flexible solutions for
your business needs

CARE – FTA
Fault Tree Analysis

RELIABILITY OPTIMIZATION

System failure analysis for sophisticated and large scale systems.

COST REDUCTION

Improving System's Reliability and Up-Time while Saving Maintenance Cost

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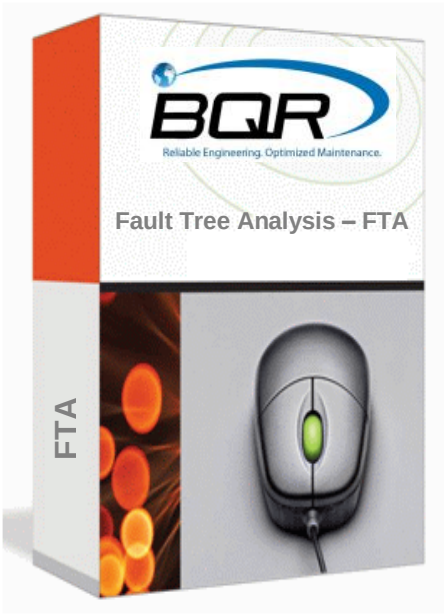
BQR Reliability Software.
RELIABILITY YOU CAN TRUST.



Key Benefits of the FTA

- Identifies system safety issues and critical components
- Compiles with safety and reliability requirements
- Enables Calculation of top event occurrence probability
- Evaluates product risk
- Identifies causes and consequences of events (accidents/incidents)
- Identifies design changes and attention

Overview

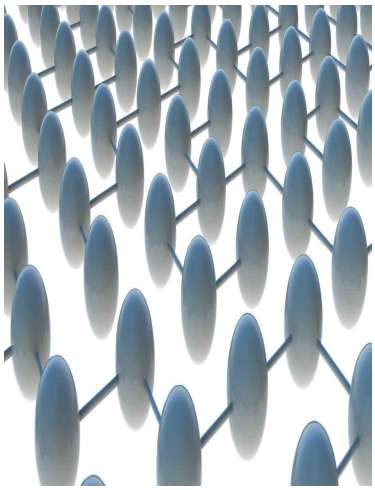
What are the odds that a complex system or sub system will fail? What events or their combination may be end-causes and should be eliminated while the system is being repaired? How can periodical inspections affect a system's reliability?

The Fault Tree Analysis (FTA) provides answers for such issues. Using FTA, you can calculate the probability a system will fail according to different criteria you set in advance.

FTA is presented in a form of an analysis Product Tree composed of various events (failure and other events). Some events occur at the same time as the failure. Other events represent the end causes of all the failures in the system with no apparent causes. FTA displays cause-effect relationships in the system and calculates the probability and rates for each event in the system, including system failures. This enables you to protect your system from such failures as well as to prepare your system for repair, should a repair be required. Creating a Fault Tree turns the process of analyzing all the causes and probability of failure events easy and efficient. The Fault Tree is a successive model that shows the probability and frequency of all failure causes from the highest block level (the system), to the lowest block level (leaf). The Fault Tree is composed of dependent failure modes; in order for one failure event to occur, other events must take place first. FTA is especially designed to have a flexible structure that enables you to easily create a clear and visual analysis tool with as many events as you want. You can easily edit (add, delete, cut, copy and paste) any event in your project. Fault Tree Analysis (FTA) is analytical technique for used to define hierarchically all the system failure causes, their probabilities and frequency. In practice, the user obtains through the FTA calculation another form of most important reliability parameters for entire system and all its sub systems: Failure rate (frequency) and Availability (which is equal to 1 minus the corresponding failure event Probability) for Hot recovery condition or Reliability (by the same way) for No recovery condition. In its most general definition, Events Tree Analysis is when either faults (or failures) or any events and their causes are described by a process, decision flow or logical deduction.

The event that does not have sub events represents either END cause or a model (Network, Markov) which cannot be built by means of FTA and should be imported through link option from a corresponding RBD project.

The meaning of event parameters



Two calculation modes are available:

Hot recovery - when each event is recovered after its occurrence independently of other events,

No recovery - when no recovery actions are performed until the root event will occur.

