

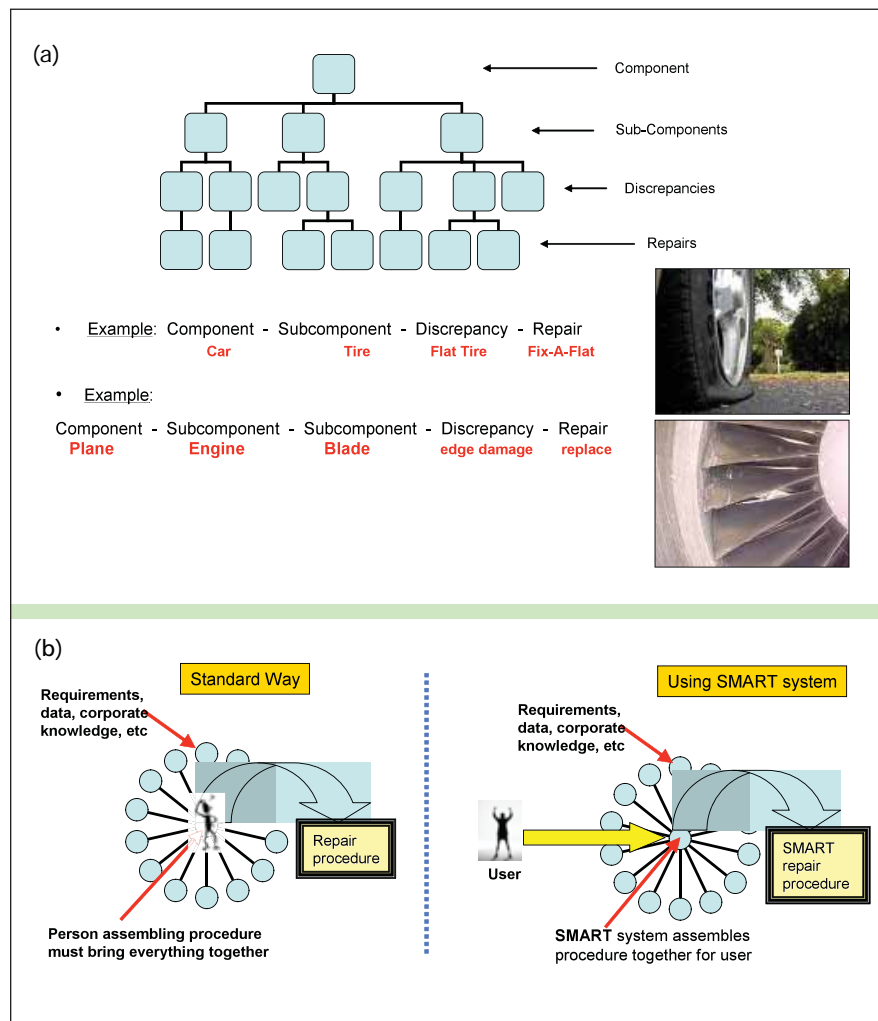
## Systems Maintenance Automated Repair Tasks (SMART)

John F. Kennedy Space Center, Florida

SMART is a uniform automated discrepancy analysis and repair-authoring platform that improves technical accuracy and timely delivery of repair procedures for a given discrepancy (see figure a). SMART will minimize data errors, create uniform repair processes, and enhance the existing knowledge base of engineering repair processes. This innovation is the first tool developed that links the hardware specification requirements with the actual repair methods, sequences, and required equipment. SMART is flexibly designed to be useable by multiple engineering groups requiring decision analysis, and by any work authorization and disposition platform (see figure b).

The organizational logic creates the link between specification requirements of the hardware, and specific procedures required to repair discrepancies. The first segment in the SMART process uses a decision analysis tree to define all the permutations between component/subcomponent/discrepancy/repair on the hardware. The second segment uses a repair matrix to define what the steps and sequences are for any repair defined in the decision tree. This segment also allows for the selection of specific steps from multivariable steps.

SMART will also be able to interface with outside databases and to store information from them to be inserted into the repair-procedure document. Some of the steps will be identified as optional, and would only be used based on the location and the current configuration of the hardware. The output from this analysis would be sent to a work authoring system in the form of a predefined sequence of steps containing required actions, tools, parts, materials, certifications, and spe-



SMART Solution to Problems: (a) simplistic example; (b) solution philosophy — variables.

cific requirements controlling quality, functional requirements, and limitations.

This work was done by Joseph Schuh of Kennedy Space Center and Brent Mitchell, Louis Locklear, Martin A. Belson, Mary Jo Y.

