

1971

January 2

A ban on television cigarette advertisements goes into effect in the U.S.

February 8

A new stock market index called the Nasdaq debuts.

Computer engineer Ray Tomlinson sends the first e-mail.

February 9

Satchel Paige becomes the first Negro League player to be voted into the Baseball Hall of Fame.

"All in the Family" debuts on CBS.

U.S. Occupational Safety and Health Administration is formed.

January 25

Idi Amin leads a military junta and seizes power in Uganda.

February 9

The San Fernando earthquake leaves more than 60 dead and causes \$500 million in property damage.

Boxer Joe Frazier defeats Muhammad Ali in the "Fight of the Century."

April 14

President Richard Nixon ends the U.S. trade embargo against China.

Symptoms of Operational Error

By D.A. Weaver

Reprinted from October

1971

When this article was published, D.A. Weaver was director of policyholder education for Employers Insurance Company of Wausau. In that role, he devised and conducted courses in safety management. During his career, he developed a series of conferences on strengthening supervisory skills and devised a technique of operations review to help locate and define operational error. Before joining Employers Insurance, Weaver was a faculty member of the Traffic Institute at Northwestern University and a safety consultant. He also held positions at the Institute of Public Safety at Penn State University. When this article was published, he was a CSP, a certified fleet safety director, and a chartered property and casualty underwriter. Weaver was named an ASSE Fellow in 1990 and is a professional member emeritus of ASSE's Pikes Peak Chapter.

OPERATIONAL ERROR has occurred whenever unplanned and undesired results stem from the acts or decisions of supervisory management. With that definition, this article relates safety to organizational improvement and offers eight aphorisms to guide the safety director in performing his role as a manager in the organizational context.

The themes advanced in this article were developed as the opening topic in a course in safety management. They were meant to open the door for course content to follow, content dealing with the management of a function rather than the do's and don'ts of safety technology. Robbed of the opportunity for full exposition, the themes have an aphoristic

brevity. It may serve, however, to outline the role of the safety director as a manager, to help orient less-experienced safety practitioners and to be interesting to the safety professional.

All Themes Tied Together by One Principle

One principle ties all the themes together. "The function of safety is to locate and define operational error." This quote, taken from an article by Pope and Cresswell, becomes the logical base to discuss the supervisory/management aspects of safety management. If the function of safety is to locate and define operational error, how does the safety director operate within the managerial context to do so? What is operational error; how is it defined? What effect do operational errors have on an organization? What effect do they have in implementing safety controls? How does the newly appointed safety director implement fundamental change in an organization instead of merely preaching his newly acquired "do's and don'ts" of safety? In short, how does he operate as a manager?

It becomes necessary now to attempt a definition of operational error. Operational error has occurred whenever unplanned and undesired results stem from the acts or decisions of supervisory management, or the failure to act or decide. The term "supervisory management" encompasses the entire management structure from chief executive to the lowest level of frontline leadership.

What are "unplanned and undesired results"?

April 20

U.S. Supreme Court rules unanimously that busing of students may be ordered to achieve racial desegregation.

May 29

First standards adopted to provide a baseline for safety and health protection in American workplaces.

October 1

Walt Disney World opens in Florida.

First night game in World Series history is played, with the Pittsburgh Pirates defeating the Baltimore Orioles.

November 15

Intel releases world's first microprocessor, the 4004.

Greenpeace is formed from a group formerly known as the Don't Make a Wave Committee.

May 1

Amtrak begins operation of intercity passenger trains in the U.S.

June 13

New York Times begins to publish the Pentagon Papers, reporting on the country's political and military involvement in the Vietnam War.

October 21

President Nixon nominates William H. Rehnquist to the U.S. Supreme Court.

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Examples are endless, including occasional accidents and injuries. If the customer ordered green and we send him pink, operational error has occurred. If 300 gallons of product go down the drain, operational error has occurred. If the crew goes to one location, the power equipment to a second, and an angry supervisor waits at the actual job-site, we have an unplanned and undesired result stemming from operational errors. The examples of waste and snafus are indeed more common and more costly than the occasional accident or injury, but such incidents have no name. We recognize, define and name the particular incident we call an accident, but all such unplanned and undesired results stem from operational error.

