
Developing Leaders for Decision Making Under Stress: Wildland Firefighters in the South Canyon Fire and Its Aftermath

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To identify the sources of ineffective leadership decisions, we focus on ten decisions made by a leader of a wildland firefighter crew during the fatal South Canyon fire of July 5–6, 1996. The decisions of team leaders in fire zones are unusually clear-cut and consequential for the goals of the enterprise, but they are not unlike decisions faced by managers of most organizations. We suggest that three factors—underpreparation, acute stress, and ambiguous authority—can result in suboptimal decisions by team leaders on a fireline. Through detailed evaluation of the team leader's ten most consequential decisions in the South Canyon fire, we conclude that five were relatively optimal for the triple objectives of safety, speed, and suppression, but five others proved suboptimal. Much of their suboptimality is traced to the fact that the team leader was undertrained for leadership decision making, faced intense stress, and operated without clear authority. In the wake of this firefighting disaster—14 men and women lost their lives—the fire service created a development program using both classroom and experiential methods for preparing its leaders to make good and timely decisions. The South Canyon fire and its aftermath point to the value of explicit preparation in leadership decisions by both fire services and business schools as part of their efforts to enhance strategic thinking and other essential leadership attributes for achieving organizational goals in high stress environments.

Wagner Dodge led his crew of 16 young men to combat the forest fire in Mann Gulch, Montana on August 5, 1949. All but one had parachuted into the

We are grateful to editor James Bailey and two anonymous reviewers for their very helpful suggestions and guidance during the review process. We are thankful for the useful commentary and insights of those who joined us during a day-long walk of the South Canyon fire zone on Storm King Mountain on May 29, 2002, including affiliates of several wildland firefighting agencies: Kim Bang, Grant Beebe, Tim Blake, Sarah Doehring, Pam Ensley, Deb Epps, Anthony Escobar, Jim Glenn, Jim Kitchen, Mark Linane, Bob Leighty, Nancy Lull, Greg Power, George Steele, and Steve Thomas; officers of the U.S. Marine

canyon at 4 p.m. for what looked to be a routine mission. But a series of leadership choices resulted in their entrapment, and by 5:56 p.m. all but three had been fatally burned.

Donald Mackey helped oversee 49 firefighters spread out to combat a fire on Storm King Moun-

Corps: Bob Baird, Eric Carlson, and Cheston Souza; author John Maclean; and affiliates or graduates of the Wharton School: Mark Davidson, Neil Doherty, Bruce Newsome, and Barbara Shannon. We are deeply indebted to Donald Mackey, whose decisions during the South Canyon fire have profoundly informed our thinking and conclusions.

tain, Colorado on July 6, 1994. Some of the 49 had parachuted onto the mountain that day; others had come by helicopter, still others by foot. A chain of leadership decisions also resulted in their entrapment, and by 4 p.m. it appeared that the Mann Gulch disaster was about to repeat itself.

Bad luck and a fatal confluence of environmental factors contributed to the flaming ambush of the firefighters in both Mann Gulch and on Storm King Mountain, but leadership decisions were also critical in both. Those most directly responsible on-site had faced a sequence of decision points during their fateful hours in the fire zone, and their decisions at those points helped bring the teams to the brink of disaster.

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The human consequences of suboptimal decisions by fire leaders are compellingly clear, and, conversely, optimal leadership decisions are no less vital for successfully suppressing a fire. The same is evident in company management: Faulty leadership decisions helped bring down such firms as Enron and WorldCom, and quality decisions have been vital for the prosperity for companies from eBay to Southwest Airlines.

To help identify what makes for good leadership decisions, we have chosen to focus on wildland firefighters, those who combat forest, brush, and grass fires in the backcountry. The decisions of wildland fire crew leaders are unusually clear-cut and consequential for the goals of the enterprise—but at root they are not unlike decisions faced by managers of most organizations. Wildland firefighting offers a particularly effective vehicle for understanding the predicates of good leadership decision making whatever the venue.

The specific focus of our analysis is the set of leadership decisions among the firefighters on Storm King Mountain on July 5 and 6, 1994 in what has come to be known as the South Canyon fire. Our method is to examine the events of the fire in sufficient detail to pinpoint the critical decisions and then extrapolate their implications for leadership decisions in other settings and institutions, including company management. Our purpose is not only to identify the factors that facilitate or undermine optimal leadership decisions, but also

to help specify the developmental steps that organizations can take to help their leaders reach better decisions on behalf of the enterprise. An underlying purpose is to draw greater attention to decision making by those in leadership positions.

LEADERSHIP DECISIONS

Making decisions is what most managers do much of their day. Hundreds are minor, but some are significant: commencing a project or hiring a staff. A few are momentous: blowing a whistle or redirecting a career—or even launching an enterprise or saving a firm. Made well, good decisions become the foundation of personal advancement; made poorly, they can end an otherwise promising career.

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Apart from personal consequences, decision making is at the heart of virtually all management work and a key driver of organizational outcomes (Barnard, 1968; Donaldson, 1983; Finkelstein & Hambrick, 1996).

Decisions take on special significance when made by those in leadership positions because they impact the fate of many others and possibly even the enterprise itself. We define *leadership decisions* to be those moments when an individual with organizational responsibility faces a discrete, tangible, and realistic opportunity to commit enterprise resources to one course or another on behalf of the enterprise's objectives. Making no choice in the face of such an opportunity—whether consciously recognized or not—is also deemed to be a decision. Few leadership decisions are taken without the input and influence of others, and in focusing on the decisions of an individual, we do not mean to imply that they are solely responsible for the decisions, but rather that they take a principal role in making the decisions.

Although the varied options in a decision may all be plausible, we focus on the fact that some are more optimal than others for achieving the enterprise's goals. This analytic focus is akin to the pragmatic focus of many firefighters. Good decision making, offers one experienced urban firefighter, "is about taking action now in order to give yourself and your organization a shot at the best possible future" (Salka, 2004: 105). Our focus is also

similar to what some analysts have stressed in decision making. In *The Functions of the Executive*, for instance, Chester Barnard refers to organizational decisions as a "choice of means to accomplish ends which are not personal" (1968: 186). Similarly, "top management teams make strategic decisions," offered another observer, and their "quality" had direct bearing on "organizational performance" (Amason, 1996: 123). Our concern is on why some leadership decisions are suboptimal for achieving the "best possible future" and "ends which are not personal," and how firms can better prepare leaders to make decisions for "organizational performance."

Making quality leadership decisions on behalf of the organization has been well recognized by academic investigators as a defining aspect of leadership. Yukl (1989), for instance, identified good decision making as one of the key components of leadership. Yet detailed study of leaders in the act of making decisions has often proven challenging. Organizational leaders communicate in public but decide in private, making that aspect of their leadership more difficult to study. Most work of senior management is well shrouded, and as a consequence, in the words of one inside observer who knew it well, "most executive decisions produce no direct evidence of themselves" (Barnard, 1968: 193). This is one reason that research on corporate governance has focused more often on the composition and policies of boards of directors than the decisions made by directors inside the boardroom. Since "most of the work done by a board takes place in the privacy of the boardroom," noted two governance observers, "rarely, if ever" does information "escape to the outside world," and most such decisions are thus largely invisible to the outside world (Carter & Lorsch, 2004: 163). The actual decisions of those in leadership positions should nonetheless be subject to direct examination when feasible if we are to understand what often makes the difference for an outcome in a fire zone, executive office, or boardroom.

EXAMINING LEADERSHIP DECISIONS

Underpinning our analysis is the premise that distinct leadership decisions can be isolated and evaluated against the firm's goals. The task will not be easy not only because such decision making is typically shrouded in secrecy, but also because managers sometimes report that there was no single decision moment behind their company's commitment to launch a product or enter a market. Researchers similarly report that some decisions evolved out of numerous discussions, multiple

players, and unanticipated events, with few sharp-edged decision moments (Langley, Mintzberg, Pitcher, Posada, & Saint-Macary, 1995). And for some organizations, their goals are so ambiguous that the quality of decisions on their behalf is simply beyond evaluation.

While such descriptions are no doubt correct for some decisions in some organizations, they are not applicable to all decision makers, especially in leadership positions. It is there that the decision context, enterprise goals, and conflicting demands are most likely recognized, analyzed, and incorporated into a relatively specific decision to take the firm down one path or another. It is there that the calling for reasoned and judicious considerations of the alternatives is most paramount, and it is there that authority most clearly resides for selecting one path over another. Although enormous political and historical forces shaped the U.S. plan to attack the Afghan government in 2002 and Iraq government in 2003, for instance, detailed insider descriptions of how those policies were chosen point unequivocally to specific decisions by the president (Woodward, 2003, 2004).

For these reasons we have chosen to focus on leadership decisions in a setting akin to the White House, where they are relatively explicit. While appreciating that the broader context is important for fully understanding what transpired on in the South Canyon fire, our aim here is not to wholly explain the event (and others have sought to do so: see Maclean, 1999; Butler et al., 1998). It is rather to understand one critical contributing element—the decisions of the team leader—and why some decisions fell short of achieving the team's objectives.

After appraising a diverse range of thinking and research on organizational decision making, Langley and her colleagues urged that to "appreciate the rich relationship between commitment and action, or to detect the roles of insight, inspiration, and emotion [in decisions] will require researchers to zoom in closer to the people and processes under study" (1995: 276). Our agenda is to appreciate the richness by zooming in on the key figure during the South Canyon fire.

LEADERSHIP DECISIONS AND LEADERSHIP ATTRIBUTES

The underfocus on leadership decisions may have resulted in a partial misspecification of the behavioral foundation of leadership. Many observers have concluded that organizational leadership calls for at least four major attributes: strategic thinking about the organization's environment, mobilization of its resources to achieve its strat-

egy, execution of the strategy, and selflessness (see, e.g., Bennis, 2003; Bossidy & Charan, 2002; Collins, 2001; Gardner, 1993; George, 2003; Tichy, 1997; Useem, 1998).

