Reliability Engineering & System Safety

Volume 99, March 2012, Pages 193 – 208

A systemic analysis of patterns of organizational breakdowns in accidents: A case from Helicopter Emergency Medical Service (HEMS) operations

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http://dx.doi.org/10.1016/j.ress.2011.07.009, How to Cite or Link Using DOI

Abstract

In recent years, many accident models and techniques have shifted their focus from shortfalls in the actions of practitioners to systemic causes in the organization. Accident investigation techniques (e.g., STAMP) have been developed that looked into the flaws of control processes in the organization. Organizational models have looked into general patterns of breakdown related to structural vulnerabilities and gradual degradation of performance. Although some degree of cross-fertilization has been developed between these two trends, safety analysts are left on their own to integrate this gap between control flaws and patterns of organizational breakdown in accident investigation. This article attempts to elaborate the control dynamics of the *Systems Theoretic Accident Model and Process* (STAMP) technique on the basis of a theoretical model of organizational viability (i.e., the *Viable Systems Model*). The joint STAMP – VSM framework is applied to an accident from a Helicopter Emergency Medical Service (HEMS) organization to help analysts progress from the analysis of control flaws to the underlying patterns of breakdown. The joint framework may help analysts to rethink the safety organization, model new information loops and constraints, look at the adaptation and steering functions of the organization and finally, develop high leverage interventions.

Highlights

► This article bridges the gap between two parallel trends in systemic accident models. ► Investigation techniques (i.e., STAMP) have looked into the flaws of safety management processes. ► The literature has highlighted many patterns (or archetypes) of organizational breakdowns. ► The Viable System Model is used with STAMP to link control flaws and organizational breakdowns.

Keywords

STAMP; Viable System Model; Cybernetics; Organizational accidents; Systems thinking

Figures and tables from this article:

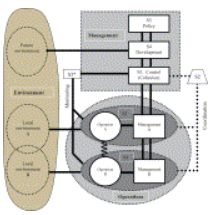

Fig. 1. A recursive template for the analysis of interactions between management, operations and environment.

Figure options

Fig. 2. A hierarchical representation of the wider organization of HEMS operations (STAMP perspective).

Figure options

Fig. 3. Flaws in the control loops regulating the interactions between flight crews, air traffic control and flight company.

Figure options

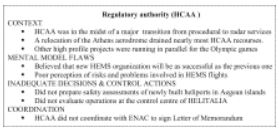

Fig. 4. Control flaws at the regulatory level.

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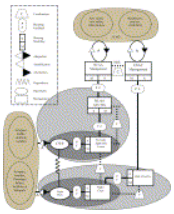

Fig. 5. A recursive representation of the wider organizational context (VSM perspective).

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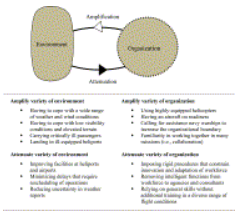

Fig. 6. Balancing the varieties of organization and environment.

Figure options

Table 1. Description of the five safety functions of the Viable System Model (adapted from [6]).

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Table 2. Control flaws leading to accidents [2].

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Table 3. Description of the extended categories of analysis in STAMP.

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Table 4. Timeline of first HEMS accident.

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Table 5. An overview of the main VSM principles to diagnose organizational breakdowns.

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Table 6. Some performance breakdowns leading to control flaws and hazards.

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