

# National Aeronautics and Space Administration

## Press Kit



# TIMED Mission

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## **Table of Contents Page**

TIMED Pre-Launch Release - 3

Media Services Information 5

Spacecraft Quick Facts 6

Delta II Launch Vehicle Illustration 8

Science Objectives 9

Science Instruments 11

Program/Project Management 12

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## **IT'S ABOUT TIMED: NASA SPACECRAFT WILL USE LOFTY PERCH TO STUDY GATEWAY TO SPACE**

A NASA mission will soon reveal the well-kept secrets of a mysterious region situated 40 to 110 miles (about 60 to 180 kilometers) above the Earth called the Mesosphere and Lower Thermosphere/Ionosphere (MLTI), where electrical currents surge and auroras cast an eerie glow over the Northern and Southern hemispheres.

The Thermosphere, Ionosphere, Mesosphere, Energetics and Dynamics (TIMED) mission will uncover the mysteries of this region by producing the very first set of comprehensive, global measurements of the MLTI.

TIMED is scheduled to launch Dec. 7 aboard a Delta II rocket from the Western Range of Vandenberg Air Force Base, Calif., during a launch window that extends from 9:58 a.m. to 10:18 a.m. EST (6:58 a.m. to 7:18 a.m. PST).

Studying the MLTI was nearly impossible until now. Conventional airplanes and balloons cannot reach this high altitude, and it is too low for direct satellite measurements. Satellites

traveling at orbital speeds encounter enough particles to burn up, and sub-orbital rockets are limited to studying just one specific area before falling back to Earth after only a few minutes.

This first in a series of six Solar Terrestrial Probes will study the MLTI region from a very high location -- a 388-mile (approximately 625-kilometer) circular orbit around the Earth. TIMED will "share" its launch vehicle with an oceanography mission called Jason-1.

"It is imperative that we learn more about the dynamics of the MLTI because the Sun's energy often has profound effects on the areas directly above and below this region," said Sam Yee, TIMED project scientist at The Johns Hopkins University Applied Physics Laboratory (JHU/APL) in Laurel, Md. "With TIMED, scientists will be able to develop better predictive models of space weather's effects on communications, satellite tracking, spacecraft lifetimes and degradation of spacecraft materials."

TIMED will gather data on the MLTI using four instruments:

- Global Ultraviolet Imager (GUVI). GUVI is an ultraviolet spectrograph designed to measure the composition and temperature profiles of the MLTI region, as well as its auroral energy inputs.
- Solar Extreme Ultraviolet Experiment (SEE). This instrument will observe solar ultraviolet irradiance (the primary energy that is deposited into the MLTI region). SEE will determine how much this energy varies and how it affects the atmosphere and changes its composition.
- TIMED Doppler Interferometer (TIDI). TIDI will measure winds and temperature of the MLTI, determining wind speed and direction by examining minuscule changes in the color of light emitted from chemical constituents in the atmosphere.
- Sounding of the Atmosphere using Broadband Emission Radiometry (SABER). This multi-channel infrared radiometer will measure a wide range of infrared light emitted by the atmosphere at several altitudes.

A unique feature of the TIMED mission is its interdisciplinary approach. The four instrument Principal Investigators, or PIs, will have direct control of their instruments and experiments from the Payload Operations Centers at JHU/APL; NASA Langley Research Center, Hampton, Va.; the University of Colorado, Boulder; and the University of Michigan, Ann Arbor. Each PI institution will send daily commands to the TIMED Mission Operations Center located at JHU/APL, where instructions for the instruments and spacecraft will be gathered and uplinked daily to the TIMED spacecraft. Six interdisciplinary investigators participating in the TIMED mission will analyze and interpret data acquired by the instrument PIs throughout the mission.

NASA and the National Science Foundation are jointly sponsoring a program that will enable

the TIMED spacecraft team to closely collaborate with other scientific community members studying the MLTI. The program takes advantage of the synergy between ground- and space-based instruments and of the scientific contributions made by data assimilation and modeling. One of the most significant contributions of the collaborative investigators' program will be to provide ground-based data complementary to that provided by the TIMED spacecraft.

The TIMED mission cost of \$193 million includes the spacecraft, instrument payload, and launch vehicle. An additional \$42 million has been reserved for data analysis and ground/mission operations. The Solar Terrestrial Probes Program Office at NASA's Goddard Space Flight Center, Greenbelt, Md., manages the TIMED mission for the Office of Space Science, Washington. JHU/APL designed, built and will operate the spacecraft and lead the science effort for NASA during the mission.

