We Still Need Exceptional People

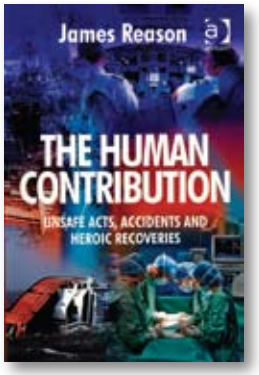
James Reason, analyst of organizational precursors in accidents, returns the focus to the individual.

BOOKS

Personal Qualities Make the 'System' Work

The Human Contribution: Unsafe Acts, Accidents and Heroic Recoveries

Reason, James. Farnham, Surrey, England, and Burlington, Vermont, U.S.: Ashgate. 310 pp. Figures, tables.



James Reason has been among the most prominent advocates of a "systems" approach to understanding accident causation. He is most closely associated with what has been called the "Swiss cheese" model — not his own term — in its successive versions. His model suggests that various latent failures sometimes combine with active failures, aligning organizational and individual factors, to create a temporary window of opportunity for an accident to break through defenses.

In *The Human Contribution*, Reason asks us to consider whether we have so absorbed his and others' system models that the balance has tilted too far from trying to understand the human side of accident scenarios. In particular, he wants to remind us that humans are not merely risk factors around whom safeguards need to be designed. They are also capable of creative and *heroic* actions on behalf of safety that no system design can accomplish.

As a prelude to discussing what he calls "heroic recoveries" that can be credited in large part to front-line individuals or small groups, Reason leads the reader step by step through the world of human factors in accidents and potential accidents.

He leads off with "A Mind User's Guide," a chapter about how the mind receives, interprets, stores and retrieves information. That might seem peripheral to heroic recoveries, but heroism usually must be allied with good decision making to be successful. Reason says, "Knowing something about how your mind works is often very helpful when making decisions in high-risk situations. Our heads are richly stocked with knowledge structures that are called to mind by similarity matching [observing common characteristics between a new situation and previously experienced ones] and frequency gambling [recalling the most frequently encountered information]. Sometimes … these unconscious search processes can lead us into error. But it is more likely that what is called to mind in this way is going to be an appropriate response."

He next considers "The Nature and Varieties of Human Error," classifying types of errors. For example, *omissions*, "a necessary or planned-for step is not done at the intended time." Any pilot who has made a gear-up landing understands this type of error. Omissions are likely to be the single most frequent type, he says, because they can occur at any stage of an activity. Another type is *wrong objects*, when "the right actions are carried out, but in relation to the wrong objects." A doctor who removes a kidney with impeccable skill from the wrong patient has committed this type of error.

"Errors cannot be eradicated, but they can be anticipated and managed accordingly," Reason says. "We can't fundamentally change the

human condition, but we can change the conditions under which people work in order to make errors less likely and more easily recoverable."

Reason continues by surveying the main explanatory theories, or "models," of unsafe acts.

He first considers the "person model," in which "unsafe acts are thought of as arising mainly from wayward mental processes: forgetfulness, inattention, distraction, preoccupation, carelessness, poor motivation, inadequate knowledge, skills and experience, and on occasions culpable negligence or even recklessness." Safety management based on this model spawns countermeasures aimed at influencing cognitive processes — posters, rewards and punishments, audits, "writing another procedure to proscribe the specific unsafe acts implicated in the last adverse event," retraining, and blaming.

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Reason acknowledges that the person model is intuitively appealing, not to mention attractive to management that would like to ascribe bad outcomes to wrongful acts by individuals. But, he says, "The shortcomings of the person model greatly outweigh its advantages," because as an explanatory framework it is "inextricably linked to a blame culture." He says the culture involves a set of pathologies called the "vulnerable system syndrome." Its three components are blame, denial and "the single-minded and blinkered pursuit of the wrong kind of excellence."

Blame is discussed at considerable length. Among its drawbacks, Reason says, is that it sabotages any attempt to create a reporting culture in which front-line operators report errors or even by-the-book acts that might have, but did not, result in accidents. "Closely investigated accidents are relatively infrequent; only through the analysis and dissemination of these 'free lessons' can the organizational managers learn how close their operations come to the 'edge.'"