The operational errors that result in accidents and injuries also produce the endless array of other unplanned and undesired results which supervisory management contends with every day. The unplanned and undesired result is merely a symptom. The accident or injury is a symptom. So is the shipment that goes astray, the contaminated batch, the customer badly served, the snafus which snowball into major events. All are symptoms of the same underlying operational errors.

Must Modify Our Definition

But is it the function of safety to "locate and define operational errors" that result in rejects, contaminated batches, badly served customers and similar snafus? Clearly, these are beyond the scope of safety, so we must modify our definition. The function of safety management is "to locate and define the operational errors that can produce the symptoms we call an accident and/or injury." So modified, the definition suggests the scope of the safety function and indicates the safety director's role as a manager.

The role of a manager is to harness and improve the supervisory/management skills of an organization to achieve safety objectives. No organization is perfect; all have strengths on which to build, and weaknesses to buttress in an ever-shifting

process of change. To this task, the safety manager brings a knowledge of management principles and practices in addition to his input of safety knowledge. In the process, the safety manager improves the competence of the organization to achieve any of the purposes and goals of management.

The point can most readily be seen in its extremes. At one extreme, excellent safety performance cannot be attained in a generally poor organization. The skills, procedures, policies and direction to achieve any of the goals of management (indeed to define the goals of management) simply do not exist. At the other extreme, excellent organizations frequently achieve excellent safety results in the absence of any "visible" safety program as such. Safety management cannot lift safety performance above the level of competence generally exhibited by the organization. It can only lift it to the same level. Thereafter, improvement in safety performance requires organizational improvement. Conversely, safety improvement achieves organizational improvement as a corollary.

Modern concepts of systems safety encompass this idea, since all of the acts of supervisory management are part of the system. But we need not implement systems safety to operate on the principle of locating and defining operational errors. We can fit the principle into safety theory by slightly modifying Heinrich's familiar domino sequence.

Direct, Simple Approach by Heinrich

Heinrich's approach was direct and simple. He centered on the unsafe act or condition in the accident sequence. Interrupt the sequence by removing the unsafe act or condition, and the accident with its possible attendant injury will not happen. It provided an entering wedge into the chaos of all knowledge encompassed by safety. Focusing on conditions, safety professionals have delved into engineering, physics and chemistry to construct one great branch of safety technology—that dealing with things. Focusing on unsafe acts, we have delved into psy-

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chology, medicine, biology, sociology and communication skills to construct another great branch of safety technology—that dealing with people. When we have delved into things and people, we have delved into all there is, borrowing our knowledge from all disciplines of learning.

To this mass of all-encompassing knowledge, safety brings a format to think with, or perhaps several as sophistication grows. Industry is imbued with Heinrich's format, in terminology, in supervisory training, in the nature of the data recorded, in analysis, and in the practices and procedures based on that thinking. Had organized industrial safety been founded on the concepts of epidemiology or of systems theory, our thought, our literature and our practices would be much different. Not necessarily better, but different.

Heinrich's shrewd focus on unsafe acts and conditions provides an entering wedge for thinking about cause and prevention. That thinking, however, diverts into undue preoccupation with fault of persons. The format offers no peg on which to assess supervisory management practices.

None of us, not even expert psychologists and psychiatrists, can brag excessively about success in understanding and "correcting" people. Obviously, we borrow from these disciplines to form important aspects of safety technology and supervisory training and skill. But supervisory management must remain amateurs in this area. They are presumed to have expertise in the area of supervisory/management practices. Why seek solutions in an area that baffles the experts? Why not also seek cause and corrective action in their own area of expertise—that of supervisory management practices.

