tion of very thin composite 20-cm-diameter laminate face sheets with good as-fabricated optical figure was developed. The approach is a new mandrel resin surface deposition onto previously fabricated thin composite laminates.

2. Matrix (regenerative) power topology: Waveform correction can be achieved across an entire face sheet at 6 kHz, even for large actuator counts. In practice, it was found to be better to develop a quadrant drive, that is, four quadrants of 169 actuators behind the face sheet. Each quadrant has a single, small, regenerative power supply driving all 169 actuators at 8 kHz in effective parallel.

3. Q-switch drive architecture: The Q-switch innovation is at the heart of the matrix architecture, and allows for a very fast current draw into a desired actuator element in 120 counts of a MHz clock without any actuator coupling.

This work was done by Gareth J. Knowles, Ross W. Bird, and Brian Shea of QorTek and Peter Chen of the Catholic University of America for Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-15666-1

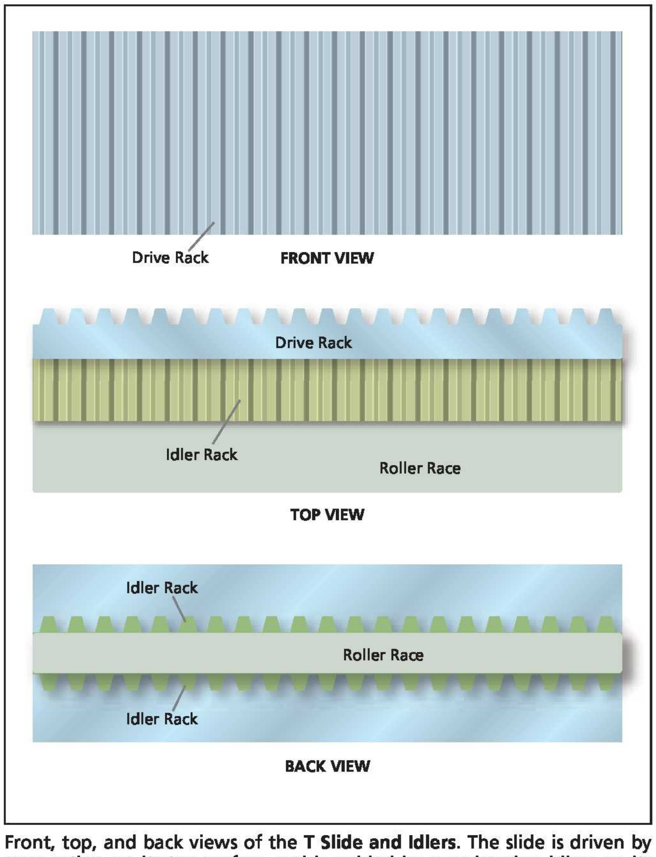
T-Slide Linear Actuators

These long-stroke linear slide actuators can hold their position with power off.

Goddard Space Flight Center, Greenbelt, Maryland

T-slide linear actuators use gear bearing differential epicyclical transmissions (GBDETs) to directly drive a linear rack, which, in turn, performs the actuation. Conventional systems use a rotary power source in conjunction with a nut and screw to provide linear motion. Non-back-drive properties of GBDET's make the new actuator more direct and simpler. Versions of this approach will serve as a long-stroke, ultra-precision, position actuator for NASA science instruments, and as a rugged, linear actuator for NASA deployment duties.

The T slide can operate effectively in the presence of side forces and torques. Versions of the actuator can perform ultra-precision positioning. A basic T-slide actuator is a long-stroke, rack-and-pinion linear actuator that, typically, consists of a T slide, several idlers, a transmission to drive the slide (powered by an electric motor) and a housing that holds the entire assembly. The actuator is driven by gear action on its top surface, and is guided and constrained by gear-bearing idlers on its other two parallel surfaces.



Front, top, and back views of the **T Slide and Idlers**. The slide is driven by gear action on its top surface and is guided by gear-bearing idlers on its other two parallel surfaces.

The geometry, implemented with gear-bearing technology, is particularly effective. An electronic motor operating through a GBDET can directly drive the T slide against large loads, as a rack and pinion linear actuator, with no break and no danger of back driving. The actuator drives the slide into position and stops. The slide holes position with power off and no brake, regardless of load. With the T-slide configuration, this GBDET has an entire T-gear surface on which to operate. The GB idlers coupling the other two T slide parallel surfaces to their housing counterpart surfaces provide constraints in five degrees-of-freedom and rolling friction in the direction of actuation. Multiple GB idlers provide roller bearing strength sufficient to support efficient, rolling friction movement, even in the presence of large, resisting forces.

T-slide actuators can be controlled using the combination of an off-the-shelf, electric servomotor, a motor angle resolution sensor (typically an encoder or resolver), and microprocessor-based intelligent software. In applications requiring precision positioning, it may be necessary to add strain gauges to the T-slide housing. Existing sensory-interactive motion control art will work for T slides. For open-loop positioning, a stepping motor emulation technique can be used.

This work was done by John Vranish of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-15023-1