Under a Hot recovery condition the probability parameters and rates of all events become independent of time shortly after the system operation starts (steady state is reached). The Rate parameter for an event means the number of occurrences and elimination per million hours. The Probability parameter means the probability that the event takes place in a given arbitrary moment of the steady state. In other words, this parameter is the fraction of total time when the event takes place. If the event is a block failure in a system, this Probability is equal to 1 minus the block availability in the system steady state.

Under No recovery condition the reliability function versus time of the system and of each block decreases up to 0. Probability parameter of each event means the chance of occurrence within a specified (in Global data) time from operation start. If the event is a block failure, its probability is equal to 1 minus the block reliability.

Cut sets.

The classic cut set definition is the following: Cut set is the set of lowest events (leaves of the fault tree) which simultaneous occurrence is sufficient for the root (main) event occurrence. Cut set is 'minimal', if without any of its events it is not a cut set.

While this is the general definition, CARE allows for the probability that should an event occur the probability of the effect occurring could be less than 1. CARE refers to this as an “Effect Probability” (EP). Since CARE FTA allows user to assign EP < 1, the cut set containing those events causes the root occurrence with a probability <=1.

Therefore CARE FTA uses a more general cut set definition: cut set is the set of the lowest events which simultaneous occurrence is sufficient for the root event occurrence with a probability independent of all other event occurrences.

If all EP = 1, both definitions describe the same cut sets. If some EP < 1, the second definition continues to define the same cut sets as for EP = 1, but the classic definition in this case discards some former cut sets.

Common events (common causes, CC).

Most of events in fault tree are considered as dependent only on their sub events, contained in their sub tree, and independent on all other events.

However CARE FTA also allows user to include a specific event in different branches of the same fault tree using Paste Common command. The program takes into calculation the fact that if one of the common causes has occurred, the rest of its copies also have occurred simultaneously. The same is regarded for common events' restoration.

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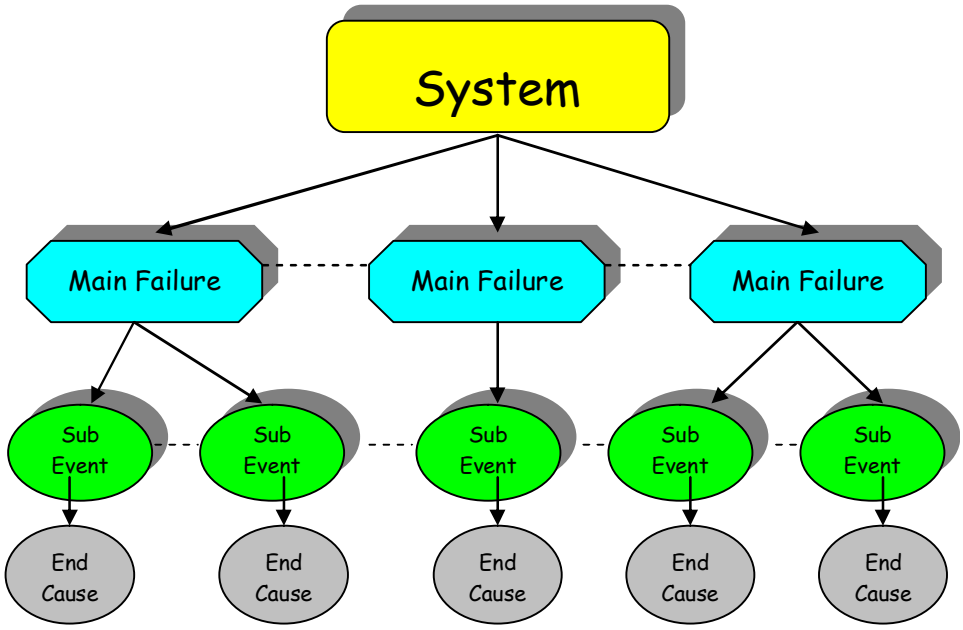
The Fault Tree appears on screen as a series of event gates, as shown...



FTA Flow Chart

Regions of danger according to MIL-ST-1629 and SAE

About BQR

Established in 1989, BQR provides software tools and consulting services for Reliability, Availability, Maintenance and Safety (RAMS) and Integrated Logistic Support (ILS). Over the years BQR has successfully completed thousands of projects for major customers around the world. The propriety know-how that BQR has developed over the years has been encapsulated in original software package and is now being provided for customers.

BQR Reliability Engineering Ltd.
Tel: (972) 3 9625911
Email: info@bqr.com
Web: www.bqr.com