Mate Two Sets of Ideas

To seek cause and corrective action in supervisory/management practices, we mate two sets of ideas. We mate the idea of locate and define operational error to the inbred thinking of the Heinrich format. The mating produces the principle that accidents and injuries as well as unsafe acts and conditions are all symptoms of operational error. Behind the unsafe scaffold, the unsafe act, the faulty tool, the defective machine or layout lie management practices. Behind any proximate cause (unsafe act and/or condition) ascribed to an accident lies management practices in policy, priorities, organization structure, decision making, evaluation, control and administration. Accident investigation seldom dwells in these areas.

In this modification of Heinrich, the input of safety technology and immediate correction are still achieved by identifying unsafe acts and conditions. We ask, "What unsafe act and/or condition," and receive a reply in terms of safety technology.

But we expose operational error by asking two further questions: "Why was the unsafe act and/or condition was permitted?" and "Did supervisors/management have the safety knowledge to prevent the accident?"

The whether question asks whether the laws, codes and standards applicable to the circumstances were known. Whether the safety director knew them. Whether the hazard had been identified by foresight. Whether the books, pamphlets and knowledge needed were available. Whether the supervisor knew them. In short, did the organization possess knowledge of the safety technology available?

The why question asks why knowledge was not effectively sought or why it was not effectively applied. The question exposes operational error in the area of management policy, confusion in goals, staffing, housekeeping, responsibility, use of authority, line and staff relationships, accountability, rules, initiative and much more. These deficiencies in supervision and management combine to produce an accident rather rarely. Their correction improves the daily operation as notably as they prevent accidents.

Purpose to Create a Rationale

The purpose of all of the above is merely to create a rationale upon which to teach the management of the safety function. We now can summarize the above and introduce a series of statements or principles to guide further thought and study, the aim being to assist the safety director to function as a manager.

Accidents and injuries (and unsafe acts and conditions) are symptoms of operational error. This principle summarizes the foregoing, since the function of safety is to locate and define those operational errors that result in accidents and injuries.

Every accident is the result of operational errors together with some combination of unsafe acts and conditions. This is the familiar idea of multiple causation with emphasis on seeking cause and correction in the acts of supervision and management. Rare is the accident that was unpredictable to safety technology. The hazard and its control were known, and usually clearly set forth in the safety literature. Hindsight nearly always indicates how it could have been prevented, yet was not. Factors of policy, priorities, pressures, conflicting goals, rule enforcement, procedure, authority and accountability relationships/factors of supervision and management stymied effective implementation of safety technology.

By this principle, we also avoid the useless hassle over whether most accidents result from unsafe acts or unsafe conditions. The dying myth that 88% of accidents result from unsafe acts is startlingly

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OSHA Begins

The OSH Act of 1970 established a nationwide federal program to protect workers against job-related death, injury and illness. Secretary of Labor James Hodgson, who had helped shape the law, termed it “the most significant legislative achievement” for workers in a decade. Hodgson’s first step was to establish—effective April 28, 1971—a special agency, OSHA, to administer the act.

Hodgson selected George Guenther, who was then director of the Labor Standards Bureau, to head OSHA as Assistant Secretary of Labor for Occupational Safety and Health. Guenther had come to the Labor Department from the post of deputy secretary of the Pennsylvania Department of Labor and Industry.

During OSHA’s start-up phase, some of its actions and policies were reasonably successful, others were less so. Its organization and establishment within the Labor Department went smoothly. A decision to seek voluntary compliance and avoid a punitive approach to enforcement was well-received by the business community. Because of resource limitations, OSHA loosely targeted its enforcement in a worst-case-first approach that emphasized investigation of catastrophic accidents and employers’ compliance in the most dangerous and unhealthy workplaces. Partly at the urging of organized labor, OSHA tried to emphasize the “H” in its name. The first standard it set was for asbestos fibers.

Soon enough, however, OSHA developed its long-lasting reputation as a “nit-picker,” largely because of the agency’s verbatim adoption and enforcement of a body of voluntary consensus standards developed by industry associations. While adoption was specifically mandated by the act, OSHA chose to promulgate the rules en masse and immediately, having them take effect in August 1971 instead of using the full two-year phase-in period that the law allowed.

