# GRIF | ETree module

## Technical sheet
To evaluate risks using Event Trees

**GRIF (GRaphical Interface for reliability Forecasting), a technology of TotalEnergies since the 80s, includes 3 packages and 12 modules allowing the user to choose the most appropriate modelling technique for the resolution of the studied system. ETree module is one of the seven modules belonging to Boolean package.**

**ETree is used to model a safety system (set of safety barriers) as an event tree**. It produces simple models suited to all sectors (aeronautics, automobile, rail, oil & gas, etc.) and is an easy way to obtain risk matrices. This module uses **ALBIZIA**, the Binary Decision Diagram (BDD) computation engine developed by TotalEnergies, that brings the advantage of running accurate **analytical computations and rapidly providing extensive information** on the system to study.

**ETree**
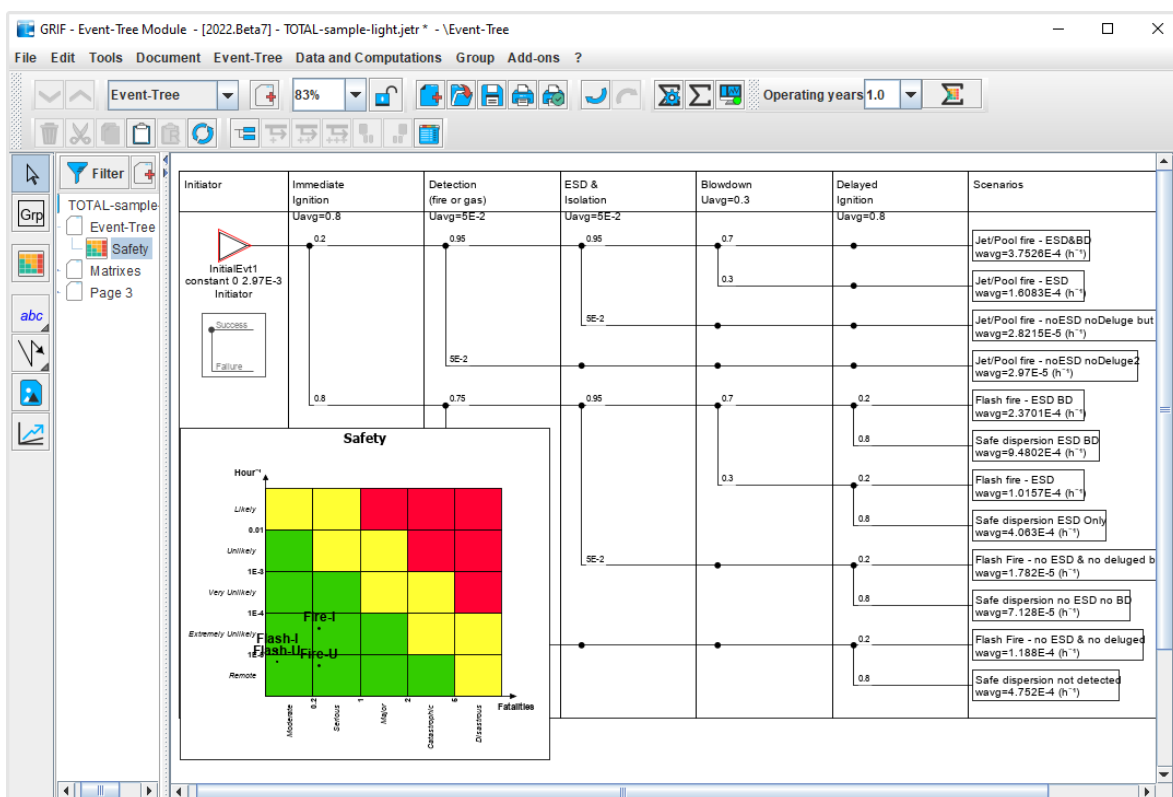


## Modelling and computations:

**You can easily create event trees** via **an intuitive graphical interface** in which barriers can be added after an initiating event (gas leak, supply loss, overflow, etc.). Each scenario (called a sequence) is therefore defined by a succession of barrier failures and successes. Each sequence has a consequence chosen from a list created by the user. A risk is defined for each consequence and can then be positioned on the X-axis in the risk matrix. The software then calculates the frequency of the consequence and assigns it to the Y-axis. The **frequency of initiating events** and probability of failure of safety barriers** can **either be constant**, follow a probability law (Exponential, Weibull, Periodic-Test, etc.) **or be defined by another type of model**: fault tree, reliability block diagram, safety instrumented loops via the Boolean module.

