High Reliability Organizing and Leadership

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Few people are naturally adept at engaging novel, risky situations, working through the uncertainty, and recovering when events go awry, but through experience they learn to handle such situations. This is a high reliability person. When an organization performs at this level it is a high reliability organization (HRO).

For high reliability to penetrate an organization and disseminate throughout members of that organization we must discuss whether HRO can be taught or if it can only be learned. We must identify who "owns" the domain of HRO knowledge, seek its repository, and expose the principles to scientific exegesis.

If it can be taught, we can use the cognitive domain of knowledge but we risk devolving into reductionist principles and pedagogy- passively teaching students there is a right way to think and act. If HRO can be taught from the cognitive domain, then we need better teachers.

If it must be learned, we must seek this knowledge within the environment that created it, an ecological model. We will build upon an individual's experience through andragogy. Recognizing its emotional context we must attend to the affective domain of knowledge (utility and attitudes), a pragmatic domain that is learned by modeling rather than taught. If HRO must be learned as attitudes, then we need better leaders.

Faced with impeding harm, people respond by self-preservation or collaboration with others. What differentiates leadership for a High Reliability Organization from all other leadership models and situations is the effect of leading against threat.

With HRO, do we teach how to teach or do we learn how to lead?

In this paper I describe HROs, how they work, and the central role of leadership in creating and sustaining High Reliability.

The High Reliability Organization

The High Reliability Organization (HRO) describes an organization that, despite working in a high risk, complex environment, has fewer than expected crises and catastrophes. It was originally described from three types of organizations: US Navy

aircraft operations (specifically the USS Carl Vinson commanded by Thomas A. Mercer, RAdm, USN, retired), the California electrical grid system, and a civilian nuclear power plant. It has more recently been described from methods used by US Federal wildland firefighting.

We can somewhat divide HROs between "control operator" systems and "emergency response" systems (from a paper to be published in *The Journal of Contingencies and Crisis Management*, April 2015.) The control operator system contains hazards in a protected environment by protocols, policies, and processes. *Processes differ from procedures*- "procedures must be followed precisely while processes involve people and have slack to allow for that," Earl Carnes, recent director of civilian nuclear power programs for the Department of Energy (personal communication). There is constant vigilance for outliers and deviations from processes as early heralds of failure *within* the system.

On the other hand, the emergency response system, responding to a hazard that has escaped control, engages the hazard within an unstable environment. Here, the outlier and deviation herald what is possible or the start of cascading failure. I believe the aircraft carrier synthesizes the two systems, maintaining precise control of processes yet able to respond immediately to a crisis. This is important because HROs do not change approaches between stable and unstable situations though they may shift values (see below). HROs modify the approach they use for *unstable* environments for use in stable environments. This produces smooth expansion and contraction without changing structure. Organizations using separate approaches, routine and emergency actions, develop problems during this shift. Weick and Sutcliffe have identified five principles present in HROs that apply to both control operator and emergency response systems (see below).

You see the difference when an HRO control operator designs a system to capture possible errors, interprets constrained improvisation as freelancing, and the HRO emergency responder becomes angry at rules and protocols that interfere with unpredicted consequences. An HRO is both and, with effective leadership, moves between the models smoothly and effortlessly.

How an HRO works

Since the initial description and codification of HROs in the 1980s, academics have pursued the deconstruction of the High Reliability Organization to better understand its structure and function. They have been unable to completely identify the mechanisms that make it work and they have been unable to reconstruct an HRO using these principles and elements. This may be the reason so few HROs have been created from scratch but have, instead, been developed from a leader with previous experience in an HRO. What we miss, in my estimation, is the effect of the environment, the influence of stress on cognition and problem solving, and the role of the HRO leader.

HROs developed as an effective response to an environment of *uncertainty, time compression,* and *threat*. In the early 1980s the US Army developed the acronym VUCA for Volatile, Uncertain, Complex, and Ambiguous. While this describes the environment there is little discussion in the military literature on how to overcome these effects on leadership or performance. While HRO principles emerge from hostile, or VUCA, environments we have not clearly addressed how this translates to non-physically threatening environments (for example, healthcare and finance) or leadership.

This environment creates both fear responses and stress responses, based on the immediacy and chronicity of the threat. The fear response immediately and involuntarily releases adrenaline or cortisol to create the fight, flight, and freeze responses, manifested behaviorally as anger, frustration, avoidance, freeze, and confusion. We see coning of attention while perception neuroanatomically forces immediate action, compared to cognition where perception induces thought. Stress, from long term threat and chronicity, impairs cognition at the neuroanatomic level. Fear and stress responses are amenable to intervention by a good leader.

The HRO leader models specific and selected attitudes and behaviors, reframes the environment and the problem to be solved, guides modulation of the threat or fear response, and provides a supportive presence before, during, and after a crisis.

