ESABASE Space Systems Analyser

Product Overview

The space systems analysis process relies upon the application of many different engineering disciplines and the use of a correspondingly large number of software tools. ESABASE provides an integrated and open system to support this process. The user need build only one model, which can then be analysed by any of the many integrated applications or by a bespoke application created and integrated by the user.

ESABASE provides a comprehensive environment for space system analysis. The software is split into two domains - the ‘Framework’ for model building and pre and post processing, and a large number of integrated applications.

ESABASE Framework

One of the finest features of the ESABASE framework is the language which is used in the description of the space system. In a clear, accurate and concise manner, the user specifies the geometry of the system, how its various parts interact and all the information necessary to use the comprehensive suite of applications. Orbit generation and fully automatic orbital pointing of bodies are also provided.

The various applications rely upon the system being discretised in some manner. The framework provides several ways of viewing a discretised system - planar elements, surface nodes, system nodes - as well as the means to define abstract structural entities such as ‘Assemblies’, ‘Subsystems’ and ‘Enclosures’. Many applications also require information about the space environment. The ESABASE framework provides a set of standard environment models which include radiation, atmospheric and solar, among others.

Three graphics tools are provided. The user may inspect various aspects of the system at any point in the design process - the geometry, a multitude of analysis parameters, discretisation schemes, analysis results or the orbital arcs.

ESABASE is an ‘open’ system. Tools are provided to allow users to integrate their own space systems analysis programs within ESABASE. These applications can directly access the data within the ESABASE model and output data into the ESABASE results database to promote the pre and post processing of the model.

Models can also be exported to a number of standard analysis tools, including AUTO CAD and PATRAN. Import and Export interfaces are also provided for the SET data standard.
ESABASE Applications

From the early stages of mission analysis and design processes, the ESABASE applications provide a rich set of powerful simulation and analysis tools. All are aimed at analysing the effects of the space environment and orbit specification on the spacecraft. Both global and local analyses can be performed, allowing dimensioning and sensitivity analysis during the design iterations. Each application provides specific, detailed reports of results.

ESABASE currently includes the following eleven applications:

- **Atomox** - A 2D/3D numerical tool, computes flux and fluences of atomic particles and other species along with the associated spacecraft erosion.
- **Debris** - A numerical tool, evaluates the debris and/or micrometeoroid impact probability on a spacecraft system and analyses the resulting damage.
- **Field of view** - Analyses sensors’ occultation over orbital points.
- **Mass** - Provides mass property generation, reporting and analysis including static and dynamic balancing and mass sensitivity analysis.
- **Outgassing** - Evaluates contaminant deposits on surfaces as a function of time.
- **Perturbation** - Computes orbital perturbations.
- **Plume** - Calculates exhaust gases impinging on the spacecraft surfaces (this is provided via an interface to the Matra Marconi Space plume application).
- **Radiation** - Computes the radiation dose at component level, taking full account of shielding provided by the spacecraft’s geometry.
- **Sunlight** - Evaluates illumination, exposure time and various solar related quantities.
- **Telecom** - Analyses Earth coverage and includes tools for occultation with geostationary satellites and data relay.
- **Thermal** - Provides interfaces to standard thermal analysis tools including ESARAD and ESATAN.

To perform these activities effectively, the Engineering Software group comprises a multi-disciplinary team of engineers, mathematicians, physicists and computer scientists combining an understanding of users’ needs with a professional software development approach.

Quality Assurance

ALSTOM Power has been developing software for ESA since 1982. All new developments and major extensions are subject to rigorous analysis and design techniques. Strict coding standards are employed on all developments, with documentation and source code tightly controlled under configuration management.

The ALSTOM Power Technology Centre is audited by Lloyds to ISO 9001 and has been TickIT certified.

Availability

ESABASE is available on an annual lease basis. Machines currently supported are:

- Sun Solaris - 2.5
- HP9000/700 Series
- DEC Alpha - unix

ALSTOM Power Technology Centre

ESABASE was originally developed by a number of European Aerospace companies under contract to the European Space Agency (ESA). In 1995, ESA asked ALSTOM Power to take over ESABASE’s distribution, support and maintenance because of our extensive expertise in the development and support of industry strength Engineering Analysis software. Since then, an extensive programme of consolidation and further development has been undertaken, alongside the user support and ‘hot line’ functions.

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