Yet a leader's personal reputation for these qualities may largely depend on the quality of the underlying decisions he or she has previously taken. Thinking strategically depends on making good decisions to acquire and analyze information on the environment; mobilizing resources requires correct decisions in assigning people and capital to the task; executing effectively is contingent upon timely and appropriate decisions to implement a plan; and selflessness depends upon subordinating self-interest to collective purpose when those objectives diverge in a decision (see Table 1).

If the leader's decisions have been made well, they come to constitute what we often attribute to the leader as strategic thinking, resource mobilization, effective execution, and personal selflessness. If taken poorly, by contrast, the leader's decisions diminish these same four defining attributes of leadership.

Greater attention to leadership decisions should provide greater insight into how four leading attributes of leadership are strengthened or weakened. Analysis of the critical leadership decisions in the South Canyon fire is thus also intended to contribute to our understanding of how managers enhance or diminish their leadership attributes.

IMPROVING LEADERSHIP DECISIONS

All organizations have an interest in ensuring that their managers make optimal decisions, especially when they occupy leadership roles, but effective decision making is not a natural capacity. Managers tend to fall recurrently into what Russo and Schoemaker (1990) have termed "decision traps," and a host of reasons for such suboptimal decisions has been identified by a range of investigators (Chiles, 2001; Hammond, 2000; Kahneman, 2003; Klein, 1998, 2003; Russo & Schoemaker, 2002).

TABLE 1
Leadership Attributes and Underlying Decision Quality

Leadership Attribute	Underlying Decision Quality
Strategic thinker	Acquire and analyze data on environment
Able to mobilize	Assign people and capital
Able to execute	Timely and appropriate implementation
Personal selflessness	Subordinate private to collective purpose

Despite the recurrent suboptimality, most researchers are optimistic about the capacity of organizations to enhance managers' decision making. Drawing upon a host of studies, for instance, Bazerman (2002: 152) has concluded that "we all have plenty of room to improve our judgment," and self-conscious learning how to make better decisions is a proven avenue for enhancement.

Other investigators as well have concluded that leadership decisions can be improved. In the private sector, for example, many have pointed to the importance of properly designed pay and promotion incentives for aligning executive decisions with investor objectives. Well-designed incentive compensation and promotion systems are viewed as optimizing the likelihood that company leaders will consistently take decisions that benefit shareholders, not just themselves (e.g., McKenzie & Lee, 1998).

Since decision making of those in leadership positions has been relatively understudied, however, the organizational roadmap for improving leadership decisions has also remained relatively underdeveloped. Research studies indirectly touching on this terrain suggest that such a roadmap should make a difference. Druskat and Wheeler (2003), for example, found that successful work teams were overseen more often than others by managers who were particularly good at acquiring critical information and building good relations between the team and outside constituencies. Put differently, when overseeing leaders decided to inform and empower their work teams, the teams performed more effectively, and such capacities should be subject to improvement through training and development.

Although the improvement of decision making by those in leadership positions is a desirable organizational objective in itself, it should also enhance the major attributes that are taken to be defining of effective organizational leadership. One way to ensure quality leadership at the top of an organization—summed up in the four recognized attributes of strategic awareness, resource mobilization, effective execution, and personal selflessness—is to assure that its leaders make the effective choices that give rise to such attributes.

THE SOUTH CANYON FIRE AS INSTRUCTION

Our method for helping to draw the roadmap for effective leadership decision making is to examine the events of the South Canyon fire in sufficient detail to pinpoint the critical decisions and then extrapolate their implications for improving leadership decision making in other institutions, in-

cluding company management. Weick (1993, 1995) used a similar terrain and method to establish the importance of what he termed organizational "sensemaking"—the effort by people to make their world understandable and accountable. The collapse of sensemaking during the 1949 blow-up in Montana proved to be a critical factor, Weick discovered, in the fatal consequences that followed. "The Mann Gulch disaster," he found (1993: 649), "can be understood as a dramatic failure of leadership," and as we turn to the South Canyon fire disaster, it too can be understood as a failure of leadership. In this instance, we trace the leadership failure not to the collapse of organizational sensemaking but to suboptimal leadership decision making. Our study may be viewed as complementary to Weick's focus on sensemaking: Both sensemaking and decision making can be powerful determinants of how leaders react to adversity and capitalize on opportunity.

We have chosen the South Canyon fire because it has been the subject of extensive official study and secondary analysis. Like Civil War battles and Space Shuttle disasters, we have the benefit of an exceptionally well-documented record on the decisions taken by those responsible for the event (for Civil War decisions, see Sears, 2003; for Space Shuttle decisions, see Columbia Accident Investigation Board, 2003).

In addition to an official investigation on the fire (South Canyon Fire Accident Investigation Team, 1994; Butler et al., 1998), we drew upon two other sources of information in preparing this analysis. The first is direct personal inspection of the South Canyon fire zone in June, 2002. We conducted the visit as a walking seminar in the company of 17 wildland firefighters (including one of the survivors, Sarah Doehring). The walking seminar provided extended opportunities to discuss the leadership decisions with experienced firefighters who themselves had taken thousands of decisions while leading fire teams of their own. The second source of information is the professional experience of the second and third authors, who have served as wildland firefighters for more than 2 decades and have taken leadership roles in dozens of fire zones. For additional perspective on leadership decisions in wildland fires, we also drew upon secondary analysis of the Mann Gulch and South Canyon fires conducted by Maclean (1999), Maclean (1990), Putnam (1995), Roberto and Ferlins (2003a, 2003b), Weick (1993, 1996) and others, including this article's first author (Useem, 1998).

Our objective is neither to criticize nor commend the decisions taken on the mountain, but rather to study them for what can be learned from them. Our

language may appear critical or complementary at times, but it is intended to reveal enduring aspects of effective leadership decision making rather than affixing blame or praise. To wildland firefighters, those who fell in the line of duty are heroes: They placed themselves in harm's way to protect others and paid the ultimate price. Yet firefighters also feel it is their duty to unflinchingly examine past tragedies to determine what went wrong in order to prevent similar calamities in the future, and since leadership decisions were a critical factor, attention must be directed at them.

We begin with an appraisal of the distinctive objectives of wildland firefighting that are the foundation for evaluating the decision making by those who lead firefighters. We identify three factors that are likely to result in suboptimal leadership decisions in firefighting. With these objectives and factors in mind, we then focus on one leader's decisions during the South Canyon fire, examining his choices in some detail as they bear upon the concepts in question. We conclude with an identification of the steps taken by U.S. agencies in the aftermath of the South Canyon fire to improve decision making nationally among those who lead others into fire zones.

SAFETY, SPEED, AND SUPPRESSION: THE TRIPLE GOALS OF LEADERSHIP DECISIONS IN FIREFIGHTING

In attacking fires in the wilderness, firefighters form into crews ranging from 3 to 20 members. Firefighting crews are rapidly deployed, combine with other crews to combat larger fires, and then just as quickly break up and redeploy to other incidents. Crew leaders operate collaboratively but also independently. During multiple-crew blazes, as was the case in the South Canyon fire, one individual takes overall responsibility as the incident commander. The leadership responsibility is total: "On any incident, large or small," states one of the fire service manuals, "the Incident Commander has ultimate responsibility for the effective and safe execution" of all aspects of the attack (Incident Command System, 1994: 3-4; National Wildfire Coordinating Group, 2004; Maclean, 2003; Pyne, 1997; Thoele, 1995). That responsibility places a premium on ensuring that leadership decisions optimally contribute to the three primary goals of firefighting: safety, speed, and suppression.

The premier criterion for decision making by fire crew leaders and incident commanders is the *safety* of their team. Like friendly fire on the battlefield, the possibility of loss is recognized but

must always be prevented. Fatal injuries are no more tolerable in firefighting than is fraudulent accounting in business or bogus stories in journalism. Since risk is always present, however, wildland fire leaders must be able to appraise it and take appropriate steps to mitigate it. Despite the premise that no loss is acceptable, crew leaders and incident commanders frequently direct their teams into venues where peril looms large.

A second criterion for decision making by crew leaders and incident commanders is speed. In firefighting, the clock is one of the main enemies. Hesitation or equivocation may do more than delay a solution: They can radically compound the problem. In product markets, short-term can be months; in stock markets, days; in fire zones, hours. A nascent 10-acre fire, small matter in the wildland play-book, can explode in minutes—if not quickly suppressed—into a 1,000-acre conflagration. Not surprisingly, the official firefighters' manual exhorts firefighters to "[m]ake sound and timely decisions" (Incident Operations Standards Working Team, 2002: iv).

A final criterion for decision making for crew leaders and incident commanders is the *technical decisions* required to actually suppress the fire: How many firefighters are required, where should a fireline be constructed, what aerial reconnaissance is needed? Good and opportune resolution of such questions is essential for success on any fireline. All three decision criteria are encoded in the primary rule for successful engagement of wildland firefighters that speaks to both safety and speed: "Fight Fire Aggressively but Provide for Safety First" (Incident Operations Standards Working Team, 2002).

UNDERPREPARATION IN LEADERSHIP DECISIONS

Wildland firefighters often assume leadership roles with little warning, and the venues for the exercise of their leadership are always new. Such assignments are analogous to the appointment of freshly commissioned officers to command soldiers in combat, or of seasoned officers to take troops onto an unknown battlefield. Unlike graduates of the military academies or war colleges, where leadership decisions have long held a central place in the curriculum, newly appointed wildland crew leaders have traditionally taken charge with virtually no formal leadership preparation (Freedman, 2000; Ruggero, 2001).

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Prior research reveals that the absence of preparatory experience weakens a capacity for making effective decisions. Consider one adversary of good decisions: overconfidence, a moment when a leader believes that a decision outcome is more likely than the factual situation would predict. Studies confirm that excess audacity is most prevalent when leaders face decisions on products and markets with which they are less familiar. Simon and Houghton (2003), for instance, examined confidence among product managers of small computer software and hardware firms when they introduced radically new products to the market. The more pioneering the new products—and thus the less familiar the market—the more the product managers became overconfident about their likely success. Other research confirms that overconfidence can be reduced through straightforward techniques such as explicitly identifying the pros and cons of a decision before making it, implying that the absence of preparation in such techniques would heighten the likelihood of an overconfidence bias (Metcalf, 1998).