HROs, as a culture, emerge from the micro-level of interaction with the environment. As rookies we are initially taught to engage the incident rather than observe and understand its structure. We learn what works through action and there are no wrong actions except not to act. Decision-making involves analysis of rapid feedback loops and, with experience, one evaluates indirect and long feedback loops. As one veteran firefighter told me, "I don't know what is happening but I know what to do." To do this, every member must feel supported from the first day on the job, which is heavily influenced by the leader. Criticism, if given, is *always* supportive to make the individual better. A USMC Colonel told a USMC veteran, "Your failure is my failure; my success is your success" (Dwayne Thomas, CWO, USMC retired, personal communication).

The rookie is also guided in how to make sense of the incident, how to give meaning to observations, and to identify what is salient. Any anomaly or outlier is an early herald or indicator of what is possible vs. a random, independent rare event that others might disregard. This forms the basis of information flow and authority migration- salient information must flow up the chain of command and the authority to quickly respond must flow down the chain. A steep authority gradient impedes information flow and impairs responsiveness, resilience, and agility in the dangerous, highly dynamic incident. Communication is a behavior and subjective to whether it occurred.

Overall, I see HRO as a response to vulnerability of and the possibility of failure by individuals and the organization. Vulnerability comes from near-death experiences

or devastating loss to the individual and is felt by that individual. Failure comes from the near-death experience of a colleague or severe loss to the colleague where you have some responsibility. Resistance to HRO generally arises from people who either have not felt such loss or have experienced such loss but passed blame to others. "The organization that does not plan to fail, will fail," Todd LaPorte, former USMC fighter pilot, author of one of the first books on the complex organization, and the UC Berkeley sociologist who led the initial HRO project.

The Five Principles of High Reliability (Karl Weick and Kathleen Sutcliffe)
Preoccupation with Failure. Ignoring small failures leads to cascading failure and even larger catastrophic events. We respond to early heralds of failure and are vigilant to failures in the covert, compensated state.

Reluctance to Simplify. When we accept simple explanations we stop looking deeper or further. We are *reluctant* to accept these simplifications. In our environment we experience ambiguity, complexity, and imperfect information making it necessary to simplify. We also recognize the risk of simplification, hence the term "reluctant." We simplify because we *choose to* not because it is easier or it is our only method of analysis.

Sensitivity to Operations. Taking frontline operations for granted, not supporting them, and not accepting the complex interactions necessary to work in dynamic, hazardous environments contributes to avoidable failures. The frontline performs the real work where the "big picture" is less strategic and focuses on changes in the situation. We must have free flow of information, something most easily lost when we fear speaking up or giving disconfirming evidence.

Commitment to Resilience. Neglecting the capabilities the system or individuals have for resilience contributes to inability to work the problem to completion. Resilience is the ability to maintain or regain a dynamic event. As the situation unfolds, the demands of the situation exceed the performance of individuals or the system. To continue operations the organization must identify errors early for correction while improvising solutions within our constraints.

Deference to Expertise. Deferring to authorities, especially because of higher status or rank and rigid hierarchy, disrupts use of local or situational knowledge and subject matter experts. This interferes with anticipating and containing the situation. In dynamic, high-risk situations, circumstances change, and may change significantly, while information reaches a distant, higher authority. Those with intimate knowledge of the circumstances and those with expertise in the necessary subject matter must make rapid decisions using short feedback loops. We reduce the authority gradient that interferes with communication and we facilitate migration of authority to those with the knowledge to make the best decisions.

Weick K, Sutcliffe K. *Managing the Unexpected: Resilient Performance in an Age of Uncertainty, 2nd ed*. Jossey-Bass. San Francisco, CA" 2007.

The Five Principles of HROs described as attitudes
(From our discussions with Karl Weick we consider these necessary and sufficient for HRO.)
Attitude toward failure. Vigilant for early heralds of failure, outliers are considered as the possible event rather than disregarded as low probability, and engagement of deviations from the norm. The power (Pareto) distribution is where HRO works versus the normal distribution where we test hypotheses.

Attitude toward the expertise of others. Individuals involved in the situation have local or specialized knowledge as necessary for expert performance. This is sought out and listened to regardless of their status or role in the hierarchy.

Attitude toward simplification. There is a constant search for hidden complexities that confound understanding and impede action; there is a sharing of knowledge between staff.

Attitude toward resilience and outcome. There is a belief that individuals and the organization will get through the difficulty by working together. You work the problem until there is resolution.

Attitude toward operations over plans. Real-time operations and contingencies take precedence over plans and evidence-based practices

HRO Core Values (Daved van Stralen and Thomas A. Mercer)
(We identified these values to make HRO operational.)
Dignity- Acknowledgement of and value everybody's contribution. (When you discipline, do not take away the person's dignity.) I do not use respect because respect is generally earned and can easily be lost. Some individuals will search for reasons to justify not respecting other people.

Honesty- What is said represents the circumstances. This is not honesty as in telling or not telling "white" lies or when someone intrudes on your boundaries. I do not use trust because it is a transaction that can be based on bias and experience.

