Guide 9

USING THE MORT MODEL
(MANAGEMENT OVERSIGHT AND RISK TREE)

For Use During MES-Based Investigations

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USING THE MORT MODEL

Models of idealized systems can help investigators and analysts develop recommended actions to improve future performance. The MANAGEMENT OVERSIGHT & RISK TREE (or MORT) model Safety Management Program is an example of such a model. MORT is included in this Guide Set to show how such generalized guidance can be incorporated into MES-based investigations.

The general procedure for using models is to

1. select a model
2. determine if the model is relevant to Matrix
3. step through Matrix EBs to find applicable ideas from model
4. develop the ideas into candidate problems or actions

INTRODUCTION

In the 1970s, work performed at the United States Department of Energy's System Safety Development Center (SSDC) at Idaho Falls ID USA (now closed) contributed numerous models of this type to the knowledge base available to help recommendation developers. Similar tools are available in other fields.

The MORT User's Manual (SSDC 4, Revision 3) provides numerous helpful tools for investigators to use as "thought starters" within the framework of the MES investigation. However, observe the Warning below. While some of the material has aged, the ideas behind the materials can still be helpful to new users. MORT materials are still available on the Internet. See below.

MORT and MORT-based investigation processes like Root Cause Analysis variants use the MORT Events and Causal Factors charting method to support MORT investigations. E&CF was based on early and now obsolete research that led to MES, and still incorporates conditions and other abstractions in the charts, among its other problems. Because of the high degree of subjectivity in typical usage, it use during the development of the process descriptions is not recommended.

WARNING to INVESTIGATIORS

DO NOT ALLOW MORT TO BE USED TO AUDIT A SAFETY PROGRAM DURING AN INVESTIGATION.

- **INVESTIGATIONS ARE CONDUCTED TO FIND OUT WHAT HAPPENED.**

- **AUDITS HAVE DIFFERENT PURPOSES, METHODS, OUTPUTS AND EFFECTS.**

INVESTIGATORS ARE ADVISED TO USE MORT ONLY AS DESCRIBED HERE DURING AN INVESTIGATION, TO AVOID POTENTIAL OBJECTIVITY PROBLEMS.

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If a safety need or problem is observed but it is not causally linked to any other MES Matrix events, and did not play a role in the mishap process, do not include it in the description or explanation of what happened. If it can not be linked directly or logically to the scenario, refer the observation to an audit group or discuss it in another report.

MORT investigation procedures parallel the MES technology in some respects. However, because they rely so heavily on the MORT safety assurance model and logic trees to guide the investigation, rather than letting the data guide the investigation as MES does, users are urged not to mix MORT and MES processes except as described here.

OBJECTIVE

To provide ideas about options during the certain stages of an investigation and the recommended action development effort. This Guide describes how to use the MORT model to assure that mishap investigations do not overlook any significant "programmer" actions that might be considered when filling gaps in MES Matrixes, and to recommended for future management of the occurrence. Programmers are individuals who "program" behavior of others - designers, trainers, managers, supervisors, family members, co-workers, regulators, etc.

APPLICABILITY

The MORT model is applicable during MES-Tree and recommended action development tasks. During hypothesis development, the MORT chart might suggest possible scenarios or aspects of scenarios for an MES-tree. After an accident or incident is understood, MORT can help with the problem discovery and definition tasks, and provide potential guidance to identify performance improvement options. It is most useful for suggesting potential candidates for action in specific cases.

DATA REQUIRED

The MORT model and companion Department of Energy MORT User's Manual[1] or MORT training are needed to use this method adequately . An understanding of the safety assurance system in the organization where the mishap happened, *and the description of the known events during the mishap* are needed before the MORT model ideas can be expected to add to the hypothesis or recommended action options developed.

DATA SOURCES

The data sources when the MORT model is used are the MES Matrix and the MORT model and User's Manual.

THE MORT MODEL

First time users are urged to read the legend on the MORT chart, and to acquire and read the MORT User's Manual, The MORT model itself contains a listing of:

- almost 100 generic problems,

- around 240 "bubbles" representing more specific problems, and

- 1500 possible specific safety assurance system problems if followed in every detail.

The model is laid out in a logic tree form. The main tree begins with the loss types described at the end of this Guide. The trees are supplemental branches from each of the main branches shown, further detailing areas on the main tree.

The MORT model uses several construction and layout techniques to permit all the information to be shown on a single (large) sheet of paper. When using the tree, knowledge of 4 ELEMENTS of its construction is useful:

A. **Question codes**. Each block on the tree has a label below the lower left corner. These labels are used to relate the questions in the MORT USER'S MANUAL to the tree, and to coordinate discussion by groups during their use.

B. **Watch Nomenclature**. The MORT model uses 5 ways to instruct the user to track the tree to other parts of the charts. These instructions are not conventional fault tree instructions. Differences include:

1. If a triangle comes off the sides or top of a block or gate, that means the tree branch should be repeated below the event identified by the label(s) in the triangle, and tracked from there down to the bubbles.

2. If a triangle is shown at the bottom of a box, that means a branch from the location specified in the triangle should be "copied" below the box, and tracked downward to complete the examination.

3. If you see a triangle below a box, and it has no numbers in it,

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then look to the right or left of that triangle, at the same level in the tree, until you come to a branch below a box at the same level. That branch is to be repeated below the event you just came from.

4. Large letters (A-G) called "drafting breaks" show where the detailed branch originates or is detailed. You must look for these big letters. Note that A and E are located in _ places on the chart.