A similar suboptimal mind-set for decision making may be anticipated among firefighters since they are constantly forced to make decisions in unfamiliar terrains with little or no leadership preparation. Prior to the South Canyon fire, the federal agencies responsible for wildland firefighting provided virtually no leadership training. A "can do" attitude on the part of firefighters was essential for their daunting challenges, but unless disciplined through explicit leadership development, it may result in overconfidence that a given strategy will be effective and safe.

ACUTE DISTRESS AND LEADERSHIP DECISIONS

Wildland fires can reach 2,500° Fahrenheit, race forward at 25 miles per hour, and leap overhead without warning. On occasion such fires "blow up," an inflection point when they acquire a manic momentum of their own. Like avalanches and tornadoes, a blowup is one of nature's most terrifying spectacles, and fire leaders know that their crews

could bear personal witness. Tension is thus ever-present in a fire zone, and since team leaders carry personal responsibility for the lives of others, their stress can become acute. Research has confirmed that when individuals are under time pressure or performing multiple tasks at the same time, they are more likely to take suboptimal decisions for a host of reasons (including a reluctance to search for relevant information), and much of the stress experienced by firefighters is a direct product of the urgent and diverse demands imposed on crew leaders and incident commanders when confronted by a fast-evolving fire (Janis & Mann, 1977; Finucane, Alhakami, Slovic, & Johnson, 2000; Gilbert, 2002).

Prior research also demonstrates that the adverse effects of underpreparation on decision making become most pronounced under acute stress. A study by Fiedler (1992) of captains and lieutenants among urban firefighters, for example, found that the performance of seasoned officers improved under the stress of a fire, but the performance of less-prepared officers declined. Consistent with this finding that experience pays, a battalion chief with the New York Fire Department urged from his own 25-year experience that managers pay particular attention to their own inner voice when taking decisions under stress. For "making the right call when the heat is on," he writes, "intuition is really your subconscious trying to offer up the benefits of a lifetime's worth of experience" (Salka, 2004: 122). Drawing on extensive research on those facing difficult decision points, Klein (2003) similarly concluded that intuition—if well honed and informed by experience—improves decision making under stress. A fire crew leader or incident commander who is relatively underprepared for leadership may thus be expected to make decisions less well under the pressure that is often experienced in front-line firefighting.

AMBIGUOUS AUTHORITY AND LEADERSHIP DECISIONS

The decision-making burden on fire leaders is made even greater by three organizational factors that are especially prevalent in wildland firefighting. First, crew leaders guide a workforce that is largely seasonal, many employed for the summer months but otherwise unengaged. Second, they collaborate with other agencies over which they have no control. And third, as fire crews combine into temporary organizations on larger blazes, crew leaders and incident commanders find themselves working with, reporting to, or instructing

other crews and leaders whom they had never met.

All three sources of ambiguous authority work to undermine optimal decision making: the first because crews are often underdeveloped as teams; the second because related parties bring self-interested agendas to bear; and the third because crew leaders and incident commanders must orchestrate others that they sometimes scarcely know. The weak relations among the various parties can result in a crew leader or incident commander receiving less information than is available within the teams for making informed decisions. In their study of aircraft carrier flight decks, for instance, Weick and Roberts (1993) found that responsible officers were more likely to commit errors during stressful landing episodes when their collective mindfulness and mutual heedfulness was insufficiently developed or became impaired by the rush of events. The consequences of ambiguous authority are thus likely to include a reduced flow of information to the fire leader, a weakened commitment by the leader to exercise authority, and diminished team compliance with the leader's instructions (implied, e.g., by Edmondson & Watkins, 2003).

LEADERSHIP DECISIONS, ATTRIBUTES, AND OBJECTIVES

Good leadership decisions, we have argued, are a source of both leadership attributes and organizational results. Those with leadership responsibilities are thus likely to look less like leaders and also to fall short of their leadership objectives when their decisions are suboptimal. For leaders of firefighters, more specifically, both their reputations and the triple goals of safety, speed, and suppression are likely to be impaired by the three major sources of suboptimality that they face—underpreparation, acute stress, and ambiguous authority—as depicted in Figure 1.

Underdevelopment, stress, and ambiguity were precisely the circumstances that firefighter Don Mackey faced on the afternoon of July 6, 1994 as he led an assemblage of firefighters in its attack on the South Canyon fire. As we shall see, those factors weakened his capacity to make optimal decisions that would lead his firefighters to suppress the South Canyon fire and ensure their safety in doing so. By time the fire ran its course, the three suboptimizing factors had contributed to one of the gravest disasters of American wildland firefighters ever (Maclean, 2003).

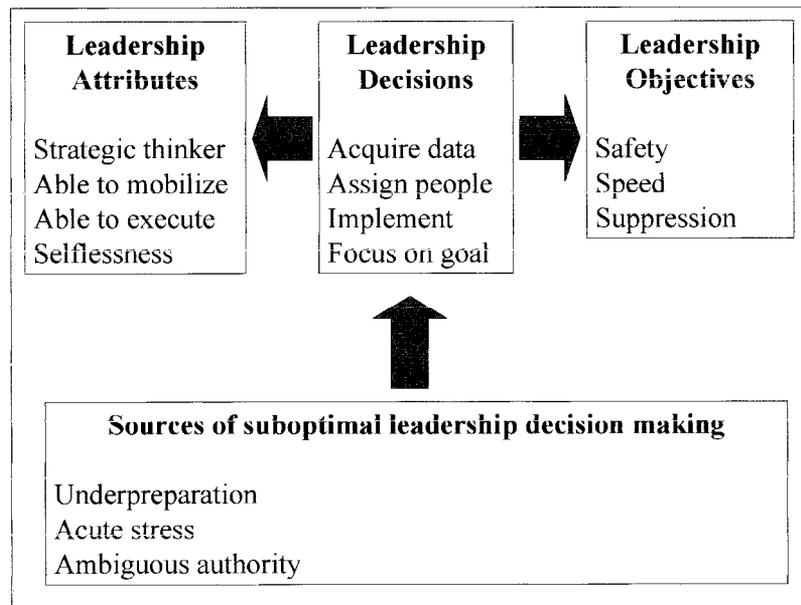


FIGURE 1
Sources of Suboptimal Leadership Decision Making

LEADERSHIP DECISIONS DURING THE SOUTH CANYON FIRE

"Okay, everybody out of the canyon!" radioed Don Mackey to his beleaguered firefighters at 4:06 p.m. as they raced along a narrow path they had been clearing for the past several hours. Wrapping around the West Flank of a ridge from the Zero Point to Lunchspot Ridge, Mackey's 2,100-foot fireline was to serve as a narrow fuel-free barrier to thwart the fire's downhill spread.

But now the fireline had become an escape path, and the crew's only way out—although even then an uncertain way—to safety. Eighteen firefighters were running for their lives, and as they sprinted toward what would become known as the Zero Point—the place where their trail reached the top of the mountain ridge—the blowup was threatening to overtake them before they could reach the comparative safety of the ridge's backside just beyond the Zero Point. Six firefighters would outpace the fire, but for Mackey and 11 others, their race against time would be lost (Figure 2).

To understand how Mackey's world had become so perilous, we return to the prior afternoon when he had parachuted onto the ridge where the South Canyon fire had been smoldering for 3 days. Mackey had been the first in a group of eight smokejumpers with the U.S. Forest Service to jump into the zone, landing at 5:45 p.m. The smokejumpers followed their customary protocol of naming the first on the ground to be the "jumper-in-charge." It was the crew's first parachute drop of

the season, and it was to be Mackey's first service as a leader of a crew that large. He readily shouldered the responsibility despite an absence of formal training in the leadership it would require (the account that follows draws upon Butler et al., 1998; Maclean, 1999; South Canyon Fire Accident Investigation Team, 1994; and direct inspection of the fire zone).

Another firefighter—Butch Blanco—already held overall responsibility for the fire as its incident commander. He had hiked up the mountain earlier that day with a crew of 7 firefighters from the U.S. Bureau of Land Management (BLM) and had constructed a fireline to contain the blaze. Just 15 minutes before Mackey landed on the ridge, however, Blanco had begun walking his own crew off the mountain to the nearby town of Glenwood Springs for the night. The blaze had seemed small and slow-moving enough to permit a night's retreat, and Blanco's crew in any case did not have the proper gear to spend the night on the mountain.

Later that evening, Mackey radioed Blanco that flames had crossed the fireline that Blanco's crew had built earlier in the day, and by 10:30 p.m. the fire had alarmingly expanded to 50 acres, up from 30 acres just several hours earlier. Mackey, now deciding as the incident commander in Blanco's absence, radioed a request at 11:30 p.m. for the addition the next morning of two high-performance teams known as Type 1 or "hotshot" crews, a total of 40 new firefighters. Hotshot crews are known for their dedication and discipline.



FIGURE 2

Ridge on Storm King Mountain Where the South Canyon Fire Overran Don Mackey and 13 Other Firefighters on July 6, 1994. Note. Photo and named features from Butler et. al., 1998, p. 5; original photo by J. Kautz, U.S. Forest Service.

Butch Blanco was formally the incident commander. Yet in Blanco's absence from the mountain that evening, Don Mackey was already making decisions as if he had become the de facto leader. Mackey's evening request for the Type 1 crews was his first substantial decision (Decision 1). During the 16 hours ahead, Don Mackey made a number of decisions on the mountain, some of them in collaboration with Butch Blanco, and we focus on the ten most consequential. Our focus on the ten decisions provides a compact method for understanding why some leadership decisions became suboptimal.

The most consequential decisions are those that had greatest bearing on the crew's triple objectives of speed, safety, and suppression. In identifying the ten, we draw upon our collective experience in

reviewing the reports on the fire, walking and examining the fire zone (a total of 12 days on Storm King mountain among us), and study of leadership decisions in related fire zones such as Mann Gulch. We believe that other qualified observers would pick much the same decision set, and we are reasonably confident that these are the ten leadership decisions that had greatest impact on whether the fire would be swiftly and safely suppressed.