Humilit*y*- The unexpected can happen to any of us, we can all fail. This is in contradistinction to hubris and cognitive dissonance- "I am a good person with good intentions, therefore I would not act that way or cause such a failure."

Empathy- HROs work in tough situations, people are going to fail and it could be us. There but for the grace of God go I. I do not use compassion here this compassion focuses on the other individual in response towards that individual. Empathy is our internal belief system.

Duty- We will not let others down, we have duty to our larger community. This is not duty described by tasks and job description. I do not use responsibility or

accountability, which can be limiting. This has a larger, spiritual component that is internalized and comes from within.

There are negative attitudes, beliefs, and values that undermine an HRO such as self-interest, self-justification, cognitive dissonance, and intimidation.

There are many who attempt to create an HRO but fail because of what I call virga leadership or virga teaching. When you see a raincloud in the distance with rain falling but not reaching the earth, you have seen virga; virga is the rain in the Southwest that never reaches the ground.

Leadership for High Reliability

The role of leadership

As you read about HROs in this paper you begin to see that we cannot design an HRO as a system nor impose our plans upon people and the environment. As one of my colleagues stated, "*The emergency has a vote in this*," (James Denney, Captain, LAFD, personal communication). HROs, rather, emerge from interactions with the environment and interactions between people within the organization. Emergence describes how novel properties and qualities come about and in an HRO they match the emerging novel properties and qualities of the contingency. The immediate leader guides this while the more distant leader prepares for it.

(An HRO is probably better described as a complex web or network that can overlay the organization's structure, emerging during time of crisis and slipping back into the background as the contingency resolves.)

Viewing Weick and Sutcliffe's five principles as attitudes helps make them operational. There are a number of definitions of attitudes in the social psychology literature; the one I use is a belief that *influences* behavior from meaning and interpretation of the environment. Attitudes do not predict behavior. Repeating a behavior creates a belief, which has a direct effect on behaviors. While attitudes can be learned from repeated behaviors they are more likely learned by modeling the attitudes of other, respected members of the organization. It is difficult to teach attitudes without the ability to model and reinforce, in real time, specific attitudes.

The military and public safety services (law enforcement and fire service) internalize selected attitudes during the indoctrination period of recruit training. In the civilian world we cannot indoctrinate, as it appears too much like "brainwashing." In civilian life we must accept the attitudes people bring to the job and our best hope is to model the attitudes we wish to see, the role of the leader.

Radm Mercer and I have identified five values that contribute to the performance of an HRO (dignity, honesty, humility, empathy, and duty listed below). A hallmark of

The HRO, in my estimation, has the ability to shift certain values during dynamic circumstances. For example, in routine situations, organizations value obedience and conformity, but during a dynamic situation the HRO values initiative and creativity. This has also been described as constrained improvisation, as is found in jazz, and is not "freelancing" or abeyance of rules. Creativity and constrained improvisation contribute to innovation, a desired response to ambiguous information as described in the special issue on ambiguity of the Journal of Contingencies and Crisis Management (April 2015).

The leader of an HRO influences individual and collective sensemaking, frames the environment and problem solving, and models specific attitudes and values. Further, the leader allows individuals to perform in a highly reliable manner, facilitates information flow, and encourages authority migration. The leader can share responsibility but accountability always remains with the leader. Finally, the leader is vigilant for nuanced signs of personality traits and behavior characteristics that, invisible during low-tempo times, undermine reliability with increasing tempo increases and approaching threats.

Models of Leadership

While there are various models of leadership, there is not a specific model of HRO leadership. In this paper I will describe leadership that I have experienced, witnessed, or learned from discussions of known leaders of High Reliability Organizations.

I will also resist efforts to categorize the leadership traits I describe. It is important to create categories because we need definitions, descriptions, measurement, and research. We lose information, however, when we categorize. I also want to recognize the constraints and benefits from Bertrand Russell's concepts of knowledge by description versus knowledge by acquaintance. Observers who are not engaged in HROs or leadership may miss the subtle and nuanced part of communication and will not recognize the rapid feedback that occurs in leadership. On the other hand, the tacit knowledge of effective leaders may keep them from recognizing or describing their thoughts, actions, and purpose. This makes it difficult for the leadership literature to capture fidelity in descriptions or to be prescriptive for the purposes of teaching and learning.

This paper will be a discussion of full spectrum leadership. Below are three distinct models I have found useful: operant leadership, a pediatrician's view, and indirect leadership.

Pragmatic, Operant Leadership

To a great extent leadership for an HRO is pragmatic; it must get the job done. It is adaptive, resisting simple solutions and binary decisions and problem solving. As a cultural entity, HROs are a social response to the dynamic, unstable environment. This means an HRO leader can create a culture of High Reliability by reframing the

environment to let people respond as it makes sense to them, changing the individual's perceptions of the environment to increase self-efficacy, and reorganizing the problems to be solved for efficiency and effectiveness.