Source: U.S. Dept. of Labor. “The Occupational Safety and Health Administration: A History of its First Thirteen Years, 1971-1984.”

alive in the ranks of supervision and management, producing blame of persons but little improvement in supervision and management. Once again—locate and define operational error—integrate safety into the prevention of unexpected and undesired results. When operational error is corrected to prevent accidents, injuries, and unsafe acts and conditions, we at the same time achieve supervisory/management improvements that help to prevent the daily incidents of waste, inefficiency, rework and snafus. The same operational errors, combining in ever-changing and often improbable ways, produce the daily load of unexpected and undesired results, including relatively rare accidents and injuries.

Safety management encompasses more than injury prevention. Perception of the scope of safety is too narrow when property damage accidents go unrecorded until they produce an injury. Or when adjunct motor vehicle operations are touched hardly at all, or its opposite, when fleet safety directors need reminding that injuries on the dock and in the shop fall under their purview.

Fire safety in many operations is clearly defined as part of safety. In others, it clearly is assigned to a fire marshal or to security staff. But in a huge middle block, it is clearly assigned to nobody. Exclusive concern with injury prevention leaves many areas of responsibility undefined, blinds us to opportunities to improve an organization overall, and creates the very circumstances in which people get hurt or killed.

Scope Needs Consideration in Every Organization

The scope of safety management needs consideration in every organization. Does it include fire or security or product safety or insurance claims administration or public liability exposures or motor vehicle safety? Safety combines well with certain other functions; and the needs, priorities and structure of organizations differ. The purpose here is not to define the precise scope of safety management nor to insist that it should be the same in every operation. The purpose is to observe the blinders created by exclusive focus on injury prevention.

The blinders can be removed by reverting to the definition of the safety function—to locate and define operational error that produces the symptom we call an accident or injury. With that definition, the organizational structure can be surveyed, areas of defined and undefined responsibilities can be exposed, staff and line authorities can be clarified, and the scope of the safety function can be defined in accord with the needs and priorities of the organization.

Safety performance reflects the will and the competence of line management. However worded, and whatever the semantic difficulties created by any given set of words, this principle enunciates the most fundamental tenet of safety, usually worded to the effect that safety is a line function.

A classroom exercise in one company illustrates the concept. The group had been carefully selected to include all echelons of management. There sat the vice president of a plant or a product line with his superintendents, managers, supervisors, foremen and frontline leaders, a vertical slice of the whole line organization. After suitable preliminaries, they were asked to list all the things they saw “out there” to correct in order to prevent accidents.

Some of what they saw was vague and abstract, but they also recorded specifics—the leaky valve under pressure, the strewn hoses, the walkway with no railing, the slippery floors, the tagout on machines that required lockout, tagouts left in place after repair was completed, rules ignored and invoked only when an injury actually occurred. They saw quite a bit.

WORK ACCIDENTS

For the period **July to December 1971**, occupational injuries and illnesses in the private non-farm sector occurred at the rate of 13.8 per 100 employee-years. The statistics covered some 56 million workers.

Rates for major industry groups were:

Construction	22.5
Manufacturing	16.5
Transportation &	12.1
Public Utilities	
Wholesale & Retail Trade .	8.8
Services	7.1
Finance, Insurance	2.8
& Real Estate	

During those six months, **3.1 million** recordable occupational illnesses and injuries were reported, as were nearly 4,300 work-related deaths and **12.2 million** lost workdays.

Then they were asked, “Why haven’t you corrected these things? At some level you have command authority. Why haven’t you issued the orders necessary to correct these things? What are you waiting for?” The ensuing discussion, corrected the idea that safety is something done by the safety director, and exposed the real confusions, the conflicting pressures, the real limitations on their command authority, and the patterns by which they received praise, blame and reward. The resolution of those real obstacles goes far to indicate the role of the safety director as a manager.