TEN CONSEQUENTIAL LEADERSHIP DECISIONS

For Don Mackey and his smokejumpers, it was a fitful evening on the mountain ridge on July 5 as summer temperatures plunged to 58°. Awake at 2 a.m., Mackey noted that the fire was exception-

ally active for that time of the night, and with dawn's first light on July 6, he requested fixed-wing aerial surveillance of the fire (Decision 2). The BLM office responsible for such aircraft promptly denied the request for an "eye in the sky" and instead assigned a light helicopter the dual task of ferrying gear and aerial observation. At the time, the South Canyon fire was just one of several dozen fires being actively fought in the area, and it was still low on the priority list for receiving scarce firefighting resources. Later, that helicopter would be conscripted into dropping water onto the fire as well. The rejection of Mackey's request for dedicated, continuous airborne surveillance of the spreading fire was an early warning that organizational complexity and the resulting ambiguity in authority would thwart this leader's capacity to acquire the vital information he would later need for making informed decisions.

While Mackey was attempting to get a handle on the fire, Butch Blanco had been climbing back up to the Storm King ridge with a crew of 11 firefighters drawn from both the Forest Service and BLM. Blanco's crew crested the ridge by 8 a.m., and Mackey huddled with Blanco at 8:45 a.m. to pool their overnight intelligence and decide upon the day's strategy.

At 10:27 a.m., a second group of smokejumpers—one of the two Type 1 crews requested by Mackey the night before—floated onto the ridge. They arrived as a crew but hardly a team: Two of the firefighters were based in Montana, two in Washington, four in Idaho. As the diversity of personnel escalated, so too would the ambiguity of Mackey's authority over them.

With the fire advancing and firefighters assembling, Blanco and Mackey decided that their own aerial reconnaissance had now become essential, and they asked the helicopter pilot to fly them over the fire zone (Decision 3). What they witnessed at 9:30 a.m. was worrisome: The fire had now expanded to 125 acres, more than double the day before. Aggressive action was called for, and Mackey proposed cutting a fireline very close to the flames on the West Flank of the ridge. His line would slope sharply down—a 55% gradient in places—for 300 feet below the Zero Point, and then, having descended beneath the lower rim of the fire that was crawling down the west face, the line was to turn left and extend horizontally across the slope. Blanco approved Mackey's plan. It was not Mackey's decision alone since he was not formally the incident commander, but he had proposed the strategy and now became its prime mover.

Mackey initiated the West Flank fireline at 11:30 a.m. (Decision 4) although its course conflicted

with several established decision rules. "Downhill fireline construction is hazardous in steep terrain, fast-burning fuels, or rapidly changing weather," warned the wildland firefighters' manual. Mackey would soon be facing not just one of those conditions but all three. "Downhill fireline construction," the manual cautioned, "should not be attempted unless there is no tactical alternative." And, although the manual says to "avoid locations that require a steep uphill escape route," the fireline would later become an uphill escape route (Incident Operations Standards Working Team, 2002: 7–8). As the conditions became more challenging, Mackey's lack of leadership training likely contributed to his decision's violation of several standard operating procedures that an experienced and trained leader would have felt more compelled to follow.

Unknown to Mackey, beyond a vertical ridgeline running down the fireline slope—Lunchspot Ridge identified in Figure 2—the fire had already burned below where the horizontal section of his fireline was to be cut. Moreover, as Mackey commenced work on the fireline, Lunchspot Ridge blocked his view of the downhill fire movement. Standard firefighting policy requires a crew leader to know that a fireline will be free of fire below it through the posting of a "lookout who can see the fire" (Incident Operations Standards Working Team, 2002: 8). But no observer was so posted, blinding Mackey to the explosive conditions that were then developing below his line.

Other factors of course may have contributed to Mackey's absence of attention to such principles. Sometimes standard procedures are so routinely violated that the enterprise's culture comes to honor the principles as much in the breach as the enforcement. Seasoned urban firefighters, for instance, tend to break with certain required routines between fires more often than beginners (Fiedler, 1992). Experienced directors and executives at Enron and Tyco, presumably well aware of securities laws, nonetheless frequently violated standard accounting and tax policies (Useem, 2004b). Still, leadership development programs are designed to ensure that those with responsibility do not routinely violate principles essential for the success or survival of the enterprise. In the case of the midday development on July 6 in the South Canyon fire, this would have meant avoidance of a downhill fireline and assignment of a lookout to guard against a fire below the fireline.

Mackey's own crew was initially skeptical of his decision to create this particular line. One of his smokejumpers radioed back after receiving Mackey's instruction: "You sure you want us to do that?"

Go down that side?" Mackey reaffirmed, but was challenged again: "Are there any safe spots down there?" Mackey offered reassurance—"It doesn't look too bad"—but his smokejumpers momentarily refused to move: "We're going to wait for you to come down here and explain some stuff to us," said one. Once face to face, Mackey elaborated, "Let me have a big crew and we'll do this, we'll do fine," and now his words proved more persuasive. His directly expressed confidence in his fireline decision nudged the crew downward, though in fact it was a misplaced reassurance stemming in part from his overconfidence in a terrain and tactic of which he was little familiar (Maclean, 1999: 77).

At 11:30 a.m., the smokejumpers moved downhill to start the West Flank fireline. When Butch Blanco soon asked Michelle Ryerson, one of the firefighters who had walked up with him that morning, to take a group down the line to support Mackey's effort, she flatly refused. Although Blanco asked Ryerson to support Mackey rather than Mackey himself, it was on Mackey's behalf since it was Mackey who had proposed the strategy and was now executing it. Mackey's premise for doing "fine"—a big crew on the line—was proving untenable from the outset in the absence of his unambiguous authority to place a big crew on the line. With the benefit of hindsight, it was evident that a lethal combination of underpreparation, intensifying stress, and ambiguous authority was already taking form, but it was not so evident to Mackey in the fire zone at the time.

Mackey's uncertainty of authority occasioned by the ad hoc melding of crews from diverse locales and several agencies became further exacerbated at 1 p.m. when a team of 20 hotshots from Prineville, Oregon began arriving on the ridge by helicopter. On the mountain now with one mission were three leaders and three crews with firefighters from five states (see Table 2).

When the first hotshot subgroup landed, it was momentarily in the fire zone without its own leader, Tom Shepard. Normally the hotshot supervisor would have arrived with the initial insertion, but Shepard had been bumped from the first heli-

copter flight because of a weight restriction, a seemingly minor snag whose consequences would soon loom large.

In Shepard's absence, Blanco instructed the first wave of Oregon hotshots on the ground to go down the West Flank fireline to join Mackey's group that was working to extend the line. When Shepard landed a few minutes later, Blanco told Shepard that the first hotshots had already descended onto the line. The Prineville boss acquiesced in the decision that had been taken in his absence, reassured in part by the fact that his hotshots would be joining smokejumpers already working on the line under Mackey's direction. It was fair to assume—as Shepard did—that an experienced and trained jumper-in-charge would not place his own firefighters at undue risk.

Hotshot crew leader Tom Shepard did not walk down to inspect the line, choosing instead to remain on the ridge top. Since Shepard had just arrived on the scene and had performed no reconnaissance of his own, he was of necessity relying entirely upon Mackey's vigilance for the protection of his hotshots. Without explicit acknowledgement, Mackey was further acquiring the essence of incident commander. Still, because it came without formal recognition and it extended across teams over which he held no formal power, his emergent authority remained equivocal.

Butch Blanco had started as the incident commander before Don Mackey's smokejumpers had arrived the prior afternoon, but Blanco's nighttime absence from the fire zone had ceded much control to Mackey. It was Mackey, for instance, who asked for the insertion of Type 1 crews and for continuous aerial surveillance on July 6, not Blanco. In a further shift of control, Blanco had given oversight of the central strategy of the day—construction of the West Flank fireline—entirely to Mackey. Blanco never descended to have a direct look at the fireline nor further instructed Mackey in its making. Mackey was now directly supervising 24 firefighters, nearly half of those on the mountain, all at the forefront of the day's main attack on the fire.

The ambiguity was enough to cause Mackey to

TABLE 2
Fire Crews Fighting South Canyon Fire on the Afternoon of July 6, 1994

Crew Type	Smokejumpers	Local Firefighters	Hotshots
Crew leader Federal agency	Don Mackey U.S. Forest Service	Butch Blanco U.S. Forest Service and Bureau of Land Management	Tom Shepard U.S. Forest Service
Members and location	16 from Idaho, Montana, and Washington	11 from Colorado	20 from Oregon

wonder if he might have even become *the* incident commander. Around 2 p.m., Mackey mused about his emergent authority with fellow smokejumper, Kevin Erickson. He asked Erickson whether he thought Butch Blanco was the incident commander, or Mackey himself. Erickson responded "I don't know." Mackey added, "neither do I," but he took no subsequent steps to clarify his place in the day's hierarchy (Decision 6).

Michelle Ryerson radioed Mackey at 3:30 p.m. from the crest of the ridge and asked him to decide whether a water drop by the helicopter should be directed on top of the ridge as requested by several firefighters close to her, or instead should be directed near the most forward firefighters with Mackey on the West Flank fireline. Mackey decided the top was more important at the moment. The query to him on how to allocate a critical resource—and his resolution of the issue without consulting Blanco—again served to reinforce the fact that he was practically functioning as the incident commander. But Ryerson's earlier refusal to join Mackey on the line also served as a reminder that his authority was not all that clear cut.

Yet, without formal assignment of incident command, Mackey would not feel impelled to take complete responsibility for the safety of the 49 firefighters now spread across the ridge. Like leaders of any organization, incident commanders are expected to be completely aware of a threatening environment as it evolves, and acceptance of that responsibility here would have dictated the assignment of fire lookouts, radio contact with all parties, and personal positioning for optimal appraisal. "Look up, down and around" exhorts the fire manual. But without the creation of such observers, communication, or positioning—not surprising since Mackey was not unambiguously in charge and new to leadership and untrained in it—he could not appreciate that the ridge was on the cusp of a blowup.

Further limiting Don Mackey's situational awareness was a critical weather forecast for the afternoon that never reached him. The local meteorologist correctly predicted that a cold front would surge through the region around 3 p.m., generating no rain but plenty of wind. Standard operating procedures required that such information be conveyed to fire crews, but bureaucratic bungling prevented its delivery that day. And it would be that sudden wind—gusting from 30- to 45-miles-per-hour soon after 3:20 p.m.—that drove so much oxygen into the fire zone that a blowup became a near certainty within the hour.