5. The ovals with R# below some diamonds in the tree show you where the ovals under the ASSUMED RISK box in the second tier of the tree originate.

C. **Watch the gates**. The lines between blocks, with the logic gates in them, show how lower level problems can lead to losses up through the chart. Remember, if any event below an OR gate occurs, the event above the gate occurs. Watch for and/or gate relationships in Matrixes was well as the MORT model.

D. **Watch box contents**. The contents of the boxes are cryptic reminders of the kinds of questions you could be thinking about as you consider your safety control options. These contents are detailed in the MORT Users Manual.

USING THE MORT MODEL

1. Select an event pair or set on the MES Matrix

2. Try to locate a similar kind of entry on the MORT model. This may require raising the level of abstraction of the event set to relate it to one or more MORT entries, of find parallels with the MORT entries.

3. Note any candidate problem statements or options for changes that MORT suggests.

4. Analyze and evaluate candidates suggested by MORT as prescribed in Guide 9.

5. Step through the remaining EB pairs and sets, looking for similarities with the Model in the same way until all the EB pairs or sets have been examined.

6. Develop the candidates suggested by this process into problem statement and change options, and evaluate them.

COMMENTS

The MORT model is a large and useful reminder list of KNOWN problems that can be used during the analysis of the events pairs on an MES Matrix, or as a reminder list to suggest candidate changes when developing recommended actions following an investigation or hazard analysis. Unlike MES, it does little to help define *unknown unknowns* and discover *unknown problems*.
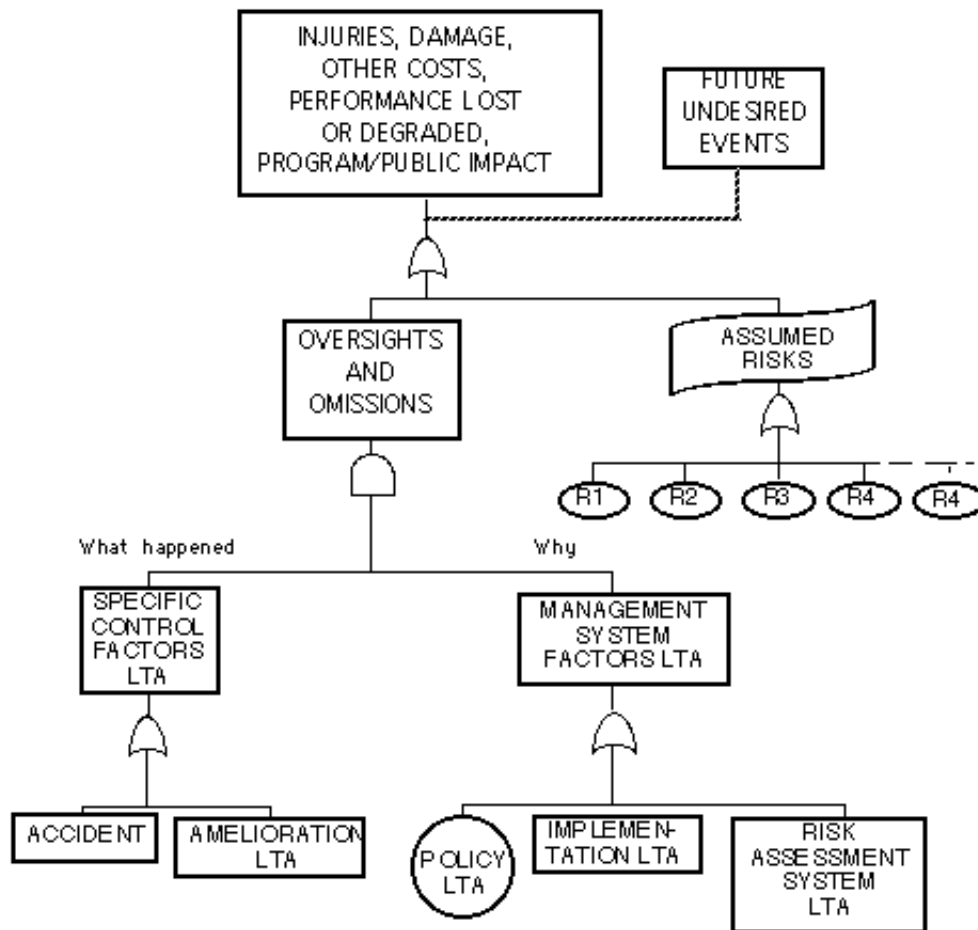
The Less-than-Adequate terminology is used as an alternative to calling something a cause or deficient, unsatisfactory, unsafe or other subjective assertions that can be argued and can create substantive controversy. Also, MORT charts do not consistent objective criteria for the determination of "less than adequate" except that something happened, and because it happened, the investigator elected to make a conclusion about the adequacy of one of the actions or conditions. A second problem is that something being less than adequate is assumed to be the bottom-most entry on the logic tree branch which may or may not be valid. The MES Matrix provides a continuous flow of interactions; if there is a gap in the flow, that defines the equivalent of the top *and bottom* of a logic tree -and it excludes OR gates. Thus use of the less-than-adequate abstraction in describing what happened or why during MES investigations is not a useful practice.

Caution in the use of the MORT model to *guide investigations* is again urged

Resource Availability

[1] Contact http://www.nri.eu.com/for information about availability of the MORT chart, MORT User's Manual and original research report .

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