Because the HRO is closely connected to the environment it almost can be described as operant leadership, with the environment operating on the leader while the leader changes the environment. The leader, then, adapts to the environment while at the same time changes the environment, a form of operant learning in real time.

A pediatrician's leadership model
I am a pediatrician so the whole world is a child. Let's look at leadership in relation to child development. (Remember the adage, "If all you have is a hammer the whole world is a nail?")

The first thing an infant does, at about two weeks of life, is to develop the social smile. Adults respond by smiling back. Voila, *relationship*. When you have a relationship with your employees you can read them and know better what to do. What is it like when your employee does not or cannot smile? When speaking to Special Forces medics, all having the rank of sergeant, they asked me if I have relationships with people I work with. Relationships are vital to them in their work.

Your mother is your first leader. What does she do? She *nurtures* you and gets oxytocin released for doing it. Oxytocin makes you feel good, contributes to social memory, and causes you to trust others. It is released through touch. Nurture your employees … know when they need a break or support.

Then your father, bearer of testosterone, gets ahold of you and introduces you to the world including hazards and pain. You are now becoming *transformed* into an adult and a better person for it.

OK, it is sexist … except for the hormones.

The last part of an adolescent's brain to develop is the prefrontal cortex where your executive functions reside. This starts at about 17 years of age and is complete at about 25 years of age. Or never. In the prefrontal cortex you gain control of emotions, think of the future, and begin to make adaptive, rather than binary, decisions, and, most critical, you develop *direction*.

There, you have my lecture on leadership: *Relationship, nurture, transform, and direction*. Develop a relationship with your employees to the level you can read them and their mood individually and collectively. Nurture them when they are over-extended, get them the resources they need to do their job. Transform your employees, challenge them, make them better, and increase their personal attributes. (Wow! Resources and attributes to exceed demands and expectations … this is my physiology of stress lecture derived from Raymond Novaco at UCI. You get an extra lecture in this!) Give your employees direction so they know where you are

headed. If they cannot reach their objective then you decompose it for them. (This is in my decision making lecture, another lecture we can do at another time.)

Indirect leadership (Howard Gardner)
HROs are constantly changing, growing, and organizing. I have found it useful to use Gardner's model of indirect leadership to create and sustain an HRO. This model of leadership rests on the narrative you use, the questions you ask, and the answers you accept.

The questions I ask are directed to appreciate complexity and ambiguity. They must develop alternative explanations for events and circumstances. When they offer plans they must have descriptions to identify undesired consequences and how to interpret the absence of a response. This also forms a "decision space" within which they can act freely- effective acting too soon or too late and the effect of using too much or too little.

To bring my perspective to the individual's view when someone errs I take the view that the individual did the right thing, did what I would have done. Everyone acts in a manner that makes sense to him or her; I must look for what would justify the individual's actions. If I can see this, I can learn where and what I need to teach. Error, here, is gold, it helps identify vulnerabilities to the system. "Once you find out who did it, then you begin your investigation," Christopher A. Hart, Chairman, NTSB (personal communication).

For descriptions I require them to be objective, articulate, and succinct. Objective descriptions are the most difficult as people do not realize when they insert opinion, interpretation, of persuasion. I learned from family conferences in the pediatric ICU regarding withdrawal support of a child that one couldn't be totally objective; the first word said always has the greatest influence. The choice of words is subjective. Articulate means the words must come together in some form of structure that makes sense. A US Marshall told me that he teaches articulate describing by telling his students that when you articulate the problem you have identified half the solution. For example, if you find a white male in an expensive car in Watts at 2:00 AM he is lost, looking for drugs, or looking for prostitutes. You now have probable cause to pull him over. Succinct, from a Roman gladiator's method of girding for combat, says enough without saying too much.

People say that we should tell a story, and that is true. But in time-constrained events we may want to describe a scene. A German film director described to me the differences between a story and a scene: a story has a beginning, middle, and end while a scene take us from A to B, containing, at most, two story arcs.

The second most difficult thing to teach, and most frustrating for the student, is to be concrete as they do not see, nor can they recognize, its importance until they are in a crisis. Concrete descriptions reduce ambiguity.

I like Howard Gardner's preface to **Leading Minds: An Anatomy of Leadership**:

> "A leader is an individual (or, rarely, a set of individuals) who significantly affects the thoughts, feelings, and/or behaviors of a significant number of individuals". Most acknowledged leaders are "direct." They address their public face-to-face. But I have called attention to an unrecognized phenomenon: indirect leadership. In this variety of leading, individuals exert impact through the works that they create.
> Whether direct or indirect, leaders fashion stories: principally stories of identity. It is important that a leader be a good storyteller, but equally crucial that the leader embody that story in his or her life. When a leader tells stories to experts, the stories can be quite sophisticated; but when the leader is dealing with a diverse, heterogeneous group, the story must be sufficiently elemental to be understood by the untutored, or 'unschooled,' mind."

