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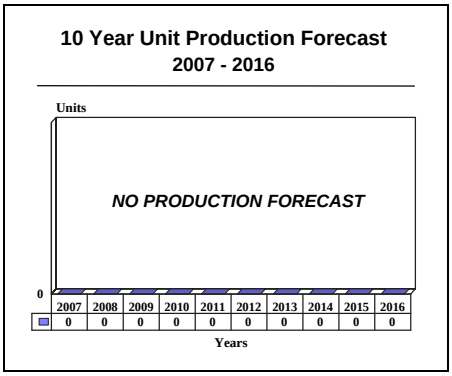
Solar-B - Archived 3/2008

Outlook

- Solar-B was launched in September 2006 on an M-V rocket
- Follow-on Solar observation mission is possible in outyears
- This report will be archived in 2008



Orientation

Description. Solar-B is a large optical telescope that will examine the Sun. The mission is part of an overall Japanese program designed to study the dynamics of solar activity and is the second mission in the Solar Terrestrial Probes (STP) Program, an international effort.

Sponsor. Sponsors of the program are JAXA, Japan; NASA, U.S.; and the Particle Physics and Research Council (PPARC), United Kingdom.

Status. Solar-B was launched in September 2006. Yohkoh (Solar-A) was launched in 1991 on board a Japanese M-3SII rocket.

Total Produced. Solar-B is operational.

Application. Solar-B is the successor to the Solar-A mission, and will continue to study the connections between fine magnetic field elements in the photosphere and the structure and dynamics of the entire solar atmosphere.

Price Range. The estimated cost of the Solar-B program is $200 million, which was divided among the program sponsors.

Contractors

Prime

Mitsubishi Electric Corp	http://global.mitsubishielectric.com, Tokyo Bldg, 2-7-3, Marunouchi, Chiyoda-ku, Tokyo, 100-8310 Japan, Tel: + 81 3 3218 2111, Fax: + 81 3 3218 2185, Prime

Subcontractor

Japan Aerospace Exploration Agency, JAXA	http://www.jaxa.jp/index_e.html, Marunouchi Kitaguchi Bldg, 1-6-5 Marunouchi, Chiyoda-ku, Tokyo, 100-8260 Japan, Tel: + 81 3 6266 6000 (Spacecraft; Optical Telescope; Launch Vehicle)
NASA	http://www.hq.nasa.gov, NASA Headquarters, Washington, DC 20546-0001 United States, Tel: + 1 (202) 358-0000, Fax: + 1 (202) 358-3251 (Focal Plane Package; X-Ray Telescope and Extreme UV Spectrometer Components)

Solar-B

Particle Physics and Research Council, PPARC	http://www.pparc.ac.uk, Polaris House, North Star Ave, Swindon, SN2 1SZ Wiltshire, United Kingdom, Tel: + 44 0179 344 2000, Fax: + 44 0179 344 2125 (EIS Instrument Structure; CCD Camera and Associated Electronics)
U.S. Naval Research Laboratory	http://www.nrl.navy.mil/, Washington, DC United States (Focal Plane Package; X-Ray Telescope and Extreme UV Spectrometer Components)

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Artist's Impression of Solar-B and Instrumentation

Source: MSFC/NASA

Technical Data

Design Features. The payload package for Solar-B includes a solar optical telescope (SOT), an X-ray telescope (XRT), and an EUV Imaging Spectrometer (EIS).

The solar optical telescope is a diffraction-limited, aplanatic Gregorian-type instrument. It has an aperture of 0.5 meters and an angular resolution of 0.2 arcsec. Included is a focal plane package (FPP) with a filter vector magnetograph and spectro-polarimeter. The filter vector magnetograph will provide a time series of photospheric vector magnetograms, and will also measure Doppler velocity intensity. The spectrometer will show detailed Stokes line profiles of intensity and polarization. It has a spectral resolution of 2.0 nm.

The X-ray telescope will provide coronal images at different temperatures. It has an angular resolution of 1.0 to 2.5 arcsec.

The EIS has a 400-arcsec field of view and a wavelength range of 25-29 nm. This instrument will display Doppler line widths as well as monochromatic images.

	Metric	U.S.
Weights		
Mass	875 kg	1,929.4 lb
Performance		
Design Life	3 years	
Orbit	Polar, Sun-synchronous	
Attitude	Solar Pointed	
Power	1,000 W	
Solar Arrays	2	
Communication	X-band, S-band	

Variants/Upgrades

Solar-A (Yohkoh). Solar-A was launched in 1991 aboard an M-3SII launch vehicle from Kagoshima Space Center, Japan. The satellite, developed by teams from Japan, the United Kingdom, and the United States, was designed to study solar physics.