Denial is the attitude that accidents happen to someone else who is less conscientious. "No statement from the managers of a hazardous system could chill me more than 'it couldn't happen here' — although the claim that 'we have an excellent safety culture' comes very close," Reason says.

What could be wrong with the pursuit of excellence? It depends, Reason says, on the real — as opposed to the official or "correct" — definition of excellence that prevails, and whether it is understood in terms of overall results rather than limited, sequestered successes. "When dealing with complex systems, people think in linear sequences," he says. "They are sensitive to the main effects of their actions upon their progress towards an immediate (often numerical) goal, but frequently remain ignorant of their side effects upon the rest of the system."

In contrast to the person model, "a system perspective is any accident explanation that goes beyond the local events to find contributory factors in the workplace, the organization and the system as a whole." He describes a number of such accident models, in addition to his own "Swiss cheese" versions.

"Although the system models seem, on the face of it, to be far more appropriate ways of considering accident causation, both in terms of understanding the contributing factors and in their remedial implications, they too have their limitations when taken to extremes," Reason says. People on the "sharp end" generally have little direct opportunity to bring about rapid system improvements and global changes. An overemphasis on systems that virtually ignores the human contribution risks instilling "learned helplessness" in personnel.

But personal attitudes are still important for safety, whether the system is benign or otherwise. "Personal qualities do matter," he says.

Reason concludes that the person and system models are inadequate in isolation: "We need to find a balance between the two that continues to promote systemic improvements while, at the same time, giving those who have little chance of changing the system some mental skills … that will help them to avoid error traps and recurrent accident patterns tomorrow rather than at some undetermined time in the future."

In the culminating chapters on heroic recovery, Reason looks at the needed personal characteristics under the headings of "training,

discipline and leadership," "sheer unadulterated professionalism," "skill and luck," "inspired improvisations" and "the ingredients of heroic recovery." To illustrate his points, he cites numerous examples, not only from aviation but from military, naval, space flight and medical history. Reason's earliest example of discipline is drawn from an 1811 battle in Spain during the Napoleonic wars.

Several famous incidents in aviation are discussed in terms of the human qualities that enabled them to be ended successfully or partially successfully. The chapter on "sheer unadulterated professionalism" describes British Airways Flight 09 in 1982, when all four engines of the Boeing 747 failed after ingesting volcanic ash, and it looked like the airplane would have to glide to a water landing, which no one had ever tried in a 747. The captain's announcement to the passengers while the crew was working out emergency landing procedures was calmness itself: "Ladies and gentlemen, this is your captain speaking. We have a small problem. All four engines have stopped. We are doing our damnedest to get them going again. I trust you're not in too much distress." The engines were eventually restarted and the crew made an emergency landing at Jakarta, Indonesia.

Other incidents include the British Airways BAC 1-11 flight in which an explosive decompression blew the pilots' windscreen out of the aircraft; the Air Canada Boeing 767 that ran out of fuel because of a loading miscalculation and was glided to a landing at a disused military airstrip; the United Airlines McDonnell Douglas DC-10 in which the flight crew maintained controlled flight using thrust after an uncontained failure of the no. 2 tail-mounted engine resulted in the failure of all three hydraulic control systems; and the ingenious improvised procedures by which the captain of an Air New Zealand DC-10 was able to guide to safety the pilot of a Cessna 188 whose automatic direction finder had failed.

Reason analyzes the human qualities that underlie heroic recovery under three headings: coping with expected hazards; dealing with unlikely but possible hazards; and generic qualities "that could contribute to successful recoveries in any emergency."

Expected hazards are not necessarily likely, but rather ones that have occurred in the past and sooner or later will arise again. The human factors that improve the odds of a successful response, Reason says, are these: "Identification and assessment … ; the development, testing and training of a set of countermeasures designed to neutralize the threat (established long before it was called upon); and an effective and timely way of deploying these countermeasures, a process relying critically on situational awareness. The latter has three components: perceiving the critical elements in the current situation; understanding the significance of these elements; and making projections as to their future status."