For detailed information about the TIMED mission and other Solar Terrestrial Probe missions, go to: <http://stp.gsfc.nasa.gov/missions/timed/timed.htm>

For detailed information about the TIMED spacecraft and instruments, interdisciplinary approach and mission operations, go to: [www.timed.jhuapl.edu](http://www.timed.jhuapl.edu)

## Media Services Information

### NASA Launch Coverage

NASA TV will provide live coverage and commentary of the TIMED launch beginning at 5:50 a.m. PST (8:50 a.m. EST) on December 7. NASA TV is available on GE-2, transponder 9C at 85 degrees West longitude. Audio only is available on the "V" circuits by dialing 321-867-1220, 1240, 1260 or 7135.

A live web cast of the launch also will available at: <http://www.ksc.nasa.gov>

### Press Briefings

The L-14 TIMED **science press conference** will be held Nov. 19 at NASA Headquarters, Washington, DC beginning at 1 p.m. EST. The briefing will provide details on the uniqueness of the mission, science instruments and science objectives. The press conference will be carried live on NASA TV.

A joint Jason-1/TIMED **pre-launch mission briefing** will be held on L-1 (Dec. 6) at 11 a.m. in the Building 840 Conference Room at Vandenberg Air Force Base, Calif., for media attending

the launch. The briefing will focus on launch vehicle and spacecraft readiness, provide a timeline after spacecraft separations through the start of science, and include a weather forecast for launch day. The briefing will be carried live on NASA TV.

### **News Center/Status Reports**

NASA Public Affairs will staff the News Center at the Vandenberg Resident Office (phone: 805-605-3051) beginning on Dec. 5 (L-2) and continuing through launch and receipt of an initial signal from the spacecraft. Recorded status reports will be available on these days by calling **805-734-2693** or **301-286-NEWS**.

### **Launch Media Credentials**

Media with U.S. citizenship seeking launch accreditation must fax their requests to:

George Diller, KSC/PAO

C/O NASA Vandenberg Resident Office

Vandenberg AFB, CA

FAX: 805-605-3380

Foreign media seeking launch accreditation must fax their request **at least ten days** prior to launch to the NASA Vandenberg Resident Office listed above and also to:

30<sup>th</sup> Space Wing Public Affairs Office

Vandenberg Air Force Base

Attn: Msgt. Lloyd Conley

Fax: 805-606-8303

***\*\*\*Requests must be submitted on the letterhead of the news organization and specify the editor making the assignment to cover the launch\*\*\****

### **TIMED Quick Facts**

The TIMED spacecraft is the first of NASA's line of Solar Terrestrial Probes and the first mission ever to conduct a comprehensive, global study of the Earth's Mesosphere and Lower

Thermosphere/Ionosphere (MLTI).

A unique feature of the TIMED mission is its interdisciplinary approach, which will allow the instrument Principal Investigators, or PIs, to have direct control of their instruments and experiments via the Payload Operations Centers located at four places across the country. Each PI institution will send commands daily to the TIMED Mission Operations Center, located at APL. The Mission Operations Center will combine instructions for the instruments and the spacecraft and then uplink them to the spacecraft once daily.

**Spacecraft Dimensions:** 8.93 feet high by 5.29 feet wide in its stowed configuration for launch. On orbit, and after solar array deployment, measurements are 8.93 feet high by 38.47 feet wide tip-to-tip.

**Spacecraft Weight:** 1,294 lbs.

**Spacecraft Power:** 406 watts per orbit

**Prime Mission:** Two years

**Mission Costs:** Approximately \$193 million for the spacecraft, instrument payload, and launch vehicle. An additional \$42 million is reserved for data analysis, ground operations, and mission operations.

**Launch Vehicle:** Boeing Delta II rocket.

**Spacecraft Orbit:** A 388-mile circular orbit around the Earth, inclined at 74.1 degrees from the equator.

**Launch Site and Pad:** Western Range, Vandenberg Air Force Base, Calif. Spacecraft Launch Complex 2W.

**Launch Date and Window:** Dec. 7 during a 20-minute launch window that extends from 6:58 a.m. to 7:18 a.m. PST (9:58 a.m. to 10:18 a.m. EST).

**Spacecraft Separation:** Launch + two hours, five minutes. (Possible initial contact with TIMED may occur via NASA's Tracking and Data Relay Satellite System at two hours, five minutes after launch.)

