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# THE LIGHTWEIGHT INTEGRATED SOLAR ARRAY AND ANTENNA (LISA-T) - BIG POWER FOR SMALL SPACECRAFT

**Abstract**

NASA is developing a space power system using lightweight, flexible photovoltaic devices originally developed for use here on Earth to provide low cost power for spacecraft. The Lightweight Integrated Solar Array and anTenna (LISA-T) is a launch stowed, orbit deployed array on which thin-film photovoltaic and antenna elements are embedded.

The LISA-T system is deployable, building upon NASA's expertise in developing thin-film deployable solar sails such the one being developed for the Near Earth Asteroid Scout project which will fly in 2018. One of the biggest challenges for the NEA Scout, and most other spacecraft, is power. There simply isn't enough of it available, thus limiting the range of operation of the spacecraft from the Sun (due to the small surface area available for using solar cells), the range of operation from the Earth (low available power with inherently small antenna sizes tightly constrain the bandwidth for communication), and the science (you can only power so many instruments with limited power). The LISA-T has the potential to mitigate each of these limitations.

Inherently, small satellites are limited in surface area, volume, and mass allocation; driving competition between their need for power and robust communications with the requirements of the science or engineering payload they are developed to fly. LISA-T is addressing this issue, deploying large-area arrays from a reduced volume and mass envelope – greatly enhancing power generation and communications capabilities of small spacecraft and CubeSats. The problem is that these CubeSats can usually only generate between 7W and 50W of power. The power that can be generated by the LISA-T ranges from tens of watts to several hundred watts.

A matrix of options are in development, including planar (pointed) and omnidirectional (non-pointed) arrays. The former is seeking the highest performance possible while the latter is seeking spacecraft attitude control simplicity. In both cases, power generation ranges from tens of watts to several hundred with an expected specific power ¿250W/kg and a stowed power density ¿200kW/m3. Options for leveraging both high performance, 'typical cost' triple junction thin-film solar cells as well as moderate performance, low cost cells are being developed.

Alongside, both UHF (ultra high frequency) and S-band antennas are being integrated into the array to move their space claim away from the spacecraft and open the door for omnidirectional communications and electronically steered phase arrays.