Culture is social knowledge, the social response to the environment, and is passed down through stories. Gardner's approach is also how culture changes from the indirect leader. There must be a relationship between the stories leaders tell and the traits they embody. Every story has a purpose and a principle.

The Purpose of Leadership

"*Good leadership is invisible and occurs long before it is needed.*" Leadership occurs, and is most effective, during the downtime as there is little time available during time-compressed action to communicate verbally. A good example here is the orchestra, the conductor leads only during practice. He or she is not needed during the performance; the conductor's presence is only for show. (A Long Beach Symphony Conductor told me this.)

As noted in my pediatrician's view of leadership, the purpose of leadership is nurture, transform, and provide direction. But I have since learned there is another, critical purpose of leadership- to give purpose. Dan Kleinman is one of five NIMO Operations Chiefs in our country who manage the response to the largest disasters. NIMO is the National Incident Management Organization for the federal government and each team runs the nation's largest disasters. On short notice he must pull together disparate public and private organizations, all with different concerns, threats, and needs. What helps him most is to identify every organization's purpose and to have his purpose identified and translated to everyone involved. This must occur during times of high emotion and stress. The leader identifies purpose for the organization and translates that purpose throughout the hierarchy.

There is discussion in the management literature about leader-follower, which I find distracting for the purpose of an HRO. Stanley A. McChrystal, General, US Army

(retired), commanded the Joint Special Operations Command and described the importance of leader-leader. In an HRO, every individual who identifies a problem leads the solution until relieved of responsibility for the problem. This is leader-leader. [Command is not discussed in leadership literature. In discussions with RAdm Mercer, he believes it is because command has an authoritative connotation, coming from the military where command consists of those duties that you cannot legally delegate. For example, in medicine the physician cannot legally delegate diagnosis and prescriptive authority, a misconception that interferes with the ability to migrate authority to those in the best position to act.]

Another purpose of leadership is to bring the organization up to a level of expert performance. Malcolm Gladwell in his book *Outliers* popularized the idea that it takes 10,000 hours to reach expertise. That is actually a minor issue, reaching expertise also involves whom you compare yourself to and working on what is hard. The role of the leader is to identify industries and other organizations to which individuals can compare themselves. Also, the leader guides development in those areas that are difficult to improve.

Stress impairs cognitive function; HROs address this directly. The pediatric residents told us the pediatric ICU was their hardest rotation but the least stressful, one of our successes. Problem solving releases dopamine in the locus accumbens within the brain giving pleasure. Low levels of dopamine are associated with depression. One purpose of leadership, then, is to reduce gratuitous stress that interferes with performance.

A significant cause of stress is isolation, or the feeling of isolation. We are social animals who physiologically and psychologically need contact with other humans. In fact, a form of bullying in children occurs when classmates isolate a child from playmates. This is also found in adults. No one should feel isolated in an organization; particularly organizations working in high-stress situations or that strive to be an HRO.

Failure is an option. Life is not a movie- failure happens and we must be prepared to fail. One purpose of leadership is to prepare the organization for failure as a method to prevent failure, not just in training but also in mindset.

In firefighting and fire-based EMS, the most important person on scene was a firefighter at the end of the nozzle or the paramedic treating a patient. All efforts were directed at supporting an individual to do the job properly and with adequate resources. The role of the captain was to ensure this happened. There was sometimes an urge for the captain to perform some of the work of firefighters and medics but there is an accepted rule, "*When a fire Captain picks up the firehose he becomes a firefighter, he is no longer a fire captain*." It is important to maintain some detachment from the action for observation and leadership.

The leader must interpret, identify, and translate information and events. HROs engage complex, time compressed situations in constant flux. Individuals are immersed in action, leaving it to the leader to identify evolving threats, interpret the situation to better understand what is happening, and translate this information to various organizations and professionals using language in words that the other people understand. This also means identifying objectives for decision-making and the problem space.

For example, to relieve smoke and heat in a house fire a firefighter climbed to the roof of a house using an attached fence, with him was the captain. A Battalion Chief arrived and demanded to know why they were on the roof without a ladder when department policy was to have ladder on the roof for emergencies. The captain responded, "Isn't it also department policy to put out the fire?"

Ambiguous information
This is from my guest editorial *Ambiguity* in the current issue of *The Journal of Contingencies and Crisis Management*:

> The authors who discussed leadership commonly described elements of a bottom-up approach or, at the least, transformative and supportive leaders at the top. Weick discusses the 'group writ small', which I think is critical as it describes the dynamics of a bottom-up approach. It supports the idea that safety and reliability are self-organizing responding to local context. 'Empowering expert people closest to a problem and shifting leadership to people who have the answer to the problem at hand' (Meshkati & Khashe, 2015) is central to success.
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> Leadership in ambiguity also has a top-down element. Vidal urges caution with the Engineer's Stance of leadership – 'when lessons learned by organizations translate into the refinement of procedures, protocols, and the proliferation of rules'. 'Managing uncertainty by an inflation of rules is typical of the engineer's stance.' Rather, successful leaders seek out diverse perspectives and discrepancy (Barton et al., 2015), engage diverse participants from inside and outside the organization to provide multiple perspectives and innovative suggestions that contribute to learning-by-doing (Carroll, 1995, 2015), and a shuffling of power and influence to those who can make sense of the ambiguous situation. Only the Captain of the ship could say no, giving a bias for action to make the system work (van Stralen & Mercer, 2015). A deeper understanding of 'only the Captain can say no' is the Captain sees a larger picture of the events (Mercer, personal communication). Carroll describes the CNO [Chief Nuclear Officer] who reversed the firings of two

contract workers who voiced safety concerns. The CNO saw the larger picture and, by acting into ambiguity, increased not only safety in the program but transformed leadership in the ranks of management.

Bea described the importance of corporate leadership: when the leaders who developed the program retired, “the pipes started leaking again.”

Methods of Leading

These are independent leadership points I have accrued from various HROs.

Special Operations Forces, Joint Operations Command:
The importance of relationships within the organization. Friction will occur when units come together with independent objectives and purposes. We must maintain interoperability permission success in a common purpose. Own your own error, if you do not identify an error you made somebody else will. If somebody else notices it, reduces the trust within the system.

What to do when an error occurs:
A fire captain, counseling a novice firefighter over a life-threatening error, supported the young firefighter. "You where the best firefighter for this incident. Because of that, the fire department will support you and I will support you. There may be other firefighters more experienced than you, but they were not available, making you the best firefighter available. There are 1000 things that happen on scene. You can only see maybe 100 and act on only one or two. I may see a different 100, and I may act on a different one or two. It does not mean I am better than you, it only means I am different than you. You were the most qualified firefighter we had for that incident and we will support you.”

Veteran firefighters would often give a piece of advice to the rookie and appear to leave. Actually, the veteran firefighter stood off a short distance and watched the rookie struggle. Not for amusement, but to see how the rookie solves problems. At a given moment the veteran would step in and, without passing judgment, would give whatever additional assistance was necessary. This is how the rookie learned- he must work on his own but help is always nearby, and that help is watching.

"Never tell a good man how to do something, tell him what to do and he will surprise you with his ingenuity." George S. Patton, GEN, US Army (OK, so he was not a great leader, it is still a great quote.)

In an HRO we work in the Affective Domain of Bloom's Taxonomy. When I first started in the pediatric ICU I was concerned how to combat that phrase, "I know this is what Dr. van Stralen taught you, but let me tell you how it really works." Jim Holbrook, my educator guide, told me to teach in the Affective Domain, to only teach

what works. I did this, and people would tell me what worked, from the next day to 30 years later. They knew precisely what I said and the circumstances around the lesson. Over time I found the student filled in the space between what I taught, this is the Cognitive Domain.

Because people respond to the environment in a way that makes sense to them it is important for the leader to give meaning and context to information and events.

The leader also models attitudes, selecting attitudes necessary for an HRO.

RAdm Mercer, USN, retired, was noted for his leadership methods on the USS Carl Vinson:
During the routine and unscheduled walks along the carrier flight deck looking for debris, he would walk with the sailors. At some point during the walk the sailor would have to talk to the ship's Captain. In this way he maintained a connection with the crew and they felt connected with him. He also told me that there were often three cake celebrations a day on the ship. (I had asked him how big the kitchen was and he told me it was large enough the cook three large takes daily. Please don't think all he did was eat cake.) He founded the presence of the captain at the celebrations was more important than anything else he could do for the crew.

As noted in the article for this lecture, only the Captain of the ship could say "No." In this manner, everyone on board the ship learned how to solve problems. If they couldn't solve the problem between contemporaries or equals they moved it up the command. This prevented people from blocking information or problems from moving upward in the hierarchy.

If you lose a tool until someone you receive a thank you. Foreign Object Debris could be lethal on an aircraft carrier flight deck. There is the story of a mechanic who lost the tool announced it which caused a delay in recovering aircraft, a dangerous situation if they are low on fuel. Eventually found the tool in a different location the mechanic was thanked for stopping operations. If a tool had been lost, it could have led to the loss of an aircraft and the death the pilots. The lesson is "Don't shoot the messenger, even if the messenger is wrong, or the messages will disappear."

The Captain of the ship has a larger view of events on the ship. At that distance is more likely to resolve ambiguous information and assist in decision-making.

My fire station commander valued everyone in his command and in the department. I asked why several firefighters did not promote up to fire engineer before they retired. They had 30 years of time and veterans credits from fighting in World War II. He told me they were successful; they lived through the depression and fought in the war and could now provide for their families, provide a roof over theirhead and food on the stove. They were successful. I used this concept in a nursing home where many people were dismissive of CNAs. I told them the CNA was likely the most successful person in their family, he or she may be the only one who

completed some schooling or had a job. Recently, a woman contacted me through LinkedIn. I had to read through her credits to find out how I was connected to her. She was in management and had a Master's degree. She worked as a respiratory care practitioner. Down at the bottom the resume I saw she had been a CNA at the nursing home where I was the medical director.

