National Aeronautics and Space Administration

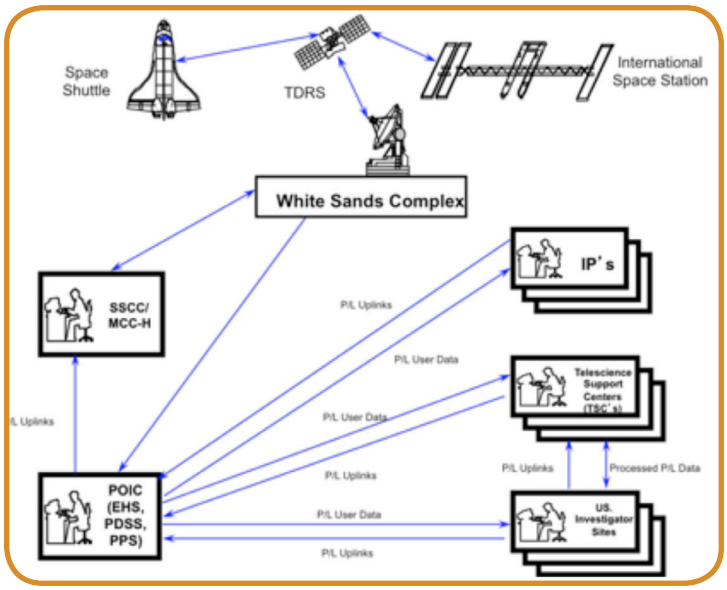
Marshall Space Flight Center
Telescience Resource Kit

Engineering Solutions for Space Science and Exploration

Telescience Resource Kit (TReK)

is a suite of software applications that can be used to monitor and control assets in space or on the ground. The Telescience Resource Kit was originally developed for the International Space Station program. Since then it has been used to support a variety of NASA programs and projects including the WB-57 Ascent Vehicle Experiment (WAVE) project, the Fast Affordable Science and Technology Satellite (FASTSAT) project, and the Constellation Program.

The Payloads Operations Center (POC), also known as the Payload Operations Integration Center (POIC), provides the capability for payload users to operate their payloads at their home sites. In this environment, TReK provides local ground support system services and an interface to utilize remote services provided by the POC. TReK provides ground system services for local and remote payload user sites including International Partner sites, Telescience Support Centers, and U.S. Investigator sites in over 40 locations worldwide.



ISS Payload Telemetry and Command Flow.

Payload Operations Integration Center.

General Capabilities:

- Support for various data interfaces such as User Datagram Protocol, Transmission Control Protocol, and Serial interfaces.
- Data Services–retrieve, process, record, playback, forward, and display data (ground based data or telemetry data).
- Command–create, modify, send, and track commands.
- Command Management–Configure one TReK system to serve as a command server/filter for other TReK systems.
- Database–databases are used to store telemetry and command definition information.
- Application Programming Interface (API)–ANSI C interface compatible with commercial products such as Visual C++, Visual Basic, LabVIEW, Borland C++, etc. The TReK API provides a bridge for users to develop software to access and extend TReK services.
- Environments–development, test, simulations, training, and flight. Includes standalone training simulators.

Past Examples

TReK was used to support the WB57 Ascent Vehicle Experiment (WAVE). WAVE recorded High Definition (HD) video and Near Infrared (NIR) images of the Space Shuttle launch. The goal was to improve the detection and analysis of anomalies (e.g., insulation loss, tile loss) during launch and landing. NIR and HD Video Cameras were mounted on a gimbaled optical bench in the nose of NASA's WB57 Canberra aircraft. TReK was installed on a computer in the aircraft cockpit and used to record the NIR images. A WAVE version of the TReK software was loaded on a flight qualified Crystal CS500 computer to control the acquisition, time tagging and recording of the NIR images. TReK also received commands from and sent command responses to the flight control system via an RS232 interface. TReK controlled the camera through an Ethernet interface and time tagged the images using a Masterclock Time Code Reader (TCR) card receiving an IRIG B timing signal. The images below show the WB57 aircraft, camera, and Crystal computer.

TReK was also used to support development, testing, and flight operations of the Fast Affordable Science and Technology Satellite (FASTSAT). NASA/MSFC in collaboration with the Department of Defense (DoD) Space Test Program (STP) and industry partners developed the spacecraft to demonstrate a fast, affordable, and low cost bus technology and mission integration approach model. The FASTSAT-HSV01 satellite carries six small payloads including three technology demonstration experiments and three atmospheric research instruments. TReK provided ground system services on FASTSAT Mission Operations Workstations and at Remote Sites.

WB57 aircraft.

Shuttle WAVE.

FASTSAT-HSV01.

For more information, please visit www.nasa.gov/centers/marshall/about/business.html

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