Resilience Engineering : Concepts and Precepts

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Preface

Decades of efforts aimed at understanding what safety is and why accidents happen have led to several significant insights. One is that untoward events more often are due to an unfortunate combination of a number of conditions, than to the failure of a single function or component. Another is that failures are the flip side of successes, meaning that there is no need to evoke special failure mechanisms to explain the former. Instead, they both have their origin in performance variability on the individual and systemic levels, the difference being how well the system was controlled.

It follows that successes, rather than being the result of careful planning, also owe their occurrence to a combination of a number of conditions. While we like to think of successes as the result of skills and competence rather than of luck, this view is just as partial as the view of failures as due to incompetence or error. Even successes are not always planned to happen exactly as they do, although they of course usually are desired – just as the untoward events are dreaded.

A case in point is the symposium behind this book. As several of the chapters make clear, the notion of resilience had gradually emerged as the logical way to overcome the limitations of existing approaches to risk assessment and system safety. Ideas about resilience had been circulated more or less formally among several of the participants and the need of a more concerted effort was becoming obvious. Concurrently, a number of individuals and groups in the international community had begun to focus on a similar class of problems, sometimes talking directly about resilience and sometimes using related terms. In the USA, the Santa Fe Institute had begun programmes on robustness in natural and engineering systems and on robustness in social processes. Within the school of high-reliability organisations, the term *resilience* appeared in paper titles, e.g., Sutcliffe & Vogus (2003). A related concept was the proposal of a conceptual framework, named Highly Optimised Tolerance (HOT), to study fundamental aspects of complexity, including robust behaviour (e.g., Carlson & Doyle, 2000 & 2002). In Europe, a research organization of scientists and practitioners from many disciplines collaborated to explore the dynamics of social-

ecological systems under the name of the Resilience Alliance, while another group was called the Information Systems for Crisis Response and Management or ISCRAM community.

The intention of getting a group of international experts together for an extended period of time to discuss resilience was, however, just one component. Some of the others were that one of the protagonists (David D. Woods) was going to spend some time in Europe, that initial inquiries indicated that the basic funding would be available, and that most of the people whom we had in mind were able and willing to interrupt their otherwise busy schedules to attend the symposium.

The symposium itself was organised as a loosely structured set of discussions with a common theme, best characterised as long discussions interrupted by short presentations – prepared as well as *ad hoc*. The objective of the symposium was to provide an opportunity for experts to meet and debate the present and future of Resilience Engineering as well as to provide a tentative definition of organisational resilience. Readers are invited to judge for themselves whether these goals were achieved and whether the result is, indeed, a success. If so, the credit goes to the participants both for their willingness to take part in a process of creative chaos during one October week in Söderköping, and for their discipline in producing the written contributions afterwards.

We would also like to thank the two main sponsors, the Swedish Nuclear Power Inspectorate (SKI) and the Swedish Civil Aviation Administration (LFV), who were willing to support something that is not yet an established discipline. Thanks are also due to Kyla Steele and Rogier Woltjer for practical and invaluable assistance both during the symposium and the editing process.

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