Heinrich’s Axiom Can Be Misleading

Heinrich’s axiom that “the supervisor or foreman is the key man in industrial accident prevention” can be misleading. What the supervisor does about safety depends on what his boss wants him to do, not on the admonitions of the safety director. His rewards come from his boss, not the safety director and so on up the chain of command to the chief executive.

Emphasis on the key man creates the idea that safety is somehow achieved by lower echelons with the help of an occasional “tut tut” from the rarified levels of upper management. The key-man idea even causes the inexperienced safety director to feel

that his job is to scurry to the lowest echelon of front-line supervision, and with that precarious leverage seek to move the whole organization. What the frontline supervisor will do, indeed what he can do, is set for him by management direction. The task of safety management is to see that the line organization at any echelon receives direction from line superiors to achieve safety objectives (plus the input of safety technology).

Management direction of loss control is just that—direction by management in accord with the mission of the organization, using safety expertise to help achieve the mission of the line structure. If the safety director has to plead for cooperation, the shoe is on the wrong foot; management direction is ineffectual. Also, it would appear, safety has been misconceived as a preaching chore, an operational error to which the safety director may contribute by failing to exercise his role as a manager.

Command authority to achieve safety objectives resides in the line structure. Safety management is a staff function—guiding, planning, counseling, helping the line to achieve its mission. The concept begins as an advisory function with no command authority—although a staff function can be invested with command authority.

The term “command authority” is used to designate line authority. It is a brisk term, usually avoided in business; but it does precisely indicate superior/subordinate relationship. To the extent that a staff function is invested with command authority, it can intervene into the operations of the line. Basically, safety is a staff function guiding, planning and assisting with command authority circumscribed by policy and practice. The command authority to achieve safety objectives resides in the line.

Staff/Line Authority Relationships

Since safety is a staff function, it follows that study of the queasy subject of staff/line authority relationships augments effective safety management. Texts have been written on it. Any management text contains a chapter on staff/line relationships. None ever mentions safety or illustrates with safety examples. Perhaps that is why safety so frequently is reduced to pleading for cooperation. The chapter in Koontz and O’Donnell is perhaps richest in implication and most precise, although there are easier expositions for purposes of safety management.

The needs of the organization should determine whether the safety function should be invested with command authority. The managerial question should be, “What command authority is needed by the safety function to achieve the mission of the line organization, and what command authority presently exists in practice?” The clarity of thinking posed

by those questions kills many a stirring debate about management support or the personality attributes of the safety director.

Safety management is powered by policy, not support and cooperation. Policy is the management tool that asserts direction and resolves competing and conflicting goals and priorities. Safety policy should not be a species of poetry asserting noble aspiration. Clarification of safety policy should be one of the primary aims of safety management.

What is policy as contrasted to procedure, methods, rules and instruction—all of which are presented in manuals and handbooks and often referred to as policy? Perhaps much fruitless discussion of dictionary definitions can be avoided by giving the word “policy” a pragmatic definition: Policy is the voice of the big boss. So defined, the safety function should know which boss has that voice and what they want that voice to say.

Try a brain-cudgeling exercise to open the doors of perception. Write precisely worded statements of what safety policy is thought to be. Begin with whatever written policy exists. Consider what may exist as unwritten policy. Assess practices and procedures as reflections of policy. Whatever exists in fact and practice for good or bad can be reduced to statements of de facto policy.

Must Understand the Organization

The safety manager must understand his organization—its needs, its conflicts, its goals, its resources—so that he can define what he wants that big voice to say. Safety’s problems in achieving support and cooperation should be reduced to carefully carved statements of written policy and submitted for acceptance, rejection or modification. Top-echelon line executives should participate in the process, for they must operate under the policy and lend command authority to its implementation. Safety is ill-served by treating it solely as a humanitarian impulse, welling up from below, and pleading for support. Rather, safety is a function to be managed with skillful application of the requisite management tools and principles. In this case, that means a proper understanding of management literature on policy becomes part of effective safety management.

