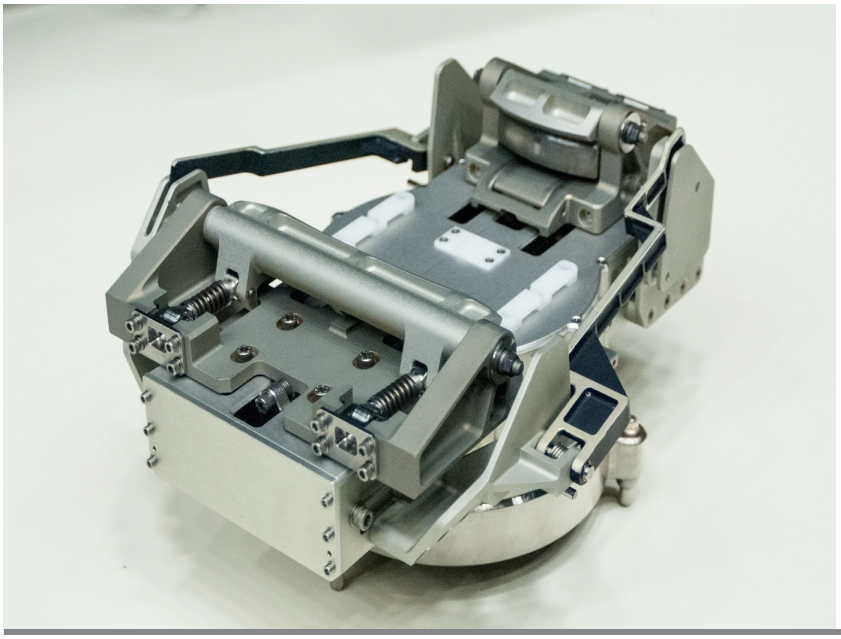

National Aeronautics and Space Administration

TECHNOLOGY SOLUTION

Robotics, Automation and Control

Robotic gripper for satellite capture and servicing

An essential tool for autonomous rendezvous and capture of satellites

The robotic gripper was developed at NASA Goddard Space Flight Center as part of a robotic satellite servicing mission. The gripping device can be used to autonomously or remotely grasp and control an out-of-fuel or otherwise disabled satellite. Specifically, the gripper interfaces to the separation ring (marman ring) of the client spacecraft and when closed is sufficient to constrain all six degrees of freedom of motion between the servicing spacecraft and the client. The jaws are designed with a conformable geometry which allows the same Gripper to interface to all spacecraft separation rings commonly used with Atlas V and Delta IV launch vehicles.

BENEFITS

- Satellite capture and constraint for servicing or refueling

THE TECHNOLOGY

The Gripper is located at the end of a robotic system consisting of a robotic arm equipped with a Tool Drive or End Effector comprising the input actuator to the Gripper as well as the structural, power and data link between the Gripper and the robotic arm. In a notional concept of operations, a Servicer would approach the Client in an autonomous rendezvous and capture (AR&C) maneuver. When the Servicers sensor suite confirms that the distance, orientation, and relative translational and angular rates with respect to the Client are within an acceptable range, the Servicer enables the grasping sequence, where the robotic arm, equipped with Gripper, extend forward to the Client. When the Gripper/ Servicer sensors indicate that the Client marman ring is sufficiently within the capture range of the Gripper, a trigger signal is sent to the robot control system that commands the End Effector to drive the mechanism of the Gripper and affect closure around the marman ring. The Gripper consists of a pair of jaws which are driven by an internal transmission. The transmission receives input torque from the End Effector and converts the torque to appropriate motion of the jaws.

APPLICATIONS

The technology has several potential applications:

- Sufficient to constrain all six degrees of freedom of motion of a client spacecraft
- Enables servicing craft to perform primary attitude control for the dual vehicle stack
- Compatible with all spacecraft separation rings commonly used with Atlas V and Delta IV launch vehicles

PUBLICATIONS

Patent No: 10414053

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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More Information

National Aeronautics and Space Administration

Agency Licensing Concierge

Goddard Space Flight Center

Code 102
Greenbelt, MD 20771
202-358-7432
Agency-Patent-Licensing@mail.nasa.gov

www.nasa.gov

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