The supply side of the equation failed to deliver the weather warning, but the demand side also did

not seek it. The principles of incident command dictate constant awareness of evolving weather conditions, but Mackey did not request up-to-date information on the day's atmospheric conditions (Decision 7). With his hands full supervising the front line, Mackey could take the absence of a radioed weather warning to him to signify no dire threats. But had Mackey preemptively sought the forecast, even as late as 4 p.m.—well after the winds had begun to kick up—he would still have had time to evacuate everybody off the West Flank fireline before the blowup. Here was a decision that could have made up for the earlier suboptimal decisions, even just minutes before the conflagration overwhelmed the firefighters. Again, the fact that Mackey was not definitively in charge of the fire may have cast doubt on whether it would even have been appropriate for him to demand an updated forecast, and that reluctance may have been reinforced by his own underpreparation in the essential operating principles of fireline leadership.

In Mackey's two preceding decisions—not to clarify who was in charge or to seek a weather forecast—he had faced opportunities to move to his firefighters in one direction or another. We define leadership decisions to include those moments when no choice was made, and now a discrete, tangible, and realistic opportunity to pursue an alternative course had presented itself. In facing the opportunities underlying Decisions 6 and 7, had Mackey taken those decisions other than the way he did (doing nothing), the subsequent experience of the firefighters on the West Flank fireline would have been very different. If Mackey had clarified that he was in fact in charge—an option facing him at Decision 6—that realized responsibility might well have compelled him to seek weather data—an option at Decision 7. He then would have most likely appreciated that an imminent arrival of violent winds on Storm King Mountain was on the verge of endangering all those on the downhill fireline.

We can also identify other moments of foregone opportunity to pursue alternative courses during the South Canyon fire. Mackey, for instance, could have simply decided to walk his team off the mountain earlier in the day. But within the context of his unfolding experience on the mountain, that would not have been a realistic option, since incident commanders, *de facto* or otherwise, virtually never stage a full-scale retreat. Decisions 6 and 7 in which Mackey did not make an active choice among alternatives are thus included among his most critical decisions because they rank among the most discrete, tangible, and realistic decisions that he faced.

At 3:30 p.m., Don Mackey took note of the newly gusting winds, and he assigned firefighters Kevin Erickson and Sarah Doehring to patrol the fireline for burning debris and hot spots that might be blown across the line. He also radioed a group of hotshots working at the end of the fireline near the Lunchspot Ridge (so named because a group had stopped for a food break there at 2 p.m.) and asked them to improve the line in their area. At 3:30, most of the firefighters on the West Flank fireline were working between 1,450 to 1,880 feet from the Zero Point.

By 4 p.m., the signs of a blowup were fast materializing below Lunchspot Ridge: Smoke swirled, flames churned, air thundered. Standing close to Lunchspot at 4:06 p.m., Mackey instructed eight nearby smokejumpers to run directly up the ridge to an area where he knew that the fire had previously burned off sufficient ground cover to serve as a small enclave, a safe zone if the fire came up the ridge (Decision 8). "Go up!" he shouted, "there's good black further up." They would indeed find that "good black" and survive when the fire soon shot up the ridge. This was a swift leadership decision that proved life saving.

But rather than run up Lunchspot Ridge with the eight other firefighters, Mackey ran back along the West Flank fireline to help push the remaining firefighters on that line to the safe zone beyond the Zero Point (Decision 9). He radioed ahead: "Okay, everybody out of the canyon!"

In going back across the West Flank fireline rather than up Lunchspot Ridge Mackey made the leader's ultimate decision (Decision 10). Although far riskier than going up, moving across would help save those still on the fireline. At a moment when team interest and self-interest were radically diverging, Mackey focused entirely on the first.

At a moment when team interest and self-interest were radically diverging, Mackey focused entirely on the first.

Already sensing the emerging blowup on their own, the West Flank firefighters had begun to rush along the fireline toward the Zero Point, and Mackey dashed along that line to catch up with them. By 4:09 p.m., Mackey had reached the tail end of the 18 fleeing smokejumpers and hotshots near a tree that was just 450 feet from the Zero Point (marked in Figure 2).

Mackey's last directive almost worked. He and 11 others had come within 120 to 280 feet of the Zero Point and the safety of the back slope before they

were overtaken by the flames between 4:13 and 4:14 p.m. The most forward of the nonsurvivors, Scott Blecha, was less than a minute from reaching the Zero Point. Two others elsewhere on the mountain became entrapped as well, making for a final death toll of 14 firefighters. Five days later, a far larger fire crew finally brought the South Canyon fire under control.

LEADERSHIP DECISIONS APPRAISED

Don Mackey's decisions had enormous impact on the firefighters' experience during the South Canyon fire. Yet he was certainly not the only decision maker on the mountain. Butch Blanco and Tom Shepard added their own important decisions to the matrix, as did off-site officials. The latter, for instance, never delivered the high-wind alert to those on the front line. Others dispatched Don Mackey onto the mountain with insufficient resources in the first place.

Still, Don Mackey's 10 leadership decisions became critical on the ground, and their impact is summarized in the "Result" column of Table 3. The 10 decisions are also displayed in Figure 3 as an overlay on the diagram in Figure 2 of the fire ridge on South King Mountain.

By integrating the authors' professional experience with detailed study of the incident for which the decision making record is exceptionally well documented, we have concluded that 5 of Mackey's 10 decisions proved relatively optimal while the other 5 were less so. We cannot be completely sure, of course, since we do not have the controlled elegance of a laboratory experiment or the statistical value of a sample. Still, 5 decisions proved advantageous in that they arguably improved the likelihood that Mackey and his team would swiftly and safely suppress the South Canyon fire:

- Decision 1 at 10:30 p.m. on July 5 to request two additional elite crews secured and assigned the people that would be required the next day to combat the rapidly expanding fire.
- Decision 3 at 9:30 a.m. on July 6 to conduct aerial surveillance significantly improved Don Mackey's information on the environment.
- Decision 8 at 4:06 p.m. to dispatch 8 smokejumpers up Lunchspot Ridge successfully moved them into a life-saving area.
- Decision 9 at 4:06 p.m. to evacuate the West Flank fireline helped successfully move 6 firefighters toward another life-saving area.
- Decision 10 at 4:06 p.m. to go back across the West Flank fireline rather than up Lunchspot Ridge placed team survival ahead of personal self-interest.

The five other decisions proved less optimal in that they lessened the likelihood that Mackey and

TABLE 3
Appraisal of 10 Leadership Decisions by Don Mackey During the South Canyon Fire on July 5–6, 1994

No.	Decision by Donald Mackey	Time	Source of Suboptimal Decision Making	Appraisal	Result	Decision Quality → Leadership Attribute
1	Requested two additional crews for the next day	10:30 p.m., July 5		Effective assessment and prompt decision	Acquired the additional personnel required	Assign people → able to mobilize
2	Requested continuous fixed-wing aerial surveillance	5:30 a.m., July 6	Ambiguous authority	Right decision but thwarted by poor interagency coordination	Prevented appraisal of fire's rapid downhill spread	Acquire data → strategic thinker
3	Conducted own aerial surveillance	9:30 a.m.		Acquired good overview of fire	Enhanced intelligence on the fire's growth	Acquire data → strategic thinker
4	Started building downhill West Flank fireline without lookout	11:30 a.m.	Underpreparation and ambiguous authority	Aggressive and unsafe	Placed firefighters in peril	Implement → able to execute
5	Added hotshots to West Flank fireline	1 p.m.	Underpreparation and working under acute stress	Taken by Blanco in absence of Shepard; implicit in Mackey's strategy	Drew additional firefighters onto unsafe terrain	Assign people → able to mobilize
6	Did not clarify who was in charge of incident	2 p.m.	Underpreparation, acute stress, and ambiguous authority	Left authority ambiguous when it should have been unequivocal	Resulted in insufficient effort to gain full situational awareness as well as lack of clarity among followers as to who was in charge	Acquire data → strategic thinker
7	Did not secure weather update	3 p.m.	Underpreparation and ambiguous authority	Left Mackey unaware of the imminent arrival of a cold front with high winds	Firefighters continued fireline work despite gusty conditions ahead	Acquire data → strategic thinker
8	Sent 8 smokejumpers up Lunchspot Ridge to safe area	4:06 p.m.		Clear-minded instruction during increasingly stressful moments	The 8 smokejumpers survived	Assign people and implement → able to mobilize and execute
9	Evacuated West Flank fireline	4:06 p.m.		Optimal given the conditions at the moment	Helped save 6 firefighters, but too late for 11 others	Assign people and implement → able to mobilize and execute
10	Personally sought to clear the West Flank fireline	4:06 p.m.		Placed crew safety ahead of personal risk	Sacrificed himself for the benefit of others	Focus on goal → selflessness

his team would swiftly and safely suppress the fire. Keep in mind that this assessment has the benefit of coming after the incident, and its intention is to improve leadership decisions in the future rather than find fault. The suboptimality of the five decisions can be explained in part by one or more of the three factors identified at the outset as potentially undermining optimal leadership deci-

sion making—under preparation, working under acute stress, and ambiguous authority:

- Decision 2 at 5:30 a.m. on July 6 to request continuous aerial surveillance that went unfulfilled limited Don Mackey's information on, and thus understanding, of the fire. The intent behind his decision was sound: He sought the "eye in the sky" so that he would have real-

