



**Project: Risk Implementation and At-Risk Implementation With Fault Tree Analysis for Dam and Levee Risk Analysis; Fault Tree Mods – support of Risk Analysis Models and Reliability Model development; USACE New Orleans District.**

**Client: US Army Corps of Engineers Risk Management Center  
Client Contact: Danny Thurmond**

**MSMM Services:** Project Management

## **DESCRIPTION**

- **Risk Implementation and At-Risk Implementation with Fault Tree Analysis for Dam and Levee Risk Analysis.** DAMRAE software is utilized by the USACE for generalized risk analysis calculations and life-loss estimation, using graphical technology and constructing event trees to measure the probability of dam failure and potential losses. In **Phase I – Proof of Concept – Prototype Model**, an Excel-based model resembled the current model that DAMRAE uses, including all the Baseline matrices delivered by the USACE in the Baseline\_Seismic.pdf file. The deliverables included a Precision Tree Prototype, and Interpolation Functions Interface. In **Phase II – Model Automation**, a customized Excel Add-In was built that interacts with PrecisionTree and @RISK. This Add-in automates the scenario building process by automating and improving the user's interface and adding a logical layer.
- **Fault tree analysis (FTA)** is currently utilized by the USACE for system failure calculations of complex civil works infrastructure systems. The USACE sought the development of a simpler generic FTA tool similar to Precision Tree that could be implemented in Excel to estimate the top event of system failure for simple FT systems. The FTA tool needed to incorporate basic gate functions such as AND, OR and n-out-of-m gates as well as the ability to calculate the top event probability using either static probabilities or a 2 or 3-parameter Weibull inputs to account for time dependent analysis. In **Phase I (Basic Fault Tree Analysis: Design and Calculation Interface)** the deliverable was an Excel Add-in, based on ***Precision Tree software***, which will let the user design and calculate basic FTA models. In **Phase II (Generalized Event Model Tree Tool: Excel Add-in for Basic FTA + General Event Tree Modeling)**, the deliverable was an enhanced Custom Ribbon, based on Phase I's delivered model.
- **Fault Tree Mods – support of Risk Analysis Models and Reliability Model development.**
  - Task 1 – Development of Fragility Curve Utility in Reliability Workbench.** USACE Risk Management Center (RMC) and districts currently use the FaultTree+ program to model and analyze the safety of dams. Task 1 produced of a .Net application (Fragility Curve Utility) to run under Microsoft Windows and to interface with RWB V11 to create multiple fault trees representing different load conditions and link these into a single event tree within the same RWB project.
  - Task 2 – Failure Modes Effects and Criticality Analysis (FMECA) Software Installation and Maintenance.** The USACE is evaluating commercial software to assist with their Failure Modes Analysis of critical Civil Works Infrastructure. The task work included installing and providing the license file for the FMECA software program for use by USACE and providing maintenance and support for one year.
  - Task 3 – USACE Technical Workshops for Reliability Workbench and Availability Workbench.** The this task provided the USACE with technical training in workshops for its engineering staff for program software updates to for fault tree analysis and examine asset management software capabilities.