," says Lindenfeld. "And we have a strong relationship with GoEngineer, who enables us to adopt new capabilities quickly and efficiently. It's a partnership that we highly value."

Robotic arm rendered in SOLIDWORKS

Motiv Robosimian Quadraped Robot

Motiv Industrial Robotic Arm

GoEngineer

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GoEngineer is a provider of powerful product design and engineering tools including support and training for SOLIDWORKS, Stratasys, Creaform, CAMWorks, and PLM with over 30 years of customer experience in high tech, medical, machine design, energy, and other industries.

Motiv Space Systems Motiv is a motion control systems provider with an experienced team that has a passion for solving problems in unique environments.

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