Lockheed Martin Solar X-Ray Imager To Be Launched On NOAA GOES-N Spacecraft

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The Solar X-ray Imager (SXI) instrument, designed and built at the Lockheed Martin Space Systems Advanced Technology Center (ATC) for the NASA Goddard Space Flight Center (GSFC) in Greenbelt, Md., is awaiting launch on the NOAA GOES-N spacecraft from the Cape Canaveral Air Force Station, Fla. SXI is one of a suite of instruments that resides on the current generation of Geostationary Operational Environmental Satellites (GOES).

"We are extremely pleased to have our first SXI instrument ready for launch and look forward to seeing it operating on-orbit," said Mons Morrison, SXI program manager at the ATC. "While the other GOES instruments provide near-constant viewing of the Earth, SXI is designed to view the Sun and provide vital information regarding solar activity."

The SXI, one of a suite of instruments on the GOES-N satellite, will be used to aid National Oceanic and Atmospheric Administration (NOAA) and U.S. Air Force personnel in issuing forecasts and alerts of "space weather" conditions, and in developing a better understanding of Sun-related phenomena that affect the Earth's environment. Turbulent "space weather" can affect radio communication on Earth, induce currents in electric power grids and long distance pipelines, cause navigational errors in magnetic guidance systems, upset satellite circuitry and expose astronauts to increased radiation.

A prototype SXI was developed, tested, and calibrated by NASA's Marshall Space Flight Center in Huntsville, Ala., in conjunction with GSFC, NOAA, and the Air Force, and launched aboard the GOES-M satellite in July 2001. The new SXI on GOES-N has a factor of two greater spatial resolution than the prototype, and like some high-end home video cameras, it has active internal jitter compensation that provides a stable picture even when the spacecraft is moving. Additionally, more sophisticated computer control allows SXI to react automatically to changing solar conditions.

SXI will observe solar flares, coronal mass ejections, coronal holes and active regions in the X-ray region of the electromagnetic spectrum from 6 to 60 A (Angstroms). These features are the dominant sources of disturbances in space weather that lead to, for example, geomagnetic storms. SXI will also examine flare properties, newly emerging active regions, and X-ray bright points on the Sun.

SXI will provide continuous, near real-time observation of the Sun's corona, acquiring a full-disk image every minute. The images cover a 42 arc- minute field of view with five arc-second pixels. The Sun, as viewed from Earth, is approximately 32 arc-minutes in diameter. By recording solar images every minute, NOAA observers will be able to detect and locate the occurrence of solar flares. This is the name given to the explosive releases of vast amounts of magnetic energy in the solar atmosphere. Since scientists are not yet able to predict the occurrence, magnitude or location of solar flares, it is necessary to continually observe the Sun to know when they are happening.

When a flare erupts, it throws out large clouds of ionized, or electrically charged, gas. A small fraction of the cloud is very energetic and can reach the Earth within a few minutes to hours of the flare being observed. These energetic particles pose a hazard to both astronauts and spacecraft.

Coronal mass ejections, which are often associated with flares, take several days to reach the Earth. Fast, powerful ejections give rise to geomagnetic storms, which can disrupt radio transmissions and induce large currents in power transmission lines and oil pipelines. They have resulted in large-scale failures of the North American power grid and greatly increased pipeline erosion. SXI also will monitor coronal holes -- persistent sources of high-speed solar wind. As the Sun rotates every 27 days, these sources spray across the Earth like a lawn sprinkler and cause recurring geomagnetic storms.

The Solar and Astrophysics Laboratory at the ATC has a long heritage of spaceborne solar instruments including the Soft X-ray Telescope on the Japanese Yohkoh satellite, the Michelson Doppler Imager on the ESA/NASA Solar and Heliospheric Observatory, and the solar telescope on

NASA's Transition Region and Coronal Explorer. The laboratory also conducts basic research into understanding and predicting Space Weather and the behavior of our Sun including its impacts on Earth and climate.

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