**Ground Contact with TIMED:** Launch + three hours, two minutes. TIMED mission operations

personnel will contact TIMED via the Universal Space Network ground station in Kiruna, Sweden.

**Actual Science Operations:** Scheduled to begin about 30 days after launch, pending on-orbit checkout of the spacecraft and instruments.

**Mission Management:** TIMED is sponsored by NASA's Office of Space Science in Washington, DC, and managed by the Solar Terrestrial Probes Program Office at Goddard Space Flight Center, Greenbelt, Md. TIMED is the first Solar Terrestrial Probe to launch.

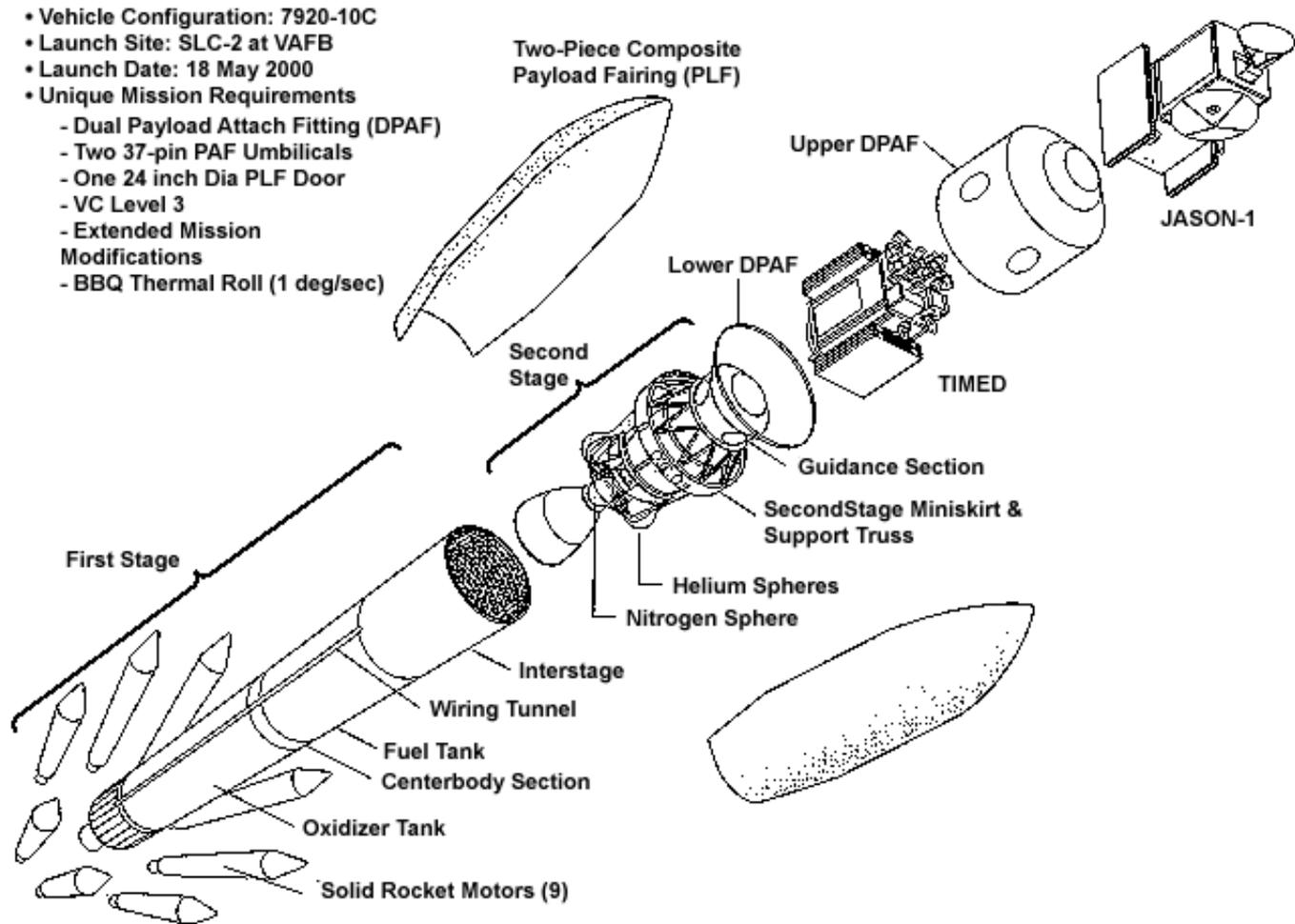
**Spacecraft Design and Operation:** The Johns Hopkins University Applied Physics Laboratory designed, built and will operate the TIMED spacecraft and lead the project's science effort for NASA during the mission.