**Hardware requirement**: Intel Core i3 or faster, 4 GB of free RAM, 1 GB of free space, no internet connection needed. **Software requirements**: Windows 10 or Linux or MacOS X with Java 11. **Licenses**: standalone with USB dongle or Floating licenses with Sentinel server. Installable, laptop.

## Specificities and strengths:

– **Multiple risks**: Several risk matrices can be defined (human, financial or environmental for example).

For each one, you can determine criticality levels: moderate, serious, major, etc. A risk is entered in each matrix for each consequence in order to effectively indicate that a consequence is catastrophic in human terms but moderate in financial terms, or vice-versa.
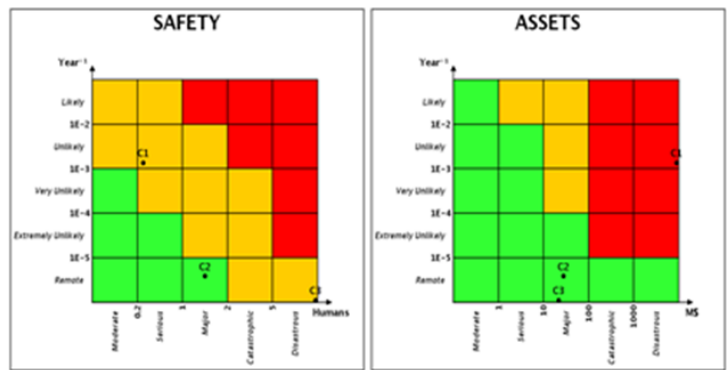
– **User-friendly templates / models**: Do you regularly carry out studies using the same safety barriers? With GRIF ETree, you can create templates with one or many pre-configured barriers and risk matrices. If you want to create a new event tree, all you have to do is open the template and enter the parameters/coefficients.

– **Calculating the frequency of each consequence over time**: Risk matrices display an average frequency but when the initiating event or the barriers are no longer constant laws, it is sometimes necessary to display the frequency variation of a sequence (scenario) or of a consequence over time.

## ETree is suitable with all modules of GRIF Boolean package:

**All ETree performed can be used in the Bool module which combines the features of all modules of the package.**

– In the same document, calculations can be made by using Event Trees (ETree), Fault Trees (Tree), Reliability Block Diagrams (BFiab), Safety Instrumented Systems (SIL), Reliability Network (Reseda), or Bow-Tie / LOPA tables (Risk).

– Models can be linked together, and a link enables the definition of any object (Event, Block, Barrier, Network node, etc.) by any models: Fault-Tree, Block-Diagram, SIS, Event-Tree; etc.

– Users in different departments of a company can work with the models they are used to, then link their models. For example, initiating-events and barriers can be defined by a Fault-Tree made using the Tree module, or a SIF made with the SIL module. ETree is not limited to an independent protection layer: barriers can share components and computation will handle the dependencies.

## Using data and results:

– Possibility of automating calculations (batch runs) and drawing variations for sensitivity analysis.
– Results are stored in the document and export into different formats (csv, XML, Excel, etc.).
– Results can be viewed as line graphs, pie charts or histograms.
– Vectorial printing in PDF format generates high quality pictures but the files are small enough to be sent by e-mail even if the document contains hundreds of pages.
– External files (PDF certificates, system pictures, etc.) can be included in the document and be part of the full report.
– Interaction with the operating system: possibility of copying/pasting to or from word processing software, spreadsheets, or presentation tools.
– Specific report including all matrices.