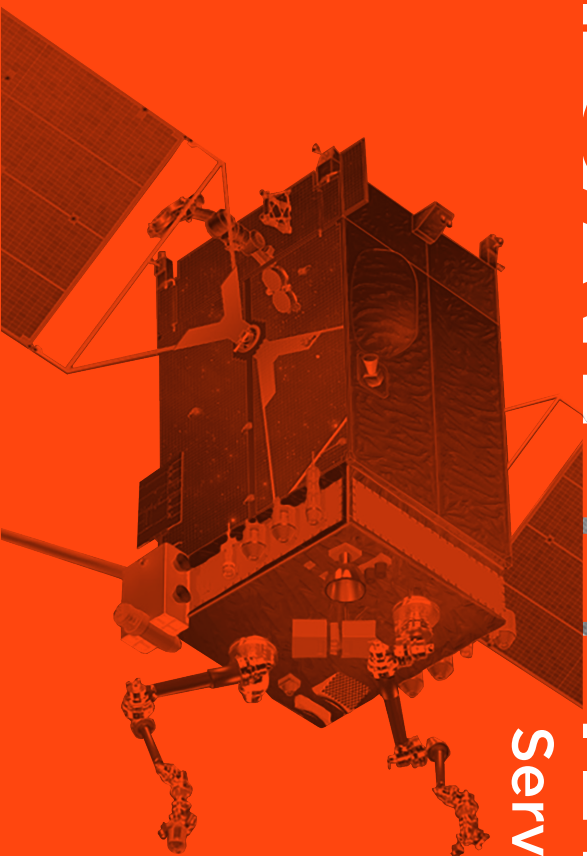


IN-ORBIT **SATELLITE**

Servicing



DRAPER®

IN-ORBIT SATELLITE SERVICING

Of the more than 1,000 operational satellites in orbit, only two (the Hubble Telescope and the International Space Station) were designed to be serviced — by humans. When the rest run out of fuel, malfunction or become obsolete, no technology exists to restore them, ending the working lives of satellites that cost millions of dollars to design, build and launch. Draper, in collaboration with SSL, is designing autonomous technology to enable robotic servicing of satellites from low-Earth, geosynchronous and super-geo orbits for commercial, NASA and DARPA programs.

To service satellites in orbit, robotic platforms will have to

- Approach and dock with a satellite travelling at 17,500 miles per hour, spinning, with many fragile protruding parts
- Access and refuel a client satellite's propellant tank, which was not designed for this purpose, without spilling cryogenic fluid
- Reposition the client and separate safely

Draper is providing the technology to enable autonomous rendezvous and proximity operations for NASA's Restore-L mission in low-Earth orbit and for the Robotic Servicing of Geosynchronous Satellites program in geosynchronous orbit.

Draper is leveraging its experience engineering rendezvous and proximity operations for NASA's Apollo, Space Shuttle and International Space Station programs and DARPA's Orbital Express program, as well as Sierra Nevada Corporation's Dream Chaser and Orbital ATK's Cygnus. By making servicing practical, Draper's technology will enable life extension and upgrades for existing satellites and allow architectures of future satellites to be more robust, resilient and complex, making satellites more cost-effective for the commercial space industry.



DEEP SPACE

Orion
SLS
OSIRIS-REx



MARS

MSL
MSR



LUNAR

Apollo
LADEE (Lunar Atmosphere and
Dust Environment Explorer)

CIS-LUNAR

DSG (Deep Space Gateway)

GEO

GEO

RSGS (Robotic Servicing in
Geosynchronous Space)
BSS 604/702

LEO

LEO

Orbital Express
International Space Station
- Timeliner
- ZPM
- SAFER astronaut return
Cygnus
Restore-L
Dream Chaser
XSS-II
Shuttle
Hubble
DMSP
DARPA Phoenix
TACSAT-2
CYGNSS

MEO


MEO

GPS



SUN

Parker Solar Probe



At Draper, we believe exciting things happen when new capabilities are imagined and created.

Whether formulating a concept and developing each component to achieve a field-ready prototype or combining existing technologies in new ways, Draper engineers apply multidisciplinary approaches that deliver new capabilities to customers. As a not-for-profit research and development company, Draper focuses on the design, development and deployment of advanced technological solutions for the world's most challenging and important problems.

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CONTACT

Kim Slater
kslater@draper.com

WWW.DRAPER.COM

17-0226