

Lockheed Martin Delivers Helioseismic And Magnetic Imager To Goddard Space Flight Center For NASA's Solar Dynamics Observatory

The Helioseismic and Magnetic Imager (HMI), an instrument for NASA's Solar Dynamics Observatory (SDO), has been delivered to NASA's Goddard Spacecraft Center for integration on SDO, which is scheduled to launch in December 2008. The HMI was designed in collaboration with Professor Philip Scherrer, HMI Principal Investigator, and other scientists at Stanford University. The instrument was built at the Solar and Astrophysics Laboratory of the Lockheed Martin Advanced Technology Center (ATC) in Palo Alto.

(Photo: <http://www.newscom.com/cgi-bin/prnh/20071115/AQTH061>)

"HMI combined with our partner instruments on SDO -- the Atmospheric Imaging Assembly and the Extreme Ultraviolet Variability Experiment -- will provide us with the data needed to first learn if predictions of solar activity are possible," said Professor Scherrer. "Then, if we and our colleagues in the solar physics community are clever enough, we'll actually develop forecast methods. This is an exciting time for studying the Sun and its impact on the Earth."

The primary goal of the HMI investigation on SDO is to study the origin of solar variability and to characterize and understand the Sun's interior and magnetic activity. Because of the turbulence in the convection zone near the surface, the Sun is figuratively ringing like a bell. By studying these oscillations of the visible surface of the Sun, considerable insight can be gained into the processes inside. In effect the solar turbulence is analogous to earthquakes. In manner similar to how seismologists can learn about the interior of the Earth by studying the waves generated in an earthquake, HMI's helioseismologists will learn about the structure, temperature and flows in the solar interior.

"This is a very satisfying milestone for us, as the delivery of HMI for mounting on the SDO spacecraft brings us a big step closer to having this spectacular instrument in space watching the Sun," said solar physicist -- and co-investigator on HMI -- Dr. Alan Title of the ATC. "HMI will provide us with sonograms of the Sun that will show us sunspots and magnetic fields before they appear on the visible surface. We'll even be able to see through the Sun and be aware of the birth of spots on the side facing away from us, allowing us to be ready for them as they rotate into our view. Moreover, HMI's high spatial resolution and full-Sun coverage will give us much more time to study magnetic field evolution in detail."

HMI will produce data necessary to determine the interior sources and mechanisms of solar variability and how the physical processes inside the Sun are related to surface magnetic field and activity. Because HMI can measure the strength and direction of the magnetic field on the surface, more precise estimates of the coronal magnetic field are possible. In addition, HMI observations will clarify the relationships between internal solar dynamics and magnetic activity, providing a better understanding of solar variability and its effects. The knowledge gained will enable a major advance in the development of a reliable predictive capability for solar flares and coronal mass ejections. The prediction of these violent solar events, how they travel through the solar system and where they are likely to impact is one of the key elements of the NASA's Living With a Star (LWS) program. It is also of critical importance to the NASA Vision for Space Exploration, and a human presence on the Moon.

The goal of SDO is to understand -- striving towards a predictive capability -- the solar variations that influence life on Earth and humanity's technological systems. The mission seeks to determine how the Sun's magnetic field is generated and structured, and how this stored magnetic energy is converted and released into the heliosphere and geospace in the form of solar wind, energetic particles, and variations in the solar irradiance.

The SDO spacecraft will also be a flagship in the Heliophysics Great Observatory, a series of missions designed to monitor the Sun and the heliosphere. As humans venture outward from Earth to the Moon, Mars and beyond their safety depends upon, at least in part, an ability to forecast energetic events on the Sun. Because both people and planets constantly move with respect to the Sun, it is also essential to understand how the energy released by these solar events travels through the heliosphere in order to properly assess the impact on space travelers wherever they may be in the solar system.

The Solar and Astrophysics Laboratory at the ATC has a 44-year-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, the solar telescope on NASA's Transition Region and Coronal

Explorer, the Solar X-ray Imager on the GOES-N environmental satellite, the Focal Plane Package on Hinode and an Extreme Ultraviolet Imager on each of the two spacecraft in NASA's Solar Terrestrial Relations Observatory. The laboratory also conducts basic research into understanding and predicting space weather and the behavior of the Sun including its impacts on Earth and climate.

The ATC is the research and development organization of Lockheed Martin Space Systems Company (LMSSC). LMSSC, a major operating unit of Lockheed Martin Corporation, designs, develops, tests, manufactures and operates a full spectrum of advanced-technology systems for national security, civil and commercial customers. Chief products include human space flight systems; a full range of remote sensing, navigation, meteorological and communications satellites and instruments; space observatories and interplanetary spacecraft; laser radar; fleet ballistic missiles; and missile defense systems.

Headquartered in Bethesda, Md., Lockheed Martin employs about 140,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services. The corporation reported 2006 sales of \$39.6 billion.

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