



## 🌀 Aerobraking Maneuver (ABM) Report Generator

abmREPORT Version 3.1 is a Perl script that extracts vital summarization information from the Mars Reconnaissance Orbiter (MRO) aerobraking ABM build process. This information facilitates sequence reviews, and provides a high-level summarization of the sequence for mission management.

The script extracts information from the ENV, SSF, FRF, SCMFmax, and OPTG files and burn magnitude configuration files and presents them in a single, easy-to-check report that provides the majority of the parameters necessary for cross check and verification during the sequence review process. This means that needed information, formerly spread across a number of different files and each in a different format, is all available in this one application. This program is built on the capabilities developed in dragReport and then the scripts evolved as the two tools continued to be developed in parallel.

*This program was written by Forest Fisher, Roy Gladden, and Teerapat Khanamornpan of Caltech for NASA's Jet Propulsion Laboratory.*

*This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44382.*

## 🌀 ABM Drag\_Pass Report Generator

dragREPORT software was developed in parallel with abmREPORT, which is described in the preceding article. Both programs were built on the capabilities created during that process. This tool generates a drag\_pass report that summarizes vital information from the MRO aerobraking drag\_pass build process to facilitate both sequence reviews and provide a high-level summarization of the sequence for mission management. The script extracts information from the ENV, SSF, FRF, SCMFmax, and OPTG files, presenting them in a single, easy-to-check report providing the majority of parameters needed for cross check and verification as part of the sequence review process.

Prior to dragReport, all the needed information was spread across a number

of different files, each in a different format. This software is a Perl script that extracts vital summarization information and build-process details from a number of source files into a single, concise report format used to aid the MPST sequence review process and to provide a high-level summarization of the sequence for mission management reference. This software could be adapted for future aerobraking missions to provide similar reports, review and summarization information.

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## 🌀 Transformation of OODT CAS To Perform Larger Tasks

A computer program denoted OODT CAS has been transformed to enable performance of larger tasks that involve greatly increased data volumes and increasingly intensive processing of data on heterogeneous, geographically dispersed computers. Prior to the transformation, OODT CAS (also alternatively denoted, simply, "CAS") [wherein "OODT" signifies "Object-Oriented Data Technology" and "CAS" signifies "Catalog and Archive Service"] was a proven software component used to manage scientific data from spaceflight missions. In the transformation, CAS was split into two separate components representing its canonical capabilities: file management and workflow management. In addition, CAS was augmented by addition of a resource-management component. This third component enables CAS to manage heterogeneous computing by use of diverse resources, including high-performance clusters of computers, commodity computing hardware, and grid computing infrastructures.

CAS is now more easily maintainable, evolvable, and reusable. These components can be used separately or, taking advantage of synergies, can be used together. Other elements of the transformation included addition of a separate Web presentation layer that supports distribution of data products via Really Simple Syndication (RSS) feeds, and

provision for full Resource Description Framework (RDF) exports of metadata.

*This work was done by Chris Mattmann, Dana Freeborn, Daniel Crichton, John Hughes, Paul Ramirez, Sean Hardman, and David Woollard of Caltech and Sean Kelly of Northrop Grumman Information Technology for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).*

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## 🌀 Visualization Component of Vehicle Health Decision Support System

The visualization front-end of a Decision Support System (DSS) also includes an analysis engine linked to vehicle telemetry, and a database of learned models for known behaviors. Because the display is graphical rather than text-based, the summarization it provides has a greater information density on one screen for evaluation by a flight controller. This tool provides a system-level visualization of the state of a vehicle, and "drill-down" capability for more details and interfaces to separate analysis algorithms and sensor data streams.

The system-level view is a 3D rendering of the vehicle, with sensors represented as icons, tied to appropriate positions within the vehicle body and colored to indicate sensor state (e.g., normal, warning, anomalous state, etc.). The sensor data is received via an Information Sharing Protocol (ISP) client that connects to an external server for real-time telemetry. Users can interactively pan, zoom, and rotate this 3D view, as well as select sensors for a detail plot of the associated time series data. Subsets of the plotted data can be selected and sent to an external analysis engine to either search for a similar time series in an historical database, or to detect anomalous events.

The system overview and plotting capabilities are completely general in that they can be applied to any vehicle instrumented with a collection of sensors. This visualization component can interface with the ISP for data streams used by NASA's Mission Control Center at Johnson Space Center. In addition, it can connect to, and display results from, separate analysis engine com-