Skipper, Leadership and Vessel Safety

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January, 2021

Introduction by Ralph Naranjo: Advocates of the phrase, "leaders are born not made," discount expertise and dwell on behavioral traits such as charisma, compassion, extroversion, boldness, etc. These personality attributes certainly play an important role in acquiring allegiance within a group. But when it comes to the complexity of command at sea and the risks linked to offshore racing and cruising, the inverse is true—leaders, or should I say, good leaders are made not born. The recipe for success includes sea time in challenging situations, an ability to weigh variables and a sense to steer toward effective outcomes. Sharing this wisdom requires communication skills and an ability to inspire others.

Doctor William Strassberg's paper "Skipper, Leadership and Vessel Safety" delves into Crew Resource Management (CRM) and defines how essential leadership skills can be developed—improving every skipper's ability to handle challenges at sea.

A Skipper's Leadership Skills are Significant

Skipper leadership and vessel safety are inevitably linked, as effective leadership enhances vessel safety. Safety practices aboard a small vessel at sea interface safety protocols and gear, captain and crew, and effective leadership integrates these components and translates vessel operating practices and rules and the safety culture they represent into practice: effective leadership empowers and enhances vessel practices. Ralph Naranjo has written in his book, *The Art of Seamanship:*

"A proficient skipper must be as multifaceted as possible, not just in breadth of knowledge but also in the kind of wisdom that's acted out on the pitching deck of a vessel at sea." and continues with the following: "*The final challenge for any skipper is the transition involved in becoming a leader"* (Naranjo, 2015).

https://youtu.be/fuXMNnU5SC8

The transition to lead and forge a safety driven team is natural in some skippers, but leadership skills can be fostered in all. Elements of leadership are composed of multiple factors. Some factors are innate, while others are developed with time and experience such as competence, situational awareness, and good decision-making. Finally, there are elements of leadership that encompass skills that can be taught and learned, such as effective communication strategies, enhanced teamwork and operational protocols. Leaders are born, but leadership is also a be skill that is developed.

Leadership Skills can be Taught

Leadership has always been an interest of mine, but ironically came to the fore in the midst of my career as a surgeon where I became involved in issues surrounding patient safety and safe surgical practices. The goal was to create a culture of safety in my surgical practice and operating room, utilizing protocols, actions, teamwork and communications centered around patients and safety. Many of the techniques I learned to create a safety culture in medicine and surgery were derived from the aerospace industry and airline safety programs, with systems checks, standardized procedures and protocols and open and decentralized communication techniques. Now, when sailing, I try my best to carry the same concepts and leadership skills on board my *Visions of Johanna*.

A skipper's leadership brings all components of a safety program to fruition. That ability to bring a crew together, to embrace and adhere to the safety-first philosophy while creating a team that works together, cares for one another and takes care of one another, I believe, is the transition to leadership that Ralph Naranjo speaks of. The character, management style and ethos of the effective skipper manifests itself in the culture of safety via quiet competence, crew confidence and smooth procedures, as well as the ability to communicate swift and effectual command if troubles develop.

Crew communications and interactions occur in several ways. Comfortable banter is often the norm, but precise and acknowledged communication to assure mutual understanding is important at crew change and when exchanging situational information, and tersely formatted communication for concise information exchange in urgent situations are also important parts of vessel communications.

Internal and external factors are involved in effective skipper leadership. Internal to the skipper, in small vessels particularly, is the need to be aware of all issues on-board. Weather, navigation, communications, crew health and morale, general stores and yacht systems are a few that come to mind. Seamanship skills and breadth of knowledge develop with experience. A second component is external: The on-board atmosphere created by successful skipper leadership develops "buy in" by the crew to yacht's rules, procedures and safety protocols. This shared sense of responsible safety behavior is a good measure of a yacht's safety program. Has your crew been discovered out with their harness unclipped? Does the atmosphere aboard your yacht foster open communications and is your crew comfortable bringing up concerns or expressing disagreement with a decision you have made? Answers to these questions are also markers of a yacht's safety program.

Vessel protocols, SOP's and emergency procedures should be known and practiced by all. Prior to sailing Greenland's east coast in 2019, I reviewed and tightened our yacht protocols to strengthen safety regimens aboard *Visions of Johanna*. The crew received a detailed handout listing preferred sailing strategies and outlines of how we run our boat. Safe use of gear and procedures and rules regarding cockpit and deck-safety protocols were stressed and an absolute rule was that no one was to enter the cockpit from pilot- house without being clipped

in. I explained, quite simply, that the water was cold, often closer to 40 degrees than 50, and if someone were to go overboard, I was simply not good enough in all conditions to assuredly turn 62-foot *Visions of Johanna* around and retrieve the person in the water in the 15–20 minute window before hypothermia became dangerous—and that's only if the victim survived the gasp reflex. These conversations, and our discussions about protocol were sobering and effective, confirming that we had to rely on and take care of one another out there. I realized just how successful we were after reaching inshore waters back in Maine. We were 25 nm. from home, motoring through calm, inshore waters and light fog approaching Isle au Haut Bay. I asked a crew to go to the mast to call lobster pots, and as they started forward, they asked if I still wanted them to clip in. I felt that in daylight with all on deck, in inshore waters with no seas and no wind it would be permissible to go forward unclipped. Inwardly I smiled and thought to myself that we had done a good job of inculcating that safety culture!

Why are Leadership and Communication Skills Important?

A skipper can study leadership skills, concepts, and techniques in an educational format. Experience and the passage of many blue-water miles fosters and matures those skills, helping a skipper think ahead and develop a sense of what might be coming next. Experience also helps develop the ability to handle all types of problems in all types of systems. But even experienced captains can make major and dangerous errors.

Here is an airline industry example: In late December 1978, United Airlines Flight 173 carrying 181 passengers and 8 crew, crashed outside Portland, Oregon. Eight passengers and two crew members died. Although there was equipment malfunction, the National Transportation and Safety Board (NTSB) investigation concluded it was the crew's carelessness and inability to work together effectively that led to a preventable disaster - exhaustion of all fuel with loss of all 4 engines (National Transportation Safety Board, 1979). How does a modern-day jetliner simply run out of fuel?

United Airlines Flight 173

https://www.youtube.com/watch?v=vgSSKKe5lw8

What happened on United Airlines Flight 173? After the landing gear malfunction, the crew held in a pattern south of Portland for 1 hour and 2 minutes. Their fuel quantities were known throughout the series of events and the time and distance able to be traveled with diminishing fuel was predictable. While concerns for fuel levels were voiced by the crew while United 173 was holding, concerns about adverse outcomes were not asserted strongly enough by the crew. Ultimately, the captain's isolated attention to the gear malfunction eclipsed the more serious concern of fuel quantities. By the time this was realized, reaching Portland International had become an impossibility.

Landing was delayed while the flight crew coped with a landing gear malfunction and prepared the passengers for a problem landing. But the National Transportation Safety Board determined that the probable cause of the accident was the failure of the captain to properly monitor and respond to the low fuel state, and crewmember's soft advisories, which in combination allowed fuel exhaustion in all engines. Inattention resulted from preoccupation with the landing gear malfunction and preparations for a possible landing emergency. Contributing to the accident was the failure of the other two flight crew to realize the developing danger, or successfully communicate their concerns to the captain…or both. The captain was focused on mechanical issues while the crew was only gently questioning fuel status.

- *Skipper preoccupation, improper focus and ineffectual assertiveness within the crew can lead to dangerous* outcomes

Crew Resource Management

Crew responsibility was seen as a common theme in several other contemporaneous aviation mishaps, highlighting the inability of crews to work as team and communicate with one another effectively.   But it was the crash of UA 173 that directly led to airline companies, in 1981, adopting new training for all crews. The training is known today as Crew Resource Management (CRM).

Could this happen aboard a yacht? Definitively yes. Here is a hypothetical: You are approaching the end stage of your overnight passage from Block Island Sound to Maine, perhaps bound for Swan's Island or Mount Desert Island. Vessel had just made course for Jericho Bay and you, the skipper, are down below trouble shooting your fridge compressor. You are in the "boat position" – butt up with head down in the bilge, trying to get your elbow to bend the wrong way to reach a part you cannot see. Focused on your problem when your crew comes below to tell you the boat could be caught up in a lobster pot warp, you tell them to try to cut it, untangle the warp or spin a 360 off of it. They come back five or ten minutes later to say they are concerned they are caught on the warp, more or less drifting and unable free themselves. You grumble that you only need a few more minutes to figure the compressor situation out and they should keep trying to get unstuck. And they go above and try to deal. But perhaps what they have not yet had an opportunity to tell you, or perhaps are uncomfortable bringing up to you, was their concern about a two knot current slowly dragging the boat towards Horseshoe Ledge. And…you might imagine the rest.

Preoccupation, narrow focus and communication problems can and do happen aboard cruising yachts. To minimize opportunities for errors, a skipper can adopt the practice of Crew Resource Management aboard their vessel. The objective of CRM is to reduce human error and potential mishaps via standard protocols and crew communication tools and teaching, with the goal of improved vessel and crew safety. Conceived in the airline industry in 1978 after the United Airlines Flight 173 incident and initiated by United Airlines in 1981, CRM techniques have subsequently been adapted to enhance safety practices in other venues including firefighting and surgical practice and patient safety,

- *CRM training focuses on both interpersonal and cognitive skills. Best practices include Situational awareness, problem solving and decision making, effective communication and leveling of the organizational hierarchy.*

Components of CRM

Situational awareness is defined as continuous extraction of environmental information and integration with previous knowledge to form a coherent mental picture of vessel status in order to best anticipate responses to future events. (Transportation Safety Board of Canada, 2011). A best course of action is based on a shared understanding of current status and potential problems, and this common understanding between crew members is referred to as team or shared situational awareness. Standard Operating Procedures (SOPs) are designed to help

vessels operate within risk-managed boundaries, maintaining situational awareness through the use of predetermined procedures.

Individual situational awareness describes a crew member's interpretation of current status and events, but sharing that situational knowledge is critical if the whole team is to work successfully on the same task. Callouts of deviations and sharing of plan changes is necessary for effective crew interaction. Crew communications and ship procedures and protocols should facilitate data transfer through specified communication styles.

Shared situational awareness also monitors reactions and mood of other crew members to identify any signs that they are becoming disengaged or are not healthy. Action to resolve issues are functions and duties of all crew members.

- *A safety oriented crew communicates well and keeps their mates abreast of vessel environment and operations.*

Problem solving is a multi-step process which includes decision making as an integral part. Crew identifies a problem, gathers information, and then uses that information to define potential solutions. Effective decision making involves the accurate understanding and appreciation of the implications of the situation, formulation of a plan and contingencies, followed by the implementation of the best course of action. Equally important is the crew's ability to recognize a change in situation that requires reinitiating the decision-making process. Inaccurate perception or inadequate consideration of the potential implications of a situation increases the risk that a decision will produce an adverse outcome.

Increased stress levels can impact a captain's ability to perceive and evaluate cues from the environment, inhibiting the problem solving process, potentially resulting in attentional narrowing (Transportation Safety Board of Canada, 2011). Attentional narrowing is an unintended failure to process potentially critical information and can lead to confirmation bias, when people seek out cues that support their desired course of action to the possible exclusion of critical cues that may support an alternate, less desirable hypothesis.

- *Increased stress levels can inhibit the problem solving process, resulting in attentional narrowing and confirmation bias. The ship's procedures and protocols should designate it duty of the vessel's crew to communicate their concerns and instigate reappraisal of questionable situations.*

Effective communication improves shared situational awareness and optimizes decision-making. Crew must be effective communicators, but this requirement can be a challenge when faced with abnormal situations and competing priorities. And human nature tends to defer confrontation, especially on small craft. To enable effective communication, SOPs should assist rapid communication and mutual understanding. Crew members must feel comfortable when providing conflicting opinions or alternative input to a skipper as often, ineffective assertion is linked with ineffective communication.

Modern CRM training specifically addresses the importance of a crew member's duty to speak by providing communication tools and techniques as SOPs. It is generally accepted that crew members should assert themselves when they are unsure of something or if there is a genuine concern about the current course of action.

Leveling of the organizational hierarchy facilitates team communication. It does not mean the skipper is not in charge. It does not create an equal or mutual command structure, nor does it alter the responsibility or authority of the captain. CRM teaching makes it the duty of every team member to voice any concerns they might have. Simply requiring crew to speak their voice if concerns are evident goes a long way towards improved communications. The skipper's encouragement, willingness and desire to hear dissenting, conflicting opinions and concerns are a large part of the rest. The hierarchy becomes more level when the skipper encourages crew to be comfortable with an open team communication process.

Effective Communication

In medicine, communication techniques changed remarkably during my surgical career. When I began my private practice in Maine in the 1980's, the surgeon was king of the operating theater while co-workers played a relatively subordinate role. I remember the very first time I walked into the recovery room as an orthopedic surgeon in a rural Maine hospital. The two recovery room nurses jumped up on their feet as I entered the room. Wearing classic nursing garb and caps, they almost stood at attention upon my arrival - as I did a 360 trying to figure out what was going on! By the time I retired from surgery, in another larger Maine hospital, I would enter an O.R. announcing my name while asking co-workers to call me Bill. I would outline a brief plan of intended surgery stating our intended shared goal, asking everyone to speak up if they saw anything they wanted me to consider. I explained that my focus was often on a small portion of the surgical field and I could potentially miss a critical issue outside my immediate zone of attention, so they must please speak up. In a span of 15 years, surgical practices morphed from a hierarchal structure to a shared team approach emphasizing teamwork and communication. The revamped culture was enabled by conscious leveling of the command structure, SOPs and enhanced communication techniques that fostered a shared understanding of our situation.

Ideally, questioning (assertive) commentary begins with non-threatening statements or questions, but if efforts fail, a more assertive approach must be taken. It should be understood that, due to human feelings and societal expectations about relationships, people generally have a really hard time using unmitigated language that doesn't hedge, qualify, weaken or soften, but that delivers unvarnished and unambiguous messaging.

Crew training and positive reinforcement can help build confidence and acceptance of the use of direct language. An aviation CRM communication tool is the PACE model: *Probing, Alerting, Challenging, and Emergency Warning (PACE)* Model. (Transportation Safety Board of Canada, 2011) which provides a series of communication strategies designed to allow for a natural escalation of assertion. PACE starts with the use of probing and unambiguous questions to

enhance group understanding of a situation. The next step in the process is to alert the skipper of the concern, voicing a specific concern to make sure that the concern is understood. The third step in the escalating process is a challenging statement, unambiguously presenting a clear description of the consequences associated with continuing on a particular course of action while providing an alternative course of action. The final step would be emergency intervention and immediate corrective action.

Ralph Naranjo has written about communication, relating "The contribution of an effective crew is greater than the sum of what the individuals offer, and good leadership elicits the most desirable outcome. Two-way communication is a primary aspect of leadership. In an urgent situation, the right decision needs to be made, and it must be passed along to all crew as succinctly as possible. This is not the time to hold court on the efficacy of the decision, because prompt implementation is often critical. This is why a good leader knows when to be a consensus builder and when a dictatorial approach is necessary. Really great skippers have a knack for making the right snap decisions, but they can also dialog with shipmates and genuinely take their input to heart". (Naranjo, 2015).

While the PACE model works well in an aircraft cockpit, I prefer a tool named SBAR, an acronym for *Situation, Background, Assessment, and Recommendation.* SBAR facilitates prompt and appropriate communication and was first developed by the military, specifically for nuclear submarines. SBAR was later put into use in health care and surgical safety which is where I learned of it.

> *Situation* determines what is going on and identifies current status and any concerns in a brief description. The main goal is to communicate what is   relevant – what is happening now.

> *Background* provides context of how we got here and backfills the story.

> *Assessment* surveys the situation and proffers solutions suggesting the most appropriate course of action.

> *Recommendation* offers precise explanation of what is recommended to be done: an explicit statement of what is required, how urgent, and what action steps are necessary.

I have brought SBAR aboard my yacht. SBAR provides precise, compact informational exchange and is natural tool to use for general informational transfers such as watch changes, as the following 2 A.M. turn-over demonstrates. The on-deck watch gives the following SBAR briefing:

> Situation: Good evening. All generally fine right now. Number 2 jib is up and we still have a single reef in the main. Wind was 10-15 knots at the start of my watch and over the past 30 minutes it has built to 12-18 knots, becoming gusty and   now forward of the beam.

Background: Tonight's forecast called for scattered thunderstorms and I have thought I have heard some thunder out there but I'm not sure.

Assessment: I see an increase in wind pressure and have a concern of impending thunder boomers. We need to get ahead of this and be ready for a squall.

Recommendation: I've considered placing a second reef in the main and waited for you. I want to help you do it before I turn in. And it's time to start a radar watch, checking for squalls on the quarter hour.

Simple and concise for informational exchange, SBAR is also used on Visions of Johanna as a specific tool for crew to captain communication. While I hope never to utilize it, our SOP allows a crew member to assert themselves by "declaring" an SBAR to the skipper. This works as a "red flag" for the captain, providing a low friction pathway for crew to short circuit informational flow while alerting the skipper to an issue of concern. It would be utilized in urgent situations. For instance, after notice of lobster warp entrapment to the refrigeration weary skipper discussed above, the crew, when sidelined a second time (or first time if situation dictated), could declare an SBAR to the skipper:

Crew: Skip, I need to declare an SBAR (the captain's attention is now harnessed).

Captain: Okay, talk to me.

Crew: Situation: Boat speed has dropped to less than 1.5 knots and I am sure we have caught a warp and are dragging a lobster pot. We have just entered Jericho Bay per your plan and are close by Horseshoe Ledge with a significant current running through the channel.

Background: We were motor sailing well and averaging 6.5 knots before you went below to suss out problem with the fridge. I do not see any line behind us but something is on the keel or the prop. This channel is narrow and has port and starboard ledges.

Assessment: With limited maneuverability we are drifting and are in imminent danger of grounding on Horseshoe or a nearby Ledge. We need corrective action immediately to prevent grounding.

Recommendation: We need you on deck immediately. We need to either get more sail up right now to try to sail out to deeper water and buy time or get an anchor down immediately and get someone in the dinghy or in the water fast to inspect our propeller.

- *Vessel safety is a shared responsibility comprised of crew teamwork, vessel SOP's and effective communication, actuated by skipper leadership,*

Leveling of organizational hierarchy

Leveling of organizational hierarchy facilitates team communication by avoiding errors due to inherent limitations embodied within hierarchal structure. Hierarchal leadership leads to errors, as occurred in 1999 when Korean Air Cargo Flight 8509 crashed shortly after take-off from London Stansted Airport. Korean Air had previously experienced a bad spell of accidents and had lost several aircraft within a decade. When analyzed, a problem with Korean Air's cockpit culture was discovered. It was too authoritarian. The British investigation that followed revealed a remarkable dynamic in the cockpit that was linked to the hierarchical structure of the Korean culture.

When the plane took off after dark, the pilot's artificial horizon wasn't working. The copilot's was functioning, as was an auxiliary artificial horizon dial located on the dashboard between them. When the pilot began to execute a planned banked turn, the horizon instrument in front of him didn't register that the plane had tilted on an appropriate angle. Unable to see that the plane already had banked, he continued to bank farther, *even though a warning buzzer sounded nine times in the cockpit.* "There was no audible acknowledgment from any crew member regarding these warnings," said the final investigative report of the British Air Accidents Investigation Branch (AAIB Special Bulletin No: S2/2000 , 2000). The plane's wing tore into the ground and all four crew members died.

The investigative report said that the captain, irritated by the flight's late departure from London, spoke in a "derogatory" and barking fashion to his crew and contributed to setting an initial tone which discouraged further input from other crew members, especially the first officer. When the plane went into its ill-fated bank less than a minute into the flight, the first officer said nothing, even though the instrument in front of him indicated that the plane was turned almost sideways.

Author Malcolm Gladwell examined the Korean culture's influence in airplane cockpits in his 2008 book *Outliers*, writing "Korean Air had more plane crashes than almost any other airline in the world for a period at the end of the 1990s", relating "What they were struggling with was a cultural legacy, that Korean culture is hierarchical. You are obliged to be deferential toward your elders and superiors in a way that would be unimaginable in the U.S" (Gladwell, 2008). In their formal recommendations, British investigators called on Korean Air to revise its company culture and training, "to promote a more free atmosphere between the captain and the first officer" (Ashley Halsey, 2013).

Human Factors and Accumulating Errors

Gladwell continues, noting errors are much more likely to be the result of an accumulation of minor difficulties and seemingly trivial malfunctions rather than one big horrendous event. He states "in a typical crash, for example, the weather is poor – not terrible, necessarily, but bad enough that the pilot feels a bit more stressed than usual. In an overwhelming number of crashes, the plane is behind schedule, so the pilots are hurrying. And 52% of crashes, the pilot

at the time of the accident has been awake for 12 hours and more, meaning that he is tired and not thinking sharply. And 44% of the time, the two pilots have never flown together before, so they are not comfortable with each other. Then the errors start - and it