The voice of the safety director is the voice of his boss. The voice of any staff member is the voice of the boss. How far that voice reaches, whether it speaks for him, whether it influences necessary centers of line authority, whether the boss is line or staff—all this must be considered in determining what niche safety management occupies in the company organization. In a smaller organization, safety usually reports to the chief executive, whose voice obviously can reach the whole organization.

In larger organizations, this simple solution is not always feasible. Safety can be found reporting to line operations, to maintenance, to engineering, to legal, to the insurance manager, to the personnel manager, to industrial relations, even to the training department. Where should it be in order to effectively manage the safety function? Part of the answer lies in the principle of similar groupings, and part lies in the goals of the organization that should be reflected in the organization structure. The question is easier asked than answered, and the answer should be unique to each organization, and the niche occupied does make a difference. The differences can be assessed by remembering that the voice of the safety director is the voice of his boss. Weaver and Petersen have pursued the principle further, and Simonds and Grimaldi have touched on location in the organization structure as well.

Accountability should be fixed near the point of control. The point of control lies in the line organization. Therefore, safety management must devise procedures to fix accountability at the point of control. This means something counted or measured with sufficient reliability and validity that line management accepts it for appraisal, praise, blame, correction and reward. Correction of supervisory safety performance (with suitable input of safety expertise) should be the task of immediate superiors at every echelon, because it matters to them, because they also are being held accountable by the same procedures.

“Tenuous, Variant, Insensitive, Unreliable”

Typical safety measurements, in the words of Tarrant, prove to be “tenuous, variant, insensitive and unreliable.” Admitting the real difficulties, the more important point is that safety technology has failed to cope with the challenge posed by the management principle. Instead, safety literature is filled with motivation and incentive gimmicks (admirable in themselves), expositions of management role and responsibility, and topics on how to get support and cooperation.

Petersen has published an item recognizing the principle and has proposed that procedures to fix accountability be developed in two pathways. One pathway evaluates activities—whether the line organization purposefully implements those activities, lockouts, inspections, orientations, coaching, preplanning, reporting, etc., deemed necessary and under the command authority of the line. The development of procedures to fix accountability for activities (see Diekemper and Spartz) would seem to pose no insurmountable obstacle. The other pathway would fix accountability for results—whether the activities pursued actually control injuries and costs, with accountability so fixed that

results show up in budgets, profit and loss statements, appraisals and recognition for successful supervisory/management performance. This is where typical data proves variant, tenuous and unreliable.

Nonetheless, safety literature contains many isolated tools that could be bent to this purpose, but they have not been harnessed to the management principle and expounded as a management tool. They seem largely to have been conceived as research projects or as arguments to gain support. The task is to shape them into ongoing control data for the use of line management, not the safety director. Petersen has also contributed a hypothetical method to achieve this purpose, but lack of method is less significant than lack of managerial principle. Feasible methods within the administrative resources of any organization do exist and are used effectively by some organizations. Their wider use depends on shrewd management of the safety function, and the development of a body of literature beyond safety technology dealing with the techniques of safety management.

Mission-Oriented Line Management

Line management by necessity is mission-oriented. The mission should include due regard for the welfare of people; but the primary mission is economic survival. The resources of any organization are limited; and time, money and effort are expended according to apparent importance. Thus, the tasks of safety consciously or unconsciously assume a priority of importance, including humanitarian ethics and morality. Humanitarian aspirations are best achieved by mission-oriented safety manage-

ment. The command authority of line management will be devoted to the tasks of safety to the degree that safety management serves their mission. That is why procedures to fix accountability are so important—so that safety performance at each echelon can be measured as it contributes to the mission.

In summary, safety management improves the whole process of supervisory/management, measuring its effects in terms of goals defined to serve the mission of the organization. But goal setting is a topic for another day. Organizational improvement is not a counsel of perfection. Organizations are composed of fallible people and will always be imperfect. But it is more feasible to improve organizations than to improve people. ■

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