For avoiding probable disaster in unlikely situations — fuel exhaustion in the 767 and the loss of normal control mechanisms in the DC-10, for instance — Reason believes one key element is "irreplaceable people." In the case of the 767, "the odds of having a skilled glider pilot as the captain and someone who had flown out of Gimli [the disused military airfield] as the copilot, the two things necessary to save the stricken aircraft, are almost infinitesimally small." The saving of the lives of many passengers and crewmembers on the United DC-10 was "a team effort, but I believe it was [Capt.] Al Haynes's personality and his cockpit management skills that were the key elements in bringing that about. And it was his inspirational use of the one and three engines that prevented the aircraft from turning onto its back and falling out of the sky at a very early stage of the emergency."

Decision-making styles are another important factor, Reason says, although different styles of decision making are needed in different kinds of situations. "There are four principal types of decision making: intuitive (recognition-primed), rule-based (where rules are available from remembered experience or from procedures), analytical (choice through comparison of options) and creative thinking (coming up with something entirely new to solve a novel

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problem). Selection of a decision-making mode depends crucially on assessing the situation."

"Realistic optimism" is one of the most important generic qualities, Reason believes: "It is high on the list of necessary attributes for aspiring heroic recoverers, and it is particularly important when there is a succession of problems, as was the case in many of these emergencies. What wins out is the stubborn belief that it will be all right in the end."

Reason sums up: "Many if not most recoveries were achieved as the result of a providential awareness, personality, professionalism, teamwork and, in certain circumstances, some unexpected skills. …But these individual ingredients did not appear altogether out of the blue. They had to be selected for and then trained, nurtured and supported by the organizations that the heroic recoverers served."

WEB SITES

Eurocontrol Airport Safety, <www.eurocontrol.int/runwaysafety/public/subsite_homepage.html>

This "Eurocontrol Web Site for the Prevention of Runway Incursions" offers information based on joint initiatives by Eurocontrol; the Joint Aviation Authorities; the International Civil Aviation Organization (ICAO); European, U.S. and Canadian regulatory bodies; and many professional and industry organizations.

The Web site contains the full text of the "European Action Plan for the Prevention of Runway Incursions," which may be downloaded at no cost. The plan provides a history of the combined efforts of interested parties in developing and implementing programs to reduce runway incursions. Also included are 56 recommendations, plus guidance materials and best practices to support actions. Guidelines are offered to assist local safety teams at airports in initiating runway safety programs. Local safety teams are a key component of the larger action plan.

Presentations and accompanying materials from runway safety workshops held in various European locations between 2002 and 2008 can be found in the "Airport Safety Archives" section.

Implementation products — posters, fact sheets and documents such as "Five Studies Relating to Different Runway Management Techniques" and "Air Traffic Control Situational Awareness Occupied Runways," ICAO's "Manual for Preventing Runway Incursions," and ARIA, an Aerodrome Runway Incursion Assessment tool — are available online for downloading. Most are in Adobe portable document format (PDF).

Eurocontrol says ARIA is a computer-based assessment methodology that can help identify specific airport locations where runway incursions could occur and remedial actions that might help reduce the odds of occurrences. ARIA software, user guide and methodology documents may be downloaded at no cost.

A link from Eurocontrol Airport Safety leads to a portal called "Preventing Runway Incursions." Clicking on the link opens a new Web site, <http://bluskyservices.brinkster.net/rsa>. The opening video says, "On average, there are two runway incursions every day in Europe. This portal contains material that you can use to help prevent runway incursions."

Readers can review videos on four runway incursion incidents. Videos — some with soundtracks — are accompanied by interactive quizzes, textual descriptions and analyses of events, and recommendations to prevent the impending incursions shown in the videos.

This portal Web site contains a facts and figures section with definitions, statistics, causal factors, accident reports and more. Several documents from the Eurocontrol Web site are duplicated at this site.

— Rick Darby and Patricia Setze