

At A Glance

autoProducts is an automated flight dynamics product generation system. It provides a mission flight operations team with the capability to easily generate all required flight dynamics products.

Benefits

- All products are generated and delivered with a click of a button
- Limited flight dynamics expertise is required to create routine products
- The execution of multiple applications is seamlessly managed

Features

- One simplified interface with user controls for different levels of expertise
- Complete automation when run as a server, a Unix cron job, or a Windows scheduled task
- Processes can be distributed across multiple platforms



autoProducts – Automated Flight Dynamics Product Generation Software

Summary

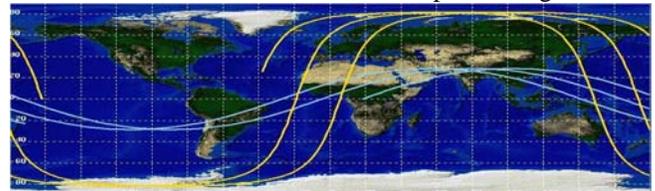
Flight dynamics system requirements include the description of numerous products to meet the operational and analysis needs of the flight operations team, scientists, and mission engineers. The generation of these products requires the integrated execution of various commercial off-the-shelf (COTS) products, institutional systems, and custom applications, and relies on flight dynamics knowledge and experience to adjust inputs, manipulate intermediate products, sequence systems, and validate the final product quality. To minimize potential human error, decrease the need for flight dynamics expertise, and reduce operations time, an automated flight dynamics product generation system, called autoProducts, has been developed. Originally configured to support the generation of more than 80 distinct flight dynamics products for the Earth Observing System (EOS) Terra mission, the software has since been adapted to several other NASA missions.

Mission Benefits

- New missions can easily adopt a unified control interface for flight dynamics product generation and delivery
- Legacy applications that are not yet GMSEC-compliant can still be integrated into the ground system framework
- Expertise and knowledge from previous missions can be reused
- Operator training and workload are significantly reduced
- Product reliability is enhanced

Flight Dynamics Product Generation

One of the core elements of ground-based flight dynamics support is the mission's Flight Dynamics System (FDS), which aids the flight dynamics engineers in planning spacecraft maneuvers, performing ground-based orbit determination, and performing attitude determination and sensor calibration. Software used to complete these tasks often executes on a variety of hardware platforms, and includes commercial, institutional, and custom applications. Resulting information and data must be formatted and packaged into products for operations personnel, scientists, and interfacing organizations to apply in further spacecraft support and data analysis. Daily routine product generation often takes many hours to complete, and as mission complexity has increased, so has the number of expected products. The completion of a single product may require the sequencing and execution of several FDS components, each with a unique user interface and set of data conventions. An automation framework that controls and interacts with the individual FDS components provides tremendous potential for reduced operations costs and increased product reliability.



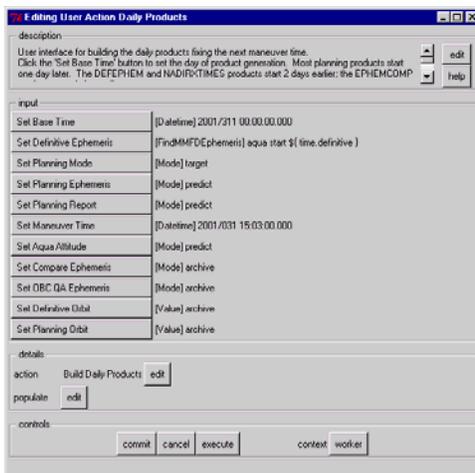
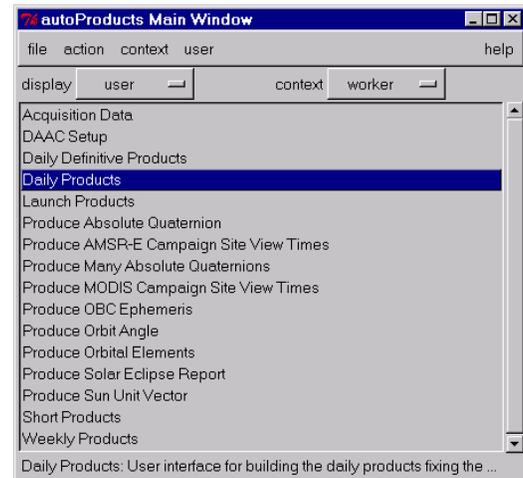
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How It Works

One of the primary concerns of the flight operations team is to generate and deliver the necessary daily flight dynamics products. This process can be configured and completed with the autoProducts framework. The software provides a simple, consistent interface for any product configuration. The user is initially presented with the autoProducts main window (shown at right), which contains a list of pre-configured setups, called actions. These actions describe required activities to generate a specific set of products. Important user actions may include *Launch Products*, *Daily Products*, or *Maneuver Products*. To edit the settings for a specific set of products, the user highlights the desired action and clicks. An editor window is opened (shown below), and settings can be modified via option menus, entry forms, and other interactions. During most nominal operations, these settings are the only ones that need to be modified or closely examined. However, there are many other settings to accommodate added flexibility and configuration of advanced flight dynamics capabilities. Once the user action settings are checked, the *execute* button can be pressed, and all selected products are generated and delivered automatically.



From the operator's viewpoint, generating mission flight dynamics products is really that simple with autoProducts. However, the actual sequence of behind-the-scenes activities is not so simple. Once configured and started, autoProducts must coordinate the execution of mission software with COTS applications such as FreeFlyer[®], STK[®], and MATLAB[®], format their custom outputs, execute Excel macros via Microsoft's[®] Object Linking and Embedding (OLE) automation, retrieve necessary data files from the network, archive completed products, extract specific information from archived products, manage file names and versions, and deliver products as scheduled to the appropriate customers.

The true benefit of autoProducts is that a previously labor-intensive activity can now be configured once and automatically executed as needed. This allows flight dynamics analysts and flight operations teams to concentrate on other mission critical tasks.

Multi-Mission Systems

AutoProducts has been adapted for use in several mission control centers. As a single mission system, it is currently being used operationally for the EOS Terra, EOS Aqua, and EO-1 missions. Additionally, autoProducts is currently being used as a multi-mission system for the Small Explorer (SMEX) Project, where the SWAS, TRACE, FAST, and WIRE missions share a single automation system. The Terra, Aqua, and EOS Aura missions are also expected to share a single automation system in the near future.

Contact Information

If you have any questions, or want to learn more about the automation capabilities our organization can provide for your satellite missions with autoProducts, please contact us at:

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