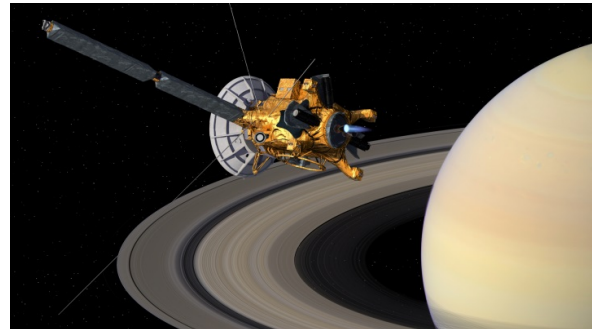


### Instrument Door and Cover Systems

Sierra Nevada Corporation's (SNC) Space Systems instrument door and cover systems provide a simple, robust, heritage solution for most spacecraft applications. Sensitive spacecraft instruments can require a wide range of protection from external threats such as dust particles, contaminants, and stray light. Some systems even require a hard space vacuum to be preserved prior to use in space to maintain sensor integrity. As both a component supplier and system integrator, SNC leverages in-house technologies and significant flight heritage to meet the most stringent requirements under the most extreme environments with the lowest-risk solutions.

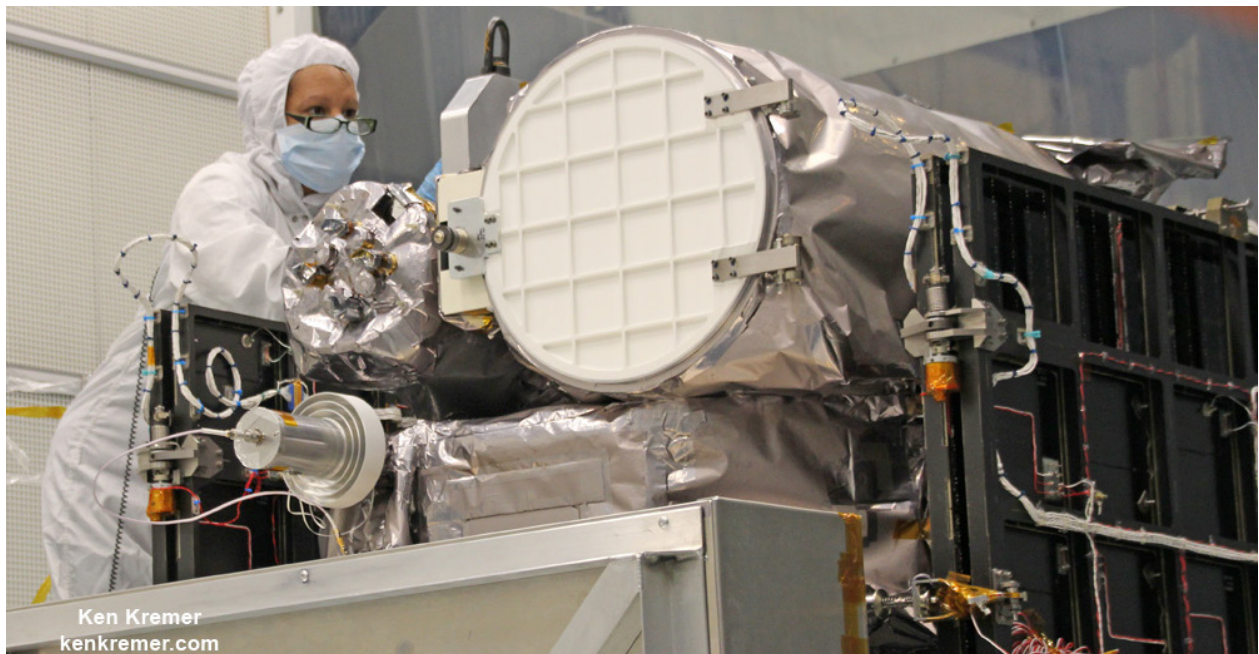
SNC's instrument doors and covers are turn-key, providing a complete end-to-end solution that can be simply bolted onto the spacecraft instrument aperture interface. Our cover systems are typically comprised of four primary elements: the door and cover structure; the latch mechanism; the seal system, and the hinge system.



**SNC Cover System Flown on Cassini** SNC's cover systems span a wide range of programs with flight-proven heritage, providing robust solutions for most spacecraft applications.

