National Aeronautics and Space Administration

NASA**facts**

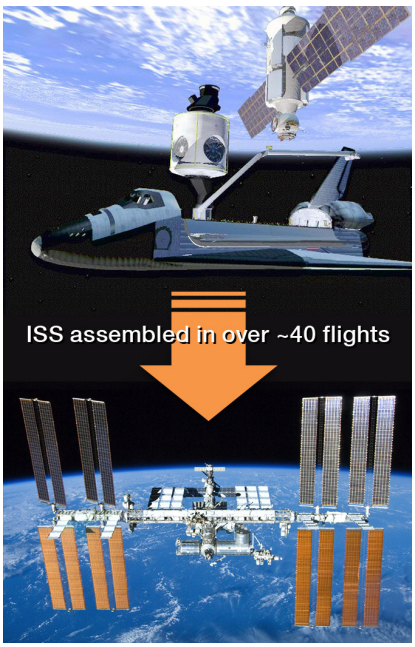
Space Technology

Game Changing Development

SALSSA: Space Assembly of Large Structural System Architectures

Except for the International Space Station (ISS), all current spacecraft are transported to orbit as an integrated unit using a single launch vehicle. This limits the mass, size and performance of the spacecraft system. The goal of Space Assembly of Large Structural System Architectures (SALSSA) is to develop technologies for automated in-space assembly of large, modular, structural systems and then, with the same technologies, enable the ability to service, refurbish or reconfigure those systems to extend their lives or repurpose them for new missions. This new paradigm of assembly and repurposing is expected to improve spacecraft performance while lowering the cost and risk of future missions.

The ISS was assembled from a relatively small number of very large and massive modules requiring several launches. The modules and components were positioned and berthed telerobotically, then permanent mechanical and utility line connections were completed by extravehicular activity (EVA) astronauts. While both intravehicular activity telerobotics and EVA operations are highly effective for assembly, they are currently limited to low-Earth orbit locations, require support for the human presence in space, and are limited based on the time the crew can perform the activity. Other spacecraft that are autonomous and able to launch as one unit can employ various deployable systems (solar arrays, radiators, antennas) to complete the spacecraft configuration. As the spacecraft size and complexity increase, the number of deployable mechanisms increases as does the potential for deployment failure.



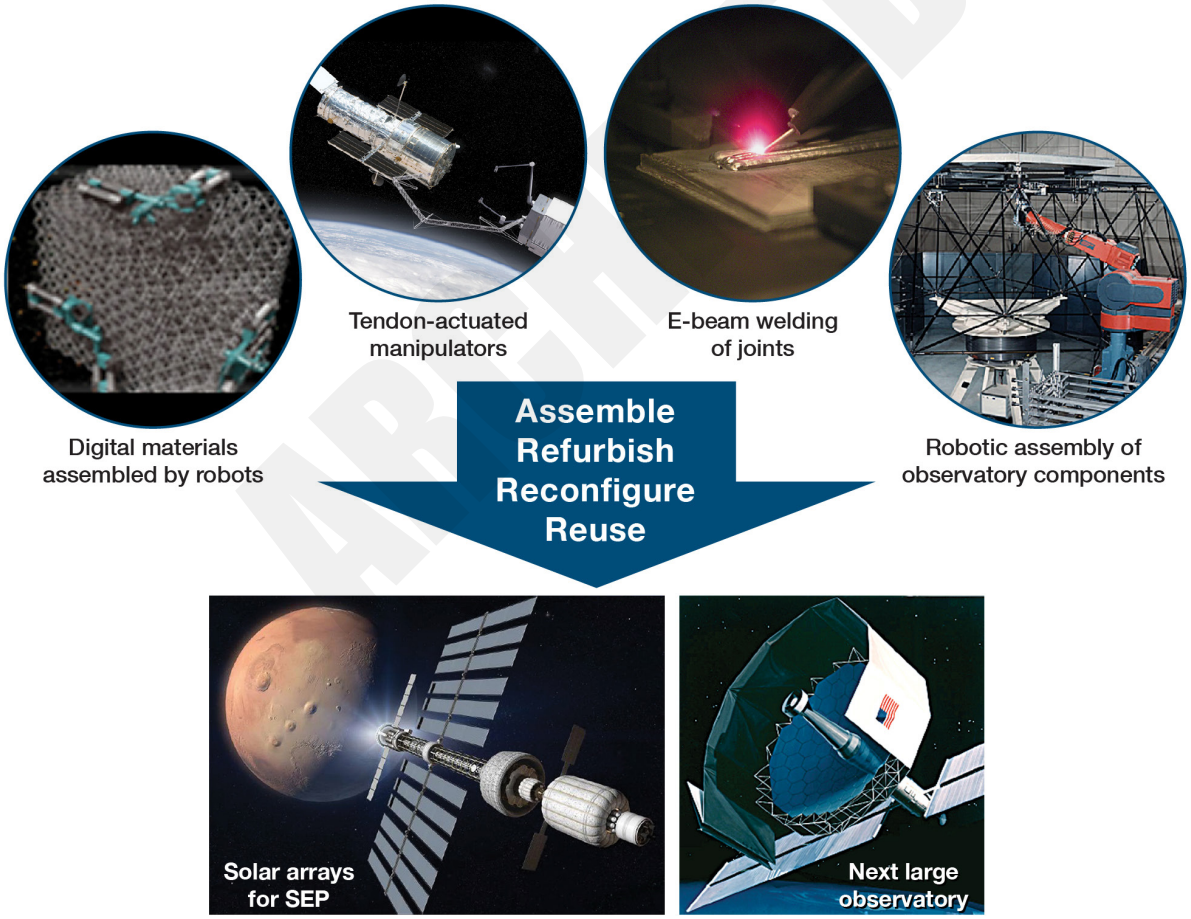
In both cases, reconfiguration and reuse, while desired, are seldom considered part of the final spacecraft design. In addition, servicing spacecraft has been limited to EVA operations for the Hubble Space Telescope.

SALSSA is a Game Changing task that will investigate three systems for automated in-space assembly of scalable and reconfigurable structures. These systems include a large space observatory, a megawatt solar array for Solar Electric Propulsion (SEP), and the repurposing of Mars mission components. The SALSAA team will look across new and emerging technologies as well as existing technologies in digital materials, structural assembly and fabrication concepts, structural joining methods, and robotic assembly and manipulation to identify assembly techniques and technologies that are cross-cutting, versatile and can be applied to many different mission architectures. SALSAA will recommend a technology development and implementation plan for future programs in in-space assembly and reconfiguration of large structures.

The Game Changing Development (GCD) Program investigates ideas and approaches that could solve significant technological problems and revolutionize future space endeavors. GCD projects develop technologies through component and subsystem testing on Earth to prepare them for future use in space. GCD is part of NASA's Space Technology Mission Directorate.

For more information about GCD, please visit http://gameon.nasa.gov/

New technologies for in-space assembly



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