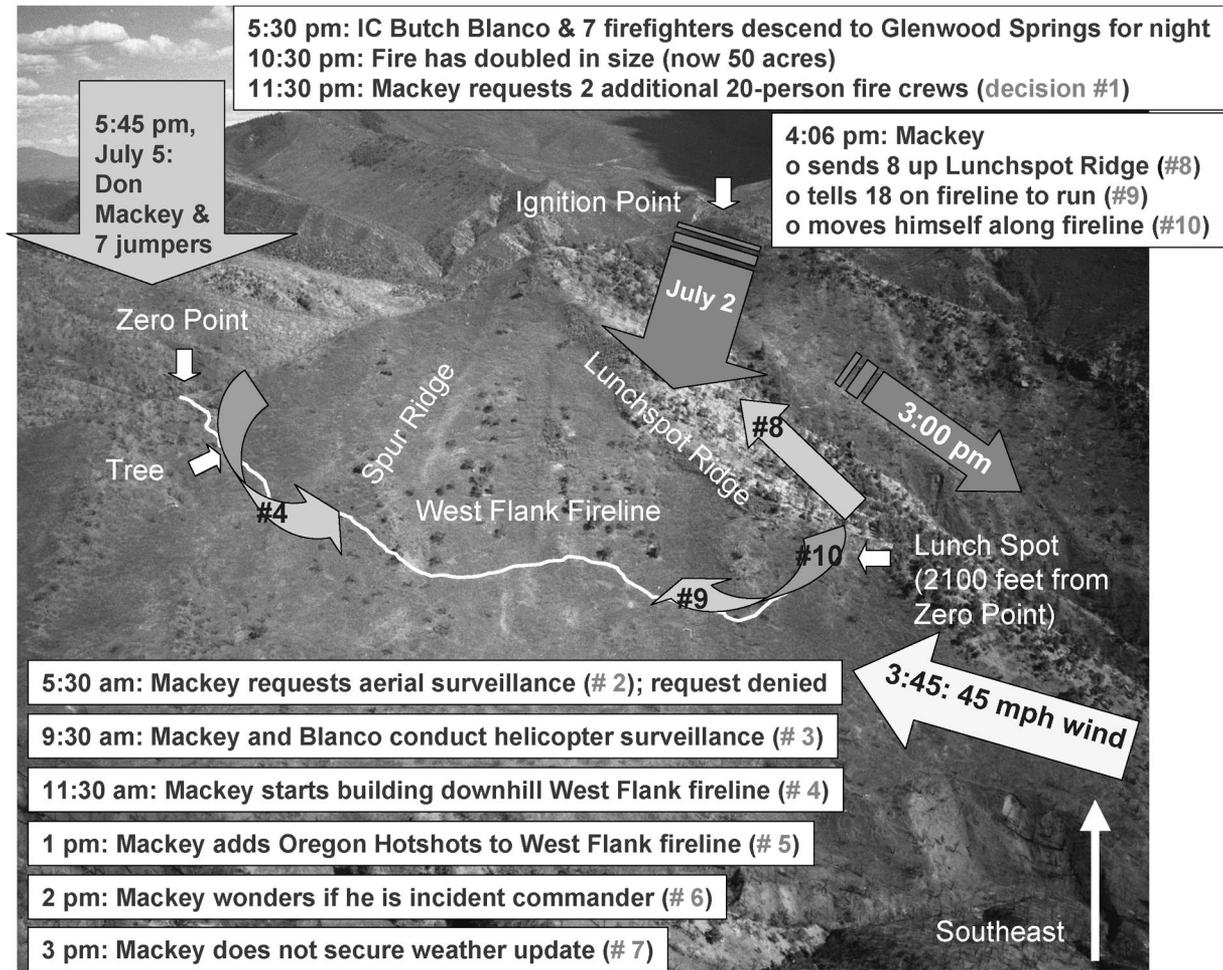


FIGURE 3

Leadership Decisions by Don Mackey During the South Canyon Fire on July 5–6, 1994. Photo: Jim Kautz, U.S. Forest Service.

time data on areas of the fire that he could not see directly. The fact that he was unable to obtain the requested resource may have seemed unremarkable at the time, since firefighters are often denied such requests because of competing priorities, safety concerns, or resource constraints. Still, arguably contributing to the rejection of his request was the fact that he was not formally the incident commander or otherwise of sufficient influence in the hierarchy to succeed in pressing the case for aerial surveillance, which he explicitly requested and in hindsight clearly needed. The outcome was to leave him partially blinded from what within hours would evolve into a fatal conflagration. With more clearly delineated authority, Mackey might well have secured the overview he sought of a fire that was already dangerously expanding.

- Decision 4 at 11:30 a.m. to start constructing the downhill West Flank fireline would place a number of firefighters in peril. We cannot be certain that a better trained supervisor would have made a safer decision under the stress of the moment, but it is arguable that a well-

prepared leader would have been less sanguine about transgressing standard operating procedures and more likely to take extra measures to guard against downhill dangers. A more experienced and trained leader might also have been more uncomfortable predicating the moment's prime strategy on an essential resource not yet firmly in hand: the "big crew" that Mackey required if his line was to "do fine" never did materialize. A leader with unequivocal authority might also have been more successful in deploying the big crew that was required.

- Decision 5 at 1 p.m. to bring the newly arrived hotshots onto the downhill fireline, good from the standpoint of building the ample force that Mackey judged was required, had the effect of placing more firefighters in harm's way. Again, the overoptimism of underpreparation for leadership likely played a role here, exacerbated by the worsening fire conditions and growing anxieties on the mountainside. With greater training in realistic appraisals of market conditions, a leader should be more savvy about

the proper allocation of resources given the increasingly dangerous conditions.

- Decision 6 at 2 p.m. not to clarify who was in command of the incident resulted in Mackey's underinvestment in the requisite situational awareness. The ambiguity of authority stemming from the diverse units on the mountain, the stress of firefighting, and sheer fatigue probably contributed to this suboptimal decision. So too did underpreparation: With greater experience and training comes greater appreciation for the requirement of unequivocal clarity in who carries ultimate responsibility on the line.
- Decision 7 at 3 p.m. not to secure a weather forecast left those on the West Flank fireline vulnerable to an unanticipated blowup. Again, the uncertainty of whether Mackey was incident commander was likely a factor, especially in combination with his underpreparation and his other preoccupations. The fire was becoming more threatening, Mackey had far more firefighters under his wing with the arrival of the hotshots, and without a warning light in the back of his mind from prior experience and training, the danger of a missing weather forecast was not necessarily top of mind.

LEADERSHIP DECISIONS AND LEADERSHIP ATTRIBUTES IN FIRES AND COMPANIES

The five good decisions were consonant with four attributes expected of a team leader: strategic thinking, resource mobilization, effective execution, and personal selflessness. As summarized in the last column of Figure 2, Don Mackey mobilized the resources required to achieve the mission (Decision 1); worked to better inform his strategic thinking about the fire (Decision 3); mobilized his team and executed swiftly when essential (Decisions 8 and 9); and risked his own life for the survival of others (Decision 10).

The five suboptimal decisions by contrast undermined the same four attributes: Don Mackey fell short of the strategic attentiveness to the fire environment essential for leading his team (Decision 2); executed an excessively risky strategy (Decision 4); mobilized firefighters onto a dangerous terrain (Decision 5); did not sharpen strategic awareness of who was in charge (Decision 6); and did not think strategically about the threatening weather (Decision 7).

Behind these four leadership attributes, then, were a set of specific decisions that either produced or diminished the attributes. Although leadership decisions are usually harder to see or witness than the leadership attributes, we have seen that the decisions in this case underpinned the attributes. The road to better leadership attributes, then, is to understand why some decisions are

suboptimal while others are not. And for that, we have here identified three primary factors that can lessen decision quality: limited preparation, experiencing acute stress, and ambiguous authority. If all three are concurrently present, as they were during the South Canyon fire, the combination can become especially lethal for leadership decisions and thus the attributes of leadership.

If we had focused on Mackey's leadership attributes rather than the underlying leadership decisions, we would have run the risk of being misled by the attributes if they were only modestly associated with the underlying decisions. What may look like good leadership from the outside can sometimes mask poor leadership decisions on the inside.

Consider the leadership of Enron shortly before the company's collapse in the fall of 2001. The board of directors displayed the right attributes for effective leadership at the top: with 13 members, its midsize was deemed right for effective oversight; with 11 nonexecutives, it was seen as rightfully dominated by outsiders; and with separation of chair and chief executive, the chair could presumably assure that the CEO would do right by the shareholders (Sonnenfeld, 2002).

Viewed from without, the Enron board's leadership attributes would seem optimal for reaching judicious decisions, but in actuality, many of the decisions inside the boardroom proved very injudicious. When CFO Andrew Fastow asked the board on June 28, 1999 to okay one of his special purpose entities, for example, approval required suspension of the company ethics code, since it stipulated that "even the appearance of an improper transaction must be avoided" and no employee could "gain separately" from company service. Yet the proposed partnership entailed both (Powers, Troubh, & Winokur, 2002; U.S. Senate, 2002).

The proposal for the ethics code suspension arrived in the Enron directors' fax machines just 3 days before their board meeting. The agenda was jam-packed with other matters, no board committee vetted the proposed suspension, the directors conducted the meeting by telephone, and the teleconference ended within an hour. The ethics suspension sailed through, and in the months that followed, the CFO not only did "gain separately" from the partnerships—pocketing \$30 million—but his "improper transactions" with the partnerships inflicted fatal damage on the firm. The problem was not the outward attributes of the Enron boardroom—it was a well sized blue-chip set of independent directors led by a nonexecutive chairman—but the abbreviated and hands-off manner in

which those in the room allowed themselves to reach their suboptimal decisions (Useem, 2003; Lorsch, 2002; Carter & Lorsch, 2004).

Leadership attributes can thus be misleading in predicting actual leadership decisions—and thus dangerously deceptive since they would sometimes appear to be good predictors. During the Civil War, for instance, Union General George B. McClellan was beloved by his soldiers and respected by his president for his leadership of the Army of the Potomac, but his failure to make timely decisions for the army during the battle of Antietam forever defined him as a failure for the Union. By contrast, Confederate General Robert E. Lee was revered by his soldiers and admired by his president for his leadership of the Army of Northern Virginia, and his timely decisions for the army on such battlefields as Chancellorsville would come to define him as an icon of the Confederacy. For McClellan, the attribute of charisma served as a poor predictor of leadership decisions on the battlefield, but for Lee, a potent forecast (Freeman, 1998; Sears, 1999; Useem, 2001).