**Launch Operations:** NASA's Kennedy Space Center is responsible for launch operations at the Western Range, Vandenberg Air Force Base, Calif.

**Payload Operations Center Locations for each instrument:**

- GUVI – JHU/APL, Laurel, Md.
- SABER – NASA's Langley Research Center, Hampton, Va.
- SEE – University of Colorado, Boulder
- TIDI – University of Michigan, Ann Arbor

**TIMED and Jason-1 Spacecraft Line Drawing**

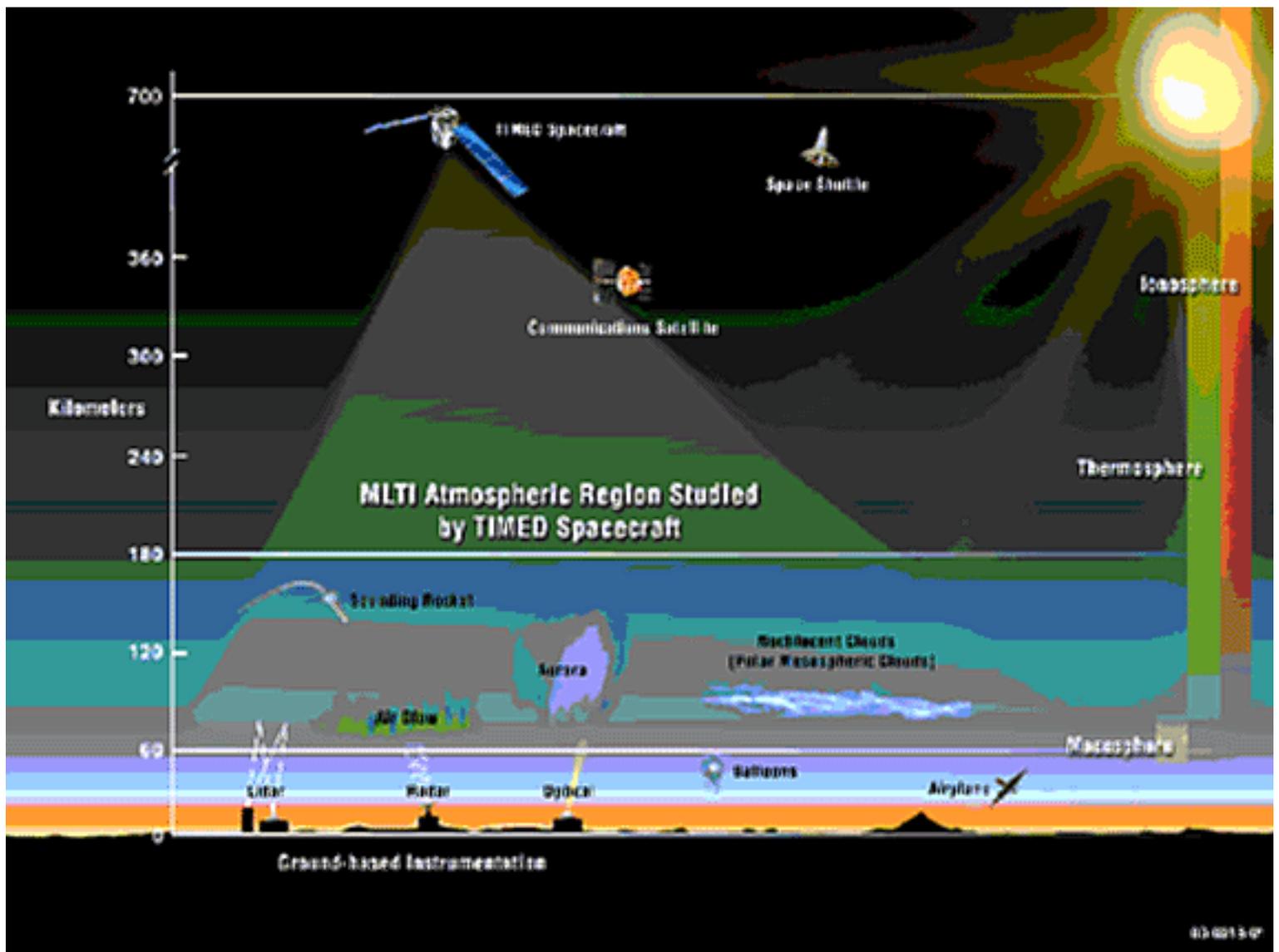


Detailed view of the Delta II rocket, reflecting the location of TIMED and Jason-1 spacecraft in their stowed configuration for launch. Illustration courtesy of Boeing.

## TIMED Science Objectives

The primary scientific objective for TIMED is to understand the Mesosphere and Lower Thermosphere/Ionosphere (MLTI) region's basic pressure, temperature and wind that result from the transfer of energy into and out of this region.

Located approximately 40 to 110 miles above the Earth's surface, the MLTI is highly sensitive to external influences from the Sun, as well as from atmospheric layers below. Its chemical and thermal balance can change rapidly due to naturally occurring *and* human-induced changes to the energy contained within this region.



*Illustration of the TIMED studying the MLTI region from its 388-mile high circular orbit. (Courtesy of JHU/APL)*

The MLTI is a gateway region between the Earth's environment and space where the Sun's energy is first deposited into the Earth's atmosphere. Since the Earth's upper atmospheric regions are connected to the lower portion of the atmosphere where we live, scientists need TIMED to help them better understand the connection between these two regions.

TIMED will also enable scientists to develop better predictive models of space weather's effects on communications, satellite tracking, spacecraft lifetimes, degradation of spacecraft materials and on spacecraft reentering the Earth's atmosphere. Data obtained during the mission will help scientists better understand the energy balance within the MLTI region, establishing a baseline for future investigations of this region.

## Science Instruments

TIMED's science payload consists of four instruments that compliment each other in collecting data on the MLTI region:

- The **Global Ultraviolet Imager (GUVI)** is a collaborative effort between The Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, MD and The Aerospace Corp. in El Segundo, CA. Although invisible to the human eye, ultraviolet light is detectable, using special instruments like GUVI. The spectrograph in GUVI breaks ultraviolet light into its component "colors," much like a prism separates white light into a rainbow. When solar ultraviolet light or the aurora energizes the MLTI, atoms and molecules in this region glow in specific ultraviolet colors. GUVI observes the glow of the MLTI region in ultraviolet light, allowing scientists to determine its chemical composition and temperature range, and measure the energy input by solar ultraviolet light and by the aurora. The principal investigator (PI) for GUVI is Andrew Christensen of The Aerospace Corp. The Payload Operations Center (POC) for GUVI is located at APL.
- The **Solar Extreme Ultraviolet Experiment (SEE)** observes ultraviolet light coming from the sun, which is the primary energy that gets deposited into the MLTI region. Built by the University of Colorado in Boulder, SEE determines how much this energy varies and will establish an index of solar variability so scientists can understand the solar ultraviolet changes in the MLTI even after the mission ends. The PI for SEE is Thomas Woods, University of Colorado, where the POC also is located.
- The **TIMED Doppler Interferometer (TIDI)**, built by the University of Michigan, Ann Arbor, measures wind and temperature profiles of the MLTI region. TIDI detects the wind speed and temperature of gas in the MLTI by measuring tiny shifts in the color of light emitted by this gas. This "Doppler shift" is a unique property of the motion of the gas. The PI for TIDI is Timothy Killeen, National Center for Atmospheric Research, Boulder, Colo. The POC for TIDI is located at the University of Michigan, Ann Arbor.
- The **Sounding of the Atmosphere using Broadband Emission Radiometry (SABER)** is a multi-channel infrared radiometer, which measures a wide range of infrared light emitted by the atmosphere at many altitudes. SABER explores the MLTI to determine its energy balance, atmospheric structure, chemistry and dynamics. SABER is a collaborative effort between Hampton University in Virginia, NASA Langley Research Center, Utah State University, Logan, and GATS, Inc. of Newport News, Va. Hampton University leads the Science Team for SABER, Utah State University built the instrument, NASA Langley has overall project management and mission implementation responsibility, and GATS, Inc. was responsible for software development and data management. The PI for SABER is James M. Russell III, Hampton University. The POC is located at NASA Langley Research Center.

## **TIMED Program/Project Management**

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Victoria Elsbernd, Solar Terrestrial Probes Program Executive

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### **NASA Goddard Space Flight Center:**

Gilberto Colon, Solar Terrestrial Probes Program Manager

Bruce Campbell, TIMED Project Manager

Richard Goldberg, TIMED Project Scientist

### **The Johns Hopkins University Applied Physics Laboratory:**

Dave Grant, TIMED Project Manager

Jeng-Hwa (Sam) Yee, TIMED Project Scientist