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SPACE OPERATIONS SYMPOSIUM (B6)
New Operations Concepts, Advanced Systems and Commercial Space Operations (2)

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ROBOTIC SERVICING OF GEOSYNCHRONOUS SATELLITES

Abstract

A persistent satellite servicing capability has been a longstanding desire of space operators. Satellites have not been equipped with features for serviceability because of the absence of a servicing vehicle. Hundreds of military, government and commercial satellites reside today in geosynchronous Earth orbit (GEO) some 22,000 miles (36,000 kilometers) above the Earth—a perch ideal for communications, meteorology and national security services. GEO is so remote that those satellites—each of which is worth hundreds of millions or billions of dollars—will never return to Earth, and to date they have never been inspected, repaired or upgraded. DARPA has been working to develop and demonstrate technologies for cooperatively inspecting and robotically servicing operational systems in GEO, including those systems not specially equipped for servicing. DARPA's new Robotic Servicing of Geosynchronous Satellites (RSGS) program seeks to develop and send to orbit a GEO robotic servicing vehicle long sought by the space community. A multi-jointed robotic arm would enable automated docking with satellites not designed to accommodate such hands-on assistance. DARPA has already performed substantial risk-reduction testing on a robotic arm design, which would enable robotic servicing missions today to be lower risk than in times past. DARPA has also developed advanced software designed to make space robotic operations safer and more reliable. Onboard mission-planning software and a variety of sensors would provide a high-fidelity picture during operations and quick responses to the unexpected. The flight system would have an automated multi-arm robotic payload integrated onto a long-life GEO bus. The ability to safely and cooperatively interact with satellites in GEO is anticipated to revolutionize military and commercial space operations, lowering satellite construction and deployment costs and improving satellite lifespan, resilience and reliability. No longer would such assets need to be designed to operate on the assumption that upgrades or repairs would be impossible—a reality that, until now, has driven a need for extreme engineering and concomitant increases in size, complexity and cost.