Tone comes from the top, as a leader we set the tone for the organization. When we created the pediatric intensive care unit we had three simple rules: do not criticize, support the better caregiver, and you have a duty to the larger community. We modeled the attitudes we sought in our staff.

Creating the Pediatric ICU as an HRO, I had a set series of lectures: Day One I helped sort out the complex patient, reducing a myriad of problems to three elements: what would kill the patient, what would keep the patient in the ICU, and what would resolve with time and treatment. Day Two we discussed decision-making. Day Three we discussed stress. Day Four we learned to take a break, even at the most busy time we can rest. The two of us that ran the ICU also routinely walk through unit to identify the signs of stress in the staff. In this way we grew from small eight-bed unit with no critically ill patients to the second largest Pediatric ICU in the state with half the patient mortality expected.

Things can go wrong

Kiss up; kick down. 1994 Fairchild Air Force Base B-52 crash (any web search or Wikipedia has the details). I viewed a film used by commercial airlines to train the pilots that recounts story of this pilot. What intrigued me was the juxtaposition of reviews by superiors, which were all glowing, and reports by subordinates, which were all negative. This pilot crashed a plane and killed many people. As leader, your view of subordinate leaders misses vital information. I would answer phone calls by first name and learned how other people treated my staff.

There will be times when stress begins to get the best of anyone. Dan Kleinman watched the faces of his rookies and, if he saw stress, would ask if they were having fun yet. They would always smile. He did not want his men or women performing with the sensation of stress. As an alternative, he would tell them to hit their "fun button." This is a concept used in Special Forces where they have a pretend "fun button" on their left breast pocket. When they saw one of their buddies exhibiting stress they would tell him to "Hit your fun button" and "Are we having fun yet?"

Key difficulties in creating and maintaining an HRO are asking the question "Why?" We do not really know why we do anything so I asked the questions "What?" and sometimes "How?" "What?" is effective to assist the individual in creating an explanation for actions taken. The personality traits of self-justification and cognitive dissonance are beyond the scope of this paper but are most serious. This leads to what one of my colleagues calls the "insider threat." If you watch the movie

Breach you will understand the difficulty this type of first. My colleague was the neuropsychologist used by the FBI the forced interviews of all 100 spies in the 1980s. The movie *Breach* is about one of them.

Certitude: How do you identify when you are personally wrong? Too often I see errors that are not considered errors. A senior leader is wrong and, through a combination of cognitive dissonance, confirmation bias, and "knew it all along" bias, never learns and always leads to destruction. I wonder if this kills more people than medical error.

In creating an HRO there are three personality types you will encounter: Central to each program I developed was a group of people that are approachable and can translate what I am saying to all the different groups. This is a great risk, to migrate authority to lower levels in our hierarchy. You can imagine the vulnerability we have from those who believe they know what to do and I am wrong; others who believe their job is to identify problems and give them to me without any suggestions for solutions; and those who resist by continuing to ask questions while refusing to accept my answers. I am sensitive to these three groups from previous experience and knowledge of how effective and destructive they can be. This will only work, something that has never before been attempted, if we all work toward the goal. As we gain experience we will change how we do things and our goal will be adjusted, but we will get there.

Anecdotes

Although they are vital for learning in any high-risk organization, anecdotes have a bad reputation from professionals and academics. I like the 17th century French connotation of anecdote, "secret or private stories." The most instructive stories in an industry or culture are not shared with outsiders and this may be the reason for their poor reputation. After a lengthy discussion with a group of HRO leaders, Karl Weick asked me to develop with him a White Paper on the role of anecdote in the HRO. It was agreed by all the leaders that we learned in this manner and we use anecdotes to teach. When you listen to an experienced operator you will hear the story and, deep within, the principle he or she wants to convey. As described by Gardner, the indirect leader fashions stories to change people. Below are illustrative anecdotes for teaching HRO.

One of the earliest problems I encountered was how people made sense out of the situation encountered. There was threat and fear, uncertainty and ambiguity, the expectations for both performance and outcome. I sorted out those things they could do something about and those they could not. We discussed actions based on reversibility and irreversibility, telling them they were free to act if the result was reversible but they might want to call me if the consequence was irreversible.
In each program I changed to an HRO I found that staff had been beat down a bit by other, more prestigious programs. For this situation, I focused on self-efficacy and

pride. In the PICU I pointed out how many people they had command over. In their minds they had only 6 to 8 patients but this added up when we added the on-call patients, nurses, respiratory care practitioners, and families. That night they were in charge of close to 80 people. In the nursing home as we began using mechanical ventilators in novel situations I described our work, compared to the PICU, as Ginger Rogers dancing with Fred Astaire-we did everything Fred Astaire did except backwards, in a dress, and in high heels. (I did have to swallow some pride stating this.) Pride must not come with elitism, a constant battle in the first years of the PICU. Discussion of pride, however, is difficult because it implies arrogance. Any discussion of pride must include the concept of duty to the community.