Program Review

Background. Plans for the Solar-A upgrade began in 1997. ISAS' request for design funding was denied. Instead, funding went to the Astro-E and Muses-C missions. However, Japan provided funding for an additional preliminary design phase in order to keep the Solar-B program alive.

The following year, the Solar-B mission received only $820,000 of the $165 million requested. Furthermore, additional budget cuts were implemented in 1998, forcing ISAS to delay the program further.

In 2001, Solar-A succeeded in observing the one-year cycle of solar activity (about 11 years) for the first time. That same year, mission engineers completed the Solar-B instrument design review. All three Solar-B instruments were approved, signaling the beginning of the construction and engineering test model phase.

In December 2001, the Solar-A power supply to the payload instruments had been shut down as a result of an annular eclipse. The spacecraft was unable to generate enough power, and the battery was discharged. Scientific operations were suspended as ISAS attempted to recharge the satellite's battery.

Yohkoh Mission Comes to an End. In May 2002, ISAS announced that it was unable to sufficiently recharge the Yohkoh (Solar-A) spacecraft's batteries, and that the satellite had undergone almost every orbital and attitude configuration, to no avail. After 10 years of operation, the Yohkoh mission came to an end. The satellite will be monitored for engineering data until its re-entry.

Vibration Testing Complete. Structural models of telescopes and their bus modules had already been made, and they were brought to ISAS, along with test staff, at the beginning of May 2002 for vibration tests, which continued throughout July.

And Then There Was One. After concluding that activity within Japan's various space agencies often overlapped, in 2001 the Japanese government opted to merge the National Space Development Agency of Japan (NASDA), the Institute of Space and Astronautical Science (ISAS), and the National Aerospace Laboratory (NAL). The official English name of this group is the Japanese Aerospace Exploration Agency (JAXA). The change took effect in October 2003.

According to the decision proposed by the Ministry of Finance, the three organizations will collaborate on all projects through the establishment of a joint program office. This office will coordinate all efforts, including launch vehicle development, spacecraft development, and the sharing of ground facilities.

Significant News

Transit Observed – Mercury passed in front of the sun from 19:12 UT on November 8 to 00:09 UT on November 9. The Mercury Transit was observed in Asian countries including Japan. Solar-B, now called Hinode, observed the event without atmospheric distortion while in sun-synchronous orbit around the Earth. (JAXA, 11/06)

Solar-B

Solar-B Launched and Renamed – JAXA launched the Solar-B aboard the seventh M-V Launch Vehicle at 6:36 a.m. on September 23, 2006 (Japan Standard Time, JST) from the Uchinoura Space Center (USC). The launch vehicle flew smoothly, and after the third stage engine burnout, it was confirmed that the satellite was safely injected into its scheduled orbit. As is the tradition in Japan, the in-orbit Solar-B was given a new name of "Hinode" – meaning "sunrise." (JAXA, 9/06)

Funding

For FY03, the Ministry of Education, Science and Sports allocated $15.9 million for the Solar-B project, while in FY04 $26 million was allocated. Japan provided approximately $90 million in total funding through 2005.

NASA funding is provided under the Office of Space Science.

U.S. FUNDING

	Prior AMT	FY03 AMT	FY04 AMT	FY05 AMT	FY06 AMT
Payload and Instrument Development	64.9	17.2	12.4	12.2	11.3

All $ are in U.S. millions.

Timetable

Month	Year	Major Development
Sep	2006	Solar-B launched aboard an M-5 rocket

Forecast Rationale

Solar-B was successfully launched on schedule in September 2006 and was renamed "Hinode," which translated from Japanese means "sunrise." After only a few short months in orbit, the spacecraft is already living up to its hype observing the transit of Mercury in November 2006 with stunning clarity. Hinode also observed a dynamic eruption above a sunspot seen in Ca II H spectral line, which was first discovered by Solar Optical Telescope (SOT). The spacecraft is operating perfectly and should continue to provide imagery through its planned lifetime. Additional solar observation spacecraft are likely but will probably fall outside the 10-year forecast period. JAXA will feel pressure to maintain data continuity if the Hinode spacecraft continues to dazzle the scientific community as it already has in its first few months of operation. This report will be archived in 2008.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

		High Confidence Level			Good Confidence Level				Speculative			
Space System	thru 06	07	08	09	10	11	12	13	14	15	16	Total 07-16
JAXA												
SOLAR-B	1	0	0	0	0	0	0	0	0	0	0	0
Total Production	1	0	0	0	0	0	0	0	0	0	0	0