# Fault Management Simulation and Visualization Tool, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)


## ABSTRACT

S&K proposes to design a tool, Fault Management (FM) Viewer, with multiple visualization models (viewers) to assist with planning FM development by providing new ways of visualizing FM concepts and data. State of the art tools to assist FM development include fault trees, success trees, and general Model Based System Engineering (MBSE) tools using SysML. S&K will structure the FM viewer to align with NASA's FM Handbook, a design reference mission from S&K Team experiences, and S&K Team experiences with past FM development support projects. The benefits of developing this approach and tool include improved FM quality, efficiency in developing FM, and a more cost-effective expenditure of FM resources on failures that are most important to control. The S&K Team will deliver a Concept of Operations for this FM Viewer to support decisions about FM designs, displays designed to support the FM design decisions enabling comparison views of risk postures with and without implementation of the proposed FM measures, options for measuring FM effectiveness and for semi-autonomous estimation of effectiveness of alternative FM designs, and XML schema defining data models for the FM Viewer that can support the exchange of date with other tools used by system developers. The S&K Team will first identify a design reference mission, plan a data exchange between related tools, design an XML schema, design information displays, explore options for measurements and automated FM estimates, develop a concept of operations, demonstrate feasibility with a partial prototype, and prepare for final report delivering the results of Phase I that also includes our proposal for Phase II.


## ANTICIPATED BENEFITS

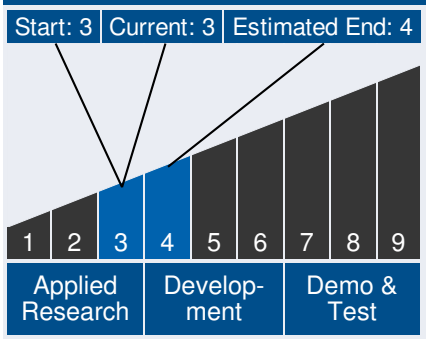
### To NASA funded missions:

Potential NASA Commercial Applications: The most obvious market niche for Fault Management (FM) Viewer is to assist FM


### Table of Contents



### Technology Maturity




### Management Team

**Program Executives:**

- Joseph Grant
- Laguduva Kubendran

**Program Manager:**

- Carlos Torrez

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engineers and project engineers at NASA to follow the recommendations in the NASA FM Handbook and adaptations to fit with the design reference mission. As pressures increase for spacecraft autonomy, they will also increase for additional FM. This software tool offers the ability to include better FM while spending development and testing resources more cost efficiently. Potential customers include future robot systems like Valkyrie and Robonaut 2, rovers like Lunar Prospector, and autonomous spacecraft like Solar Probe Plus.

**To the commercial space industry:**

Potential Non-NASA Commercial Applications: The number of non-NASA applications that could benefit from a Fault Management (FM) assistant like FM Viewer is almost limitless. Many industries, oil and gas and nuclear domains in particular, deal with faults and failures and could use assistance in thinking clearly about these issues so they can be managed effectively and efficiently. In the developing drone market, there is already a very strong push for operating drones beyond the operator's line of sight, which requires autonomy and will increase the demand for FM to ensure successful completion of drone sorties.

## Management Team *(cont.)*

**Principal Investigator:**

- Carroll Thronesbery

## Technology Areas

**Primary Technology Area:**
Modeling, Simulation, Information Technology and Processing (TA 11)
└ Modeling (TA 11.2)
  └ Frameworks, Languages, Tools, and Standards (TA 11.2.5)

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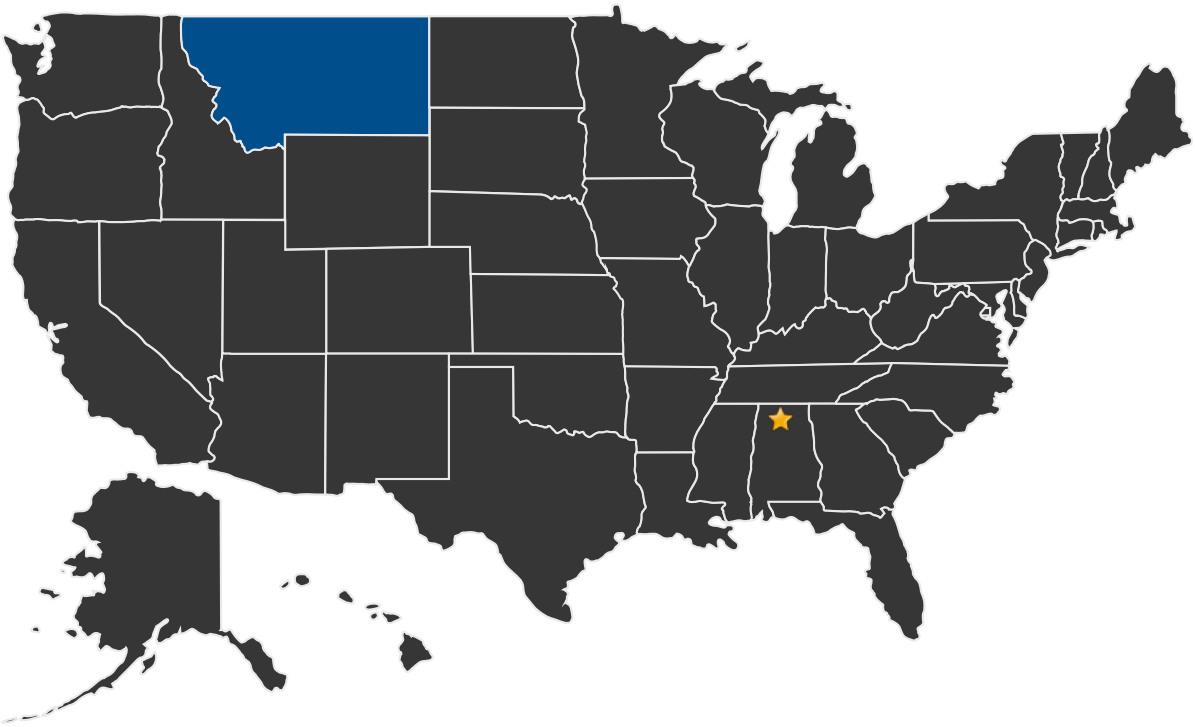
## U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

**Lead Center:**
Marshall Space Flight Center

**Other Organizations Performing Work:**

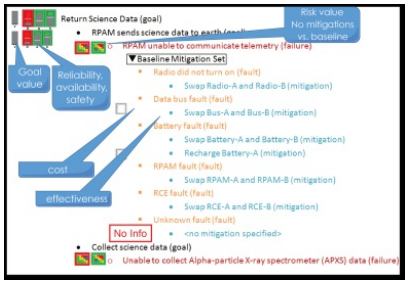
- S&K Global Solutions, LLC (Polson, MT)

## PROJECT LIBRARY

**Presentations**

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23475)

## IMAGE GALLERY

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## DETAILS FOR TECHNOLOGY 1

### Technology Title

Fault Management Simulation and Visualization Tool, Phase I

### Potential Applications

The most obvious market niche for Fault Management (FM) Viewer is to assist FM engineers and project engineers at NASA to follow the recommendations in the NASA FM Handbook and adaptations to fit with the design reference mission. As pressures increase for spacecraft autonomy, they will also increase for additional FM. This software tool offers the ability to include better FM while spending development and testing resources more cost efficiently. Potential customers include future robot systems like Valkyrie and Robonaut 2, rovers like Lunar Prospector, and autonomous spacecraft like Solar Probe Plus.