Al-Shihabi, Nadean King, Elkin Norena, and Derek Hardin of USA Spaceops. For more information, contact the Kennedy Innovative Partnerships Program Office at (321) 867-5033. KSC-12909

## NAIF Toolkit — Extended

NASA's Jet Propulsion Laboratory, Pasadena, California

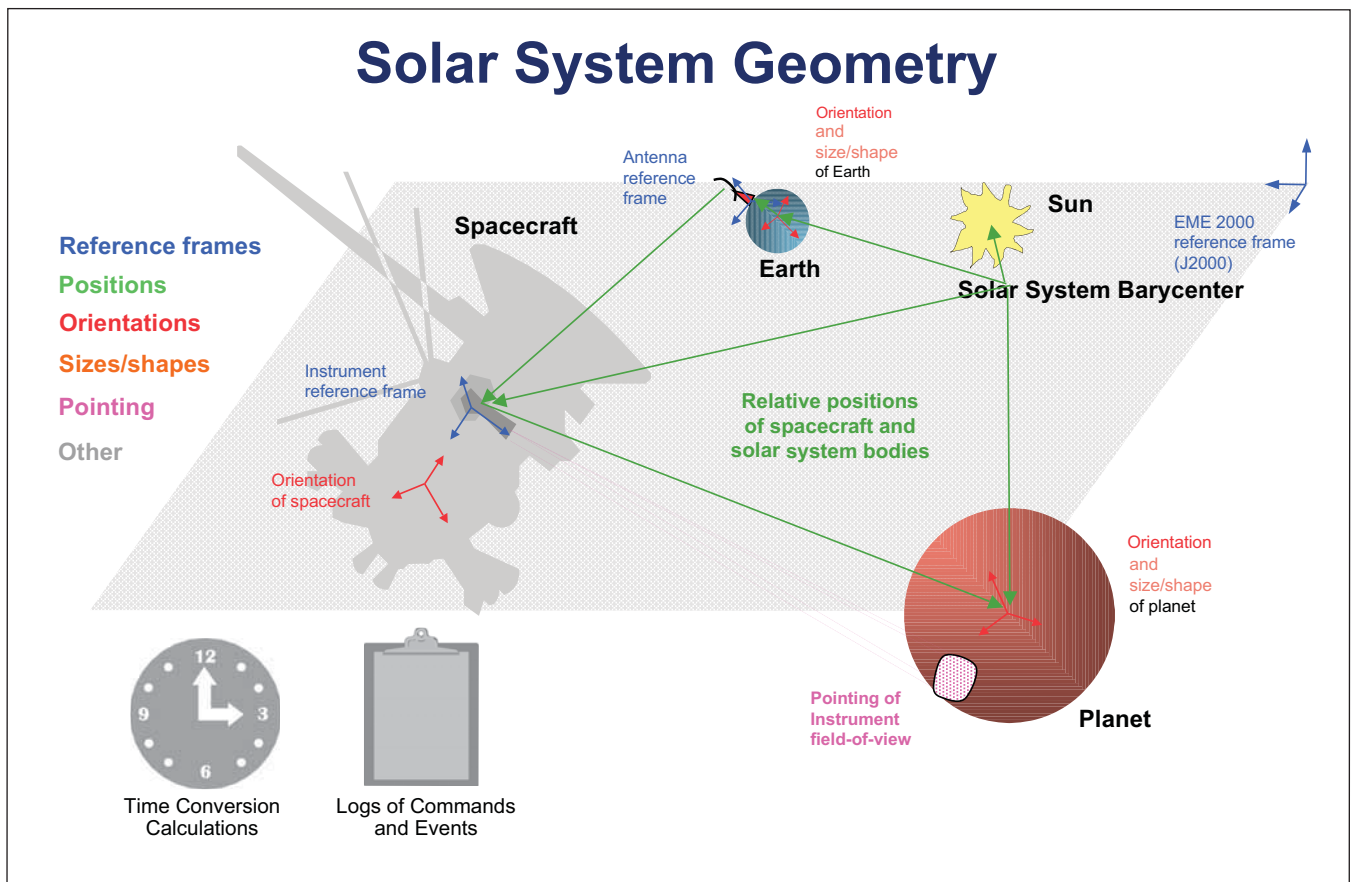
The Navigation Ancillary Information Facility (NAIF) at JPL, acting under the direction of NASA's Office of Space Science, has built a data system named SPICE (Spacecraft Planet Instrument C-matrix Events) to assist scientists in planning and interpreting scientific observations (see figure). SPICE provides

geometric and some other ancillary information needed to recover the full value of science instrument data, including correlation of individual instrument data sets with data from other instruments on the same or other spacecraft.

This data system is used to produce space mission observation geometry

data sets known as SPICE kernels. It is also used to read SPICE kernels and to compute derived quantities such as positions, orientations, lighting angles, etc. The SPICE toolkit consists of a subroutine/function library, executable programs (both large applications and simple utilities that focus on kernel

# Solar System Geometry



An Overview of SPICE.

management), and simple examples of using SPICE toolkit subroutines.

This software is very accurate, thoroughly tested, and portable to all computers. It is extremely stable and reusable on all missions. Since the previous version, three significant capabilities

have been added: Interactive Data Language (IDL) interface, MATLAB interface, and a geometric event finder subsystem.

*This work was done by Charles H. Acton, Jr., Nathaniel J. Bachman, Boris V. Semenov, and Edward D. Wright of Caltech for NASA's*

*Jet Propulsion Laboratory. For more information, see <http://naif.jpl.nasa.gov>.*

*The software used in this innovation is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at [danielb@caltech.edu](mailto:danielb@caltech.edu). Refer to NPO-47017.*