Initially, the most difficult thing I found to teach was decision-making. Later, the author of a combat decision-making book for the US Air Force told me I was the only one he knew who had taught civilians how to make decisions in emergencies. Some of this material is scattered throughout this paper and some must be taught in a separate presentation. The first decision one makes, entirely unsupported, is the most difficult and can actually bring a sensation of nausea. I work with staff for them to make their first "unsupported" decision in my presence; that is one that I will act on without question. If the decision is wrong I provide more information and continue providing information until I get a solution that will work. But there is always a point at the end where it can be either A or B and they must choose. Not only does this force them to make a decision that we act upon but I also learn what knowledge they are missing and where I should be teaching.

Left to their own devices, the residents interpreted some situations in a negative manner. When the surgery service transferred two patients to the PICU service for evaluation of brain death the whole team rebelled, calling this a "dump." That is, the surgeons did this so they would not have to do the work. In these situations, I followed the logic of their belief to its ultimate end, but I also forced them to define their terms. I described a patient treated by plastic surgeons in the PICU who was overfed by volume and die from aspiration. Feeding orders are easy for us but not for somebody without our training. From the opposite view, evaluating an abdomen is easy for a surgeon but difficult for us. A “dump,” then, is a transfer of a patient to somebody who finds it very easy to do. I do not hear about this problem again.

One early problem for our transport team was the hostility they met when retrieving a patient from a referring emergency department (ED). We made several adjustments but the most successful was to guide them in the manner retreated patients in the field surrounded by hostile and potentially violent bystanders. Perform the minimum level of work necessary, shift yourself so people can see you, and describe what you are doing as you do it. Only complement and never criticize the team. Within six months we began receiving complements from referring EDs.

In the nursing home we had a high-risk situation with children receiving mechanical ventilation but we were unable to use sedation to help with the ventilation or have blood gas analysis available to manage the ventilator. I chose smile as our endpoint

and we adjusted the ventilator to make a child smile. This increased job satisfaction for everybody, made families happier, and gave us greater safety. By the way, when I first arrived at the nursing home people did not believe they were in a dangerous situation regarding their patients. I offered to take everybody to the parking lot for a barbecue, a two-hour lunch. Nobody would go to lunch (this was a fictitious lunch actually) because the nursing home patients could die over the two-hour time interval. It was easy have them describe how the patient might die and what they can do to prevent the death. With that I pointed out how vital they were to the children's lives and survival. The HRO expert worldwide for Shell Oil used both of these stories, the smile and the barbecue, to teach safety in their refineries.

Conclusion

High Reliability Organizing is a culture learned in real-time at the interface between the environment and organization. It carries a narrative, consisting of instructive stories, passed on to novices by leaders. The dangers to an HRO are social and cognitive dangers best identified by the leader at closest proximity to the behavior. HROs need special leaders to perform and to be sustained. Because of the emotional characteristics of the HRO environment, much of this is tacit knowledge or invisible to outside observers.

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Bona fides

I began work as an ambulance man before EMS, becoming an EMT then a fire department paramedic with most of my assignments in South Los Angeles as an Angel Dust drug epidemic and the Crips and Pirus (later the Bloods) moved into South LA. I responded to over 7,000 incidents without routine police or fire support and without hand radio communications. The men who taught me were veterans of WWII, Korean Conflict, and the Viet Nam War and also experienced in major fires, riots, and natural disasters. Most knew of a colleague who died in the line of duty. I was one of the first career fire paramedics, if not the first, to attend medical school.

Personal interests include mountaineering and travel, having traveled around the world twice (3-4 months for each trip), visiting areas where English is unknown. My mountaineering experience includes ski mountaineering, winter mountaineering, and leading a Himalayan trekking peak climb.

Professionally I worked with another physician to create a pediatric intensive care unit to become the second largest in California with half the expected the mortality rate- in three years. I also created a pediatric critical care transport program, home mechanical ventilator program, pediatric subacute unit, and an Emergency Medical Care baccalaureate program. Some of this has been published for medical care, patient safety, and academic business (organizational behavior) journals.

I have presented my experience with this material to numerous industries: NASA, transportation (commercial aviation, metropolitan mass transit, NTSB), national security (intelligence, Special Operations Forces, etc.), Emergency Medical Services, US Federal wildland firefighting, chemical process safety and petroleum industries, K-12 education, nuclear power and weapons, and academic organizational behavior.

Patient safety programs that have solicited my involvement at the executive level include the Institute of Medicine, Joint Commission, Institute for Healthcare Improvement, Agency for Healthcare Research and Quality, National Quality Forum, the California Medical Association, Association of Safety Healthcare Risk Management, and the Canadian Patient Safety Institute.