DEVELOPING LEADERSHIP DECISION MAKING IN THE WILDLAND FIRE SERVICE

Some of the nation's most elite wildland firefighters were on Storm King Mountain on July 6. Hotshot crews and smokejumpers are among the best technically trained of the country's vast corps of wildland firefighters. Yet more than a dozen firefighters lost their lives in what most qualified observers have concluded was a preventable disaster. If even those technically well prepared in fire suppression could be caught by a blowup, it was not for lack of formal fire-fighting skills. The disaster, rather, derived in part from an underdevelopment of leadership skills, especially for making quality decisions under demanding and ambiguous conditions.

Donald Mackey had parachuted into the fire zone as a crew member, became jumper-in-charge on the ground, and soon assumed virtual command of a multicrew firefighting incident. His responsibilities expanded overnight from followership to leadership, and he willingly rose to the occasion. Organizations often depend upon people like Mackey to get a job done, and if they are to get the leadership they require, training and development in the essence of leadership decision making is a prerequisite.

The presence of strong technical capabilities combined with weak leadership capacities among those fighting the South Canyon fire was a direct product of U.S. policies prior to 1994. The federal

agencies responsible for wildland firefighting for years had focused on fire behavior rather than human behavior. In retrospect, that was akin to a business concentrating on engineering or an army on ballistics, important, but providing no foundation for the well-conceived and well-timed leadership decisions required in moments of pressure and ambiguity.

Appreciating the disastrous human consequences of suboptimal leadership decisions in the wake of the South Canyon fire, federal firefighting agencies commissioned an independent analysis of safety practices on the fireline. The outside study called for the U.S. government to establish a leadership development process for firefighters with a special focus on training for good decision making under conditions of stress (TriData Corporation, 1998).

In response, the National Wildfire Coordinating Group, a consortium of federal and state wildland firefighting agencies, established the Wildland Fire Leadership Development Program in 2001 with the goal of explicitly enhancing "decision-making skills" so that responsible firefighters could "make sound and timely decisions." The second and third authors of this article have been responsible for building that program (the program is described by Cook, 2002; Sutton, 2002; Wildland Fire Leadership Development Program, 2004).

Prior to the South Canyon fire, the wildland firefighting services had offered brief supervisory training but none in leadership. A decade after the fire, an array of courses had been established to provide in-depth training in leadership decision making under tension in fast-changing, unfamiliar, and complex environments. They are designed in accord with one of the main principles that now guide all wildland fire leadership development: "Make sound and timely decisions" (Wildland Fire Leadership Development Values and Principles, 2004).

In a first-level course for all firefighters ("Human Factors on the Fireline") the focus is on situational awareness and decision making with an emphasis on ensuring that personal stress and private attitudes do not undermine clear-mindedness. In one exercise, for example, participants are provided information on trends in temperature, humidity, and clouds over a particular terrain as a cold front approaches, and they are asked to forecast the way the wind will shift and what slope will become most dangerous—and thus how the fire crew should be instructed as a consequence. In a second-level course entitled "Followership to Leadership," the fundamentals of leadership are emphasized, for example, ethical decision making, and

participants devote a day in the field to making decisions in small teams. A third-level course, "Fireline Leadership," is designed for those responsible for a fire crew and emphasizes communicating intent and managing stress, and here participants study models of decision making, engage in tactical decision simulations adapted from the Marine Corps, and master after-action reviews of key decisions.

In a fourth-level course, "Incident Leadership," for "leaders of leaders"—those who would serve as incident commanders with several fire crews during an extended attack—the focus is on identifying how ambiguous authority can undermine effective decisions, how decision errors can be detected early, and how decision tempo can be maintained. Here participants engage in role and computer simulations of fire combat. This is the training course that Don Mackey should have had but could not have experienced, since it was then unavailable. In fact, a person performing the job of Don Mackey on a fire today would have received more than 80 hours of formal leadership training if they had completed the courses now available.

In a capstone course for "leaders of organizations"—those who run incident management teams that oversee dozens of units on a major fire—the focus is on integrating information from numerous sources to reach informed and timely decisions and on communicating strategic intent to the field in a way that frontline leaders can take appropriate decisions. Had Don Mackey been properly trained before his dispatch to Storm King Mountain and had he then swiftly and safely suppressed that fire, this would have been the course for a subsequent promotion that he would have likely received (Wildland Fire Leadership Development Training Courses, 2004).

Running through all these courses in the Wildland Fire Leadership Development Program is an emphasis on building the right decision-making skills for safety, speed, and suppression in a fire zone. Learning how to acquire and analyze the right data, allocate people and resources to the essential tasks, implement in a timely fashion, and focus on the goals of the enterprise regardless of personal concerns are central to the curriculum. The coursework also emphasizes learning to cope with ambiguous authority and personal stress. Although those sources of suboptimal decision making cannot be eliminated, the federal initiative is intended to reduce the third cause of suboptimal decisions, underpreparation for making leadership decisions, especially when authority is uncertain and stress is intense.

DEVELOPING LEADERSHIP DECISION MAKING OUTSIDE THE CLASSROOM

To reinforce the leadership decision-making lessons of the classroom, the Wildland Fire Leadership Development Program created a set of out-of-classroom learning experiences that draw on the concept of the battlefield "staff ride" long used by the armed forces. The military staff ride is designed to provide officers a deeper understanding of military strategy by walking such battlefields as Gettysburg and Normandy to reconstruct the key decisions (e.g., U.S. Military Academy, 2004; U.S. Marine Corps University, 2004). Although distinct from what is often termed *outdoor experiential learning*, staff rides offer some of the same power to educate in ways that classrooms cannot. By witnessing other settings, mentally reconstructing the decisions taken in those settings, and then drawing implications for one's own settings, such out-of-classroom experiences can instill the principles of leadership more enduringly than classroom experience alone (Meyer, 2003).

The staff rides of the fire leadership program offer analysis of firefighting strategies and decisions in several fire zones. The purpose, in the program's words, is to "put participants in the shoes of the decision makers on a historical incident in order to learn for the future." These staff rides are intended to build the "decision-making skills of leaders" by analyzing "fireground decisions made by leaders of the past in concert with an on-scene study of the actual terrain." While walking the terrain, participants evaluate what decisions they would have taken had they been in the shoes of the incident commander (Wildland Fire Leadership Development Staff Ride Library, 2004).

Staff rides in fire zones have become as federal policy directive states, "a decision-making and leadership development tool" for "fire management personnel at all levels." Implementing the directive, the director of the U.S. Forest Service's Fire and Aviation Management informed national forest supervisors that the "staff ride concept has proven many times over that leadership and decision making skills are enhanced through an in depth examination of the fire dynamics and human behavior" (Wildland Fire Leadership Development Staff Ride Library, 2004; Quintanar, 2003).

The South Canyon fire itself has come to serve as one of the frequently utilized staff-ride venues. Numerous groups have walked the West Flank fireline on Storm King Mountain to review the leadership decisions of Don Mackey and others. A hotshot fire crew from Redding, California even

reoriented its entire training program around leadership decision making, and the culmination of its 6-week program is an extended walk in the South Canyon fire zone on Storm King Mountain (Redding Interagency Hotshot Crewmember Report, 2003). Indicative of the learning legacy of such staff rides, Redding participants reported that their day on Storm King Mountain:

- “drove home” that “it is important to have a clear head and act aggressively”;
- enhanced “awareness” of “situations that require quick decisions”;
- “enabled me to identify the error chains and hopefully given me the strength to break them before something like this happens again”;
- made me “realize” that “good leadership traits are very, very important”;
- “was without a doubt . . . the most beneficial training and learning experience of my fire career”; and
- “was one of the most moving and educational experiences of my firefighting career.”

As their walk on the mountain came to end, one group of Redding firefighters stood near the end of the fireline where Don Mackey had shouted, “Okay, everybody out of the canyon!” The facilitators asked the firefighters to race against Mackey’s clock to reach the safety of the top. Many ran along the same fireline that Mackey had built and used, others bolted directly for the top, but whatever the path, most failed to reach the safety of the Zero Point or ridge top within the few minutes that had remained for most of Mackey’s crew. As “I ran up the West Flank fireline,” said one, “I was able to imagine the fire, the smoke, and the heat below me, and even experienced a few chaotic thoughts while I second-guessed my decision to take the West Flank escape route.”

RESEARCH ON THE DEVELOPMENT OF LEADERSHIP DECISION MAKING

Academic research substantiates the learning premises underlying the Wildland Fire Leadership Development Program. Dean and Sharfman (1996), for example, found that when manufacturing managers make strategic decisions based upon careful analysis of good information, their decisions are more likely to be successfully executed than when the managers are less analytic and less informed. By implication, training those in leadership positions to acquire essential information—such as terrain conditions and weather forecasts—and then to take reasoned decisions based on the data should improve the quality of their decisions.

Moreover, research by Eisenhardt (1989) and Judge and Miller (1991) on managerial decision

making in fast-moving environments revealed that effective decisions depend upon the availability and exploitation of good information on the market—and that well-informed, rapid decisions under such conditions led to stronger company performance. By inference, training those in leadership positions in what Eisenhardt has termed “high-velocity environments”—whether in product manufacturing or wildland firefighting—to make decisions quickly using quality data should enhance the quality of their leadership decisions when on the line.

Studies of what Kahneman (2003) terms the “systematic biases” that separate the choices that people actually make from what would be posited by rational-agent models reveal that biases can be reduced when managers draw upon intuition that is built upon prolonged practice and effective use of feedback to learn from practice (Klein, 1998; Gawande, 2002). For younger firefighters new to leadership assignments, leadership courses and staff rides should thus serve to accelerate acquisition of the experience required for sound intuition and thereby reduce the gap between their optimal and actual choices.

Decision research also implies that staff rides may be a particularly powerful training method for overcoming the tendency of firefighters to inadequately appraise low-likelihood but high-consequence risks. Studies report that people often perceive low-probability events to have zero likelihood (Kunreuther, 2001). Since the probability of human loss in most wildland fires is very low, some firefighters may tend to assume it could not happen on their watch. This may have been a factor in Don Mackey’s overly risky decisions, such as building the downhill fireline. But when low-probability risks are presented in concrete form before real-time decisions have to be taken—as when firefighters walk the South Canyon fire zone and consider the decisions that contributed to the 14 victims’ entrapment—the research would imply that when the firefighters subsequently lead a team into an active fire zone, they should better understand that their decisions could result—with small but nonzero probability—in human fatality.

Such experiential learning will be all the stronger if firefighters undergo staff rides to several zones, not just one, since other research confirms that learning from experience can be best generalized to other contexts if is derived from several contexts (Bazerman, 2002). Thus, walks on Storm King should be followed by walks in Mann Gulch and kindred zones, and to provide for a range of such opportunities, the Wildland Fire Leadership Development Program developed a host of staff

walks (Wildland Fire Leadership Development Staff Ride Library, 2004).

Confirming the indelible impression that concrete embodiment can provide, one of the Redding hotshots reported an emotional reaction upon nearing the area where many of the fire victims perished, just several hundred feet from the Zero Point. "A pair of skis formed an X over one cross making the spot where one of the firefighters died," he recalled, and "I immediately became paralyzed and stunned." The Redding firefighter had encountered the skis when testing to see whether he could reach the Zero Point in the time that Mackey's crew had. Having failed to do so, he reminded himself "this meant that if I was on the mountain in 1994, I too would have perished." Upon that realization, he urged all hotshot crew members to "climb that mountain to see and experience the emotional connections." His experience-based suggestion is corroborated by Bazerman's research-based assessment that an "event that evokes emotions and is vivid, easily imagined, and specific" will have greater hold on an individual's memory than unemotional and bland events—and thus be more informative of one's future decisions (Redding Interagency Hotshot Crewmember Report, 2003; Bazerman, 2002: 7).

In the aftermath of the South Canyon fire, the wildland fire service has used classroom and experiential learning to attack two of the three root causes of the suboptimal decisions on the mountain: inadequate preparation for leadership decision making under stress. Separately, the fire service has attacked the third root cause—ambiguity of authority—by sharpening and better instilling the principles of unequivocal leadership responsibility when on a fireline.

DEVELOPING LEADERSHIP DECISION MAKING IN ALL ORGANIZATIONS

In drawing upon the decisions of Don Mackey and others on that fateful day in 1994, the Wildland Fire Service has been respectfully learning from those who made the ultimate sacrifice to help ensure that it is not repeated. We have sought to do the same here, and we would suggest extending what has been learned from the South Canyon fire disaster to the leadership of any organization, whether a business firm, medical center, or public agency (several such lessons have been developed for business by Charlier, 1994; Roberto, 2001).

Most company managers will never find themselves on a fireline, but their leadership decisions will find parallels with those of the fireline. Laboring under intense investor, competitor, or customer

pressures, and working with uncertain lines of authority, managers must often make critical decisions on staffing personnel (akin to Mackey's Decisions 1 and 5), market analysis (Decisions 2, 3, and 7), competitive strategy (Decision 4), division of responsibility (Decision 6), workplace safety (Decisions 8 and 9), and placement of company goals ahead of career objectives (Decision 10). Making optimal leadership decisions at such points can be important for both company results and personal livelihoods, just as they were for Mackey's crews and his own livelihood. Studying the sources of suboptimal decisions on Storm King Mountain can therefore yield fresh insights into leading under analogous circumstances at home.

Whether a fireline or company venue, making quality leadership decisions under conditions of stress and ambiguous authority is not a natural capacity, and we conclude from study of the South Canyon fire experience and its aftermath that all organizations would do well to prepare their leaders for demanding decisions under uncertain circumstances. Moreover, if organizations want those in responsible positions to bring four major leadership attributes to their office—strategic thinking, resource mobilization, effective execution, and personal selflessness—they will also want to focus on improving their leaders' decision-making capabilities. This will be especially important when their managers have been recently promoted or face new markets, confront chaotic conditions, or work with less than authoritative control.

Since many managers face one of those conditions and some confront all, initiatives to develop good leadership in most organizations would be wise to start with the essentials of building quality leadership decisions. This would apply to governing bodies as well. Carter and Lorsch (2004: 35) have noted that although demands for governance reform have mainly focused on "what is visible" of the board, the "real action is in the boardroom itself." If directors and trustees are to lead along with their appointed executives, improving their decisions behind closed doors should be a company priority.

Effective preparation of leaders, however, is subject to its own set of hazards. These include overcontrol, inadequate customization, and misleading metrics, and the building of an effective leadership development program will require sustained and thoughtful management attention to avoid the pitfalls (Conger & Fulmer, 2003; Ready & Conger, 2003; Gandossy & Efron, 2004).

Since business schools carry responsibility for preparing their students to shoulder organizational leadership, the present analysis also im-

plies that they should strengthen the capacities of their students to make leadership decisions with ambiguous authority in work environments that are often demanding and frequently changing. Given the impact of increasingly global product and equity markets on company operations, the pressures for quality decision making are likely to intensify in the future, making preparation in leadership decisions even more important for management education in the years ahead (Useem, 2004a). Studies of MBA programs reveal that well-designed curriculums can improve a host of management capabilities (e.g., Boyatzis, Stubbs, & Taylor, 2002). The experience of those during the South Canyon fire suggests the seminal importance of learning to make quality leadership decisions in those programs.

Many business schools have established courses on leadership during the past decade, and the South Canyon fire also points to going beyond fostering leadership attributes to cultivating the capacities for making leadership decisions. How to think strategically, mobilize resources, execute strategy, and act selflessly are often at the core of such courses (including one offered by the first author to executive MBA students). What is also required is a focus on learning how to make good and timely decisions when in a position of responsibility and facing discrete, tangible, and realistic opportunities to take the enterprise in one direction or another. Drawing upon one of the guiding objectives of the Wildland Fire Leadership Development Program, the business school coursework should be designed to prepare future managers to "make sound and timely decisions." Cases and exercises would help students enhance their situational awareness and clear-mindedness under stress, know when and how to clarify their own authority and that of others, and master the art of conveying strategic intent so that subordinates can make good and timely decisions of their own.

In keeping with the Wildland Fire Leadership Development program, business schools would also be advised to reinforce their classroom lessons on leadership decision making with out-of-classroom learning experiences. Even the best designed classroom-based leadership curriculums do not succeed as well as they should in fully engendering the main capacities that constitute leadership, and they may be particularly inadequate for developing an ability to make good and timely leadership decisions (Day, 2000). Akin to the concept of the staff ride for firefighters, the out-of-classroom learning experiences would place future managers "in the shoes of the decision makers

on a historical incident in order to learn for the future."

Out-of-classroom learning experiences for business students need not be limited to company incidents. By examining decision moments in venues ranging from Civil War battlefields to Himalayan mountain ascents and even the South Canyon fire zone, future managers should gain improved insight into the perils and pluses of decision making in their own settings. Akin to the staff ride on Storm King Mountain that firefighters now use and action-learning projects that many companies have come to use for much the same purpose (Dolitch & Noel, 1998), leadership ventures should be designed to be tangible and engaging—and thus instructively memorable (Hirst, Mann, Bains, Pirola-Merlod, & Richvera, 2004)—and to combine analytic ideas from the classroom with tangible applications in the field, and thus, be analytically informed as well (several such ventures and their learning value for leadership decision making are described in Useem, Davidson, & Wittenberg, 2005).

LEADERSHIP DECISIONS MAKE A DIFFERENCE

The thrust of our analysis might seem to go against the conclusions of investigations of other accidents and disasters in which the source was seen as less the results of pinpointed suboptimal individual decisions than the product of error chains, impaired sensemaking, or bureaucratic complexity (e.g., Allison, 1971; Perrow, 1999; Vaughan, 1996; Columbia Accident Investigation Board, 2003). In his analysis of the accidental downing of two U.S. helicopters by two U.S. F15 fighters over northern Iraq in 1994, for instance, Snook (2000: 207) concluded that the downing should be viewed as "the behavior of actors struggling to make sense, rather than as rational attempts to decide."

From a distant perspective, the tragic turn of events during the South Canyon fire should be viewed in much the same way: Setting the stage for Don Mackey's decisions were larger contributing factors not of his own making, including the delayed and inadequate assignment of firefighting resources to the South Canyon blaze, the failure of the engaged federal agencies to unequivocally designate an incident commander and to deliver a critical weather warning, and the absence of sufficient training in the essence of incident leadership not only for himself but also for others.

Within that set stage, however, we have nonetheless found it useful to examine the leadership decisions in their own right since they made their own independent contribution to the outcome. Don

Mackey was dealt a poor hand by the government agency that dispatched him to the mountain, but some of his decisions on the slopes helped make up for the insufficient training and support that he had been rendered by the government. His eighth and ninth decisions at 4:06 p.m. to evacuate the West Flank fireline and Lunchspot Ridge, and his tenth decision to run across the fireline rather than up the ridge, no doubt contributed to the survival of as many as 14 firefighters. Conversely, his other leadership decisions that could have gone a different way—to avoid a downhill fireline, to seek a weather forecast, to resolve the ambiguity of who was in charge—contributed to the entrapment of at least 12 who did not survive.

Whether on the slope of Storm King Mountain, in the boardroom of Enron, or on the battlefield of Antietam, readers will find it analytically useful to focus on specific leadership decisions and their impact on the goals of the enterprise. We should seek to learn more about how leadership decisions within such settings can be critical to the successes or setbacks of an organization—and how they can be improved.

Organizations would themselves benefit from an improved appreciation for what best contributes to quality leadership decision making within their walls. With better understanding, programs can be better designed to help incident commanders and enterprise managers better avert the unforced errors to which they are prone when working under stress and ambiguity. While not overlooking the importance of error chains, reduced sensemaking, and organizational bottlenecks, the U.S. agencies responsible for firefighting are now seeking to prepare their field leaders for quality decisions in the challenging moments yet to come—and other organizations would do well to consider the same.

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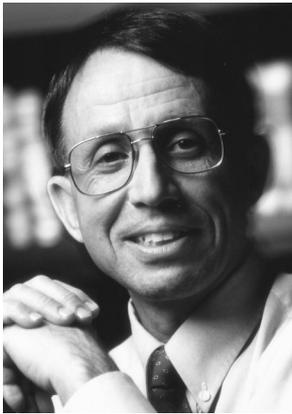
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