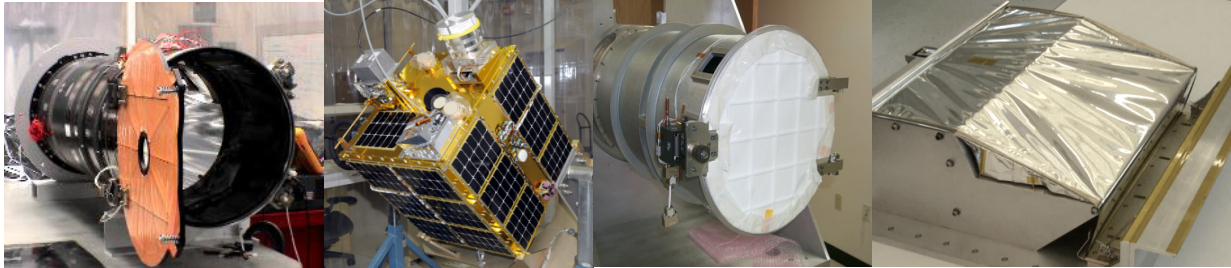
Credit: NASA

Features	
• Turn-key systems and mechanisms	• Lightweight door structures; variety of seals available
• Redundant latch mechanisms with simple re-set and high reuse	• Experience with a wide range of sizes from 1 inch to >3 feet in diameter
• Thin-film, roll-up covers available for ultra-lightweight needs	• One time open systems with positive latch out at end of travel, to motorized systems requiring many open-close cycles



**SNC's DISCOVER EPIC Camera Door System.** This door system was used on NASA's Deep Space Climate Observatory (DISCOVER) Earth Polychromatic Imaging Camera (EPIC) instrument.

Credit: Ken Kremer



**Swift UVOT- XRT**  
(SNC Photo)

**FASTSAT TTI**  
(Credit: NASA)

**DISCOVER EPIC Camera Door**  
(SNC Photo)

**CrIS Cooler Cover**  
(SNC Photo)

**SNC Heritage Door and Cover Systems.** SNC has contributed doors and cover systems to a wide variety of spacecraft programs, including Swift UVOT XRT, FASTSAT TTI, DISCOVER EPIC Camera Door, and CrIS Cooler Cover, as shown above in these examples.

Heritage Cover System Programs	
<ul style="list-style-type: none"> <li>• Cassini Plasma Spectrometer (CAPS)</li> <li>• Swift Ultraviolet/Optical Telescope (UVOT) and X-ray Telescope (XRT)</li> <li>• Deep Space Climate Observatory (DSCOVR, formerly Triana) Earth Polychromatic Imaging Camera (EPIC)</li> <li>• Clementine</li> <li>• Earthwatch</li> <li>• Cross-track Infrared Sounder (CrIS) Cooler</li> <li>• Government Missions</li> </ul>	<ul style="list-style-type: none"> <li>• Atmospheric Infrared Sounder (AIRS) Earthshield</li> <li>• Europa Mass Spectrometer for Planetary Exploration (MASPEX)</li> <li>• Fast, Affordable, Science and Technology Satellite (FASTSAT) Thermospheric Temperature Imager (TTI)</li> <li>• Mars 2001 In-situ Propellant Production Precursor (MIP)</li> <li>• IKONOS (Space Imaging Remote Sensing System)</li> <li>• OrbView-3 and -4 (multispectral imagery satellite)</li> </ul>

### Instrument Door and Cover Structure

The door and cover structure consists of lightweight, machined aluminum or composite materials. These structures are available for use on rigid doors, including door paint/tape surface preparations to reflect light and heat away from the instrument, or ultra light-weight, thin-film covers that simply un-latch and roll-up to expose the aperture.

### Latch Mechanism

The latch mechanism keeps the door closed during launch and in-space loads. Simple High Output Paraffin (HOP) or Shaped Memory Alloy (SMA) actuators offer ease of use, with hundreds of operation cycles possible with zero latch refurbishment. Single string, electrically redundant and fully mechanically redundant designs are available. SNC also offers latches that can "re-latch" the door closed for multiple open-close cycle applications, as well as separation nuts for systems requiring a robust pre-load of the door prior to launch.

### Seal System

The seal system keeps external environments away from the sensor. SNC has experience with seals ranging in complexity from simple labyrinth types to keep out stray light, to lightweight foam seals to keep out dust and other particulates, to O-rings with non-stiction features to hold a light differential pressure. SNC also has experience with a variety of seal approaches (knife edge seals and others) for holding a hard space vacuum inside the cover.

### Hinge System

The hinge system opens the door and exposes the sensor view and features: 1) simple, one-time open spring hinges, with or without dampers; 2) lock-out at end of rotation to preclude bounce back; and 3) motorized hinge-lines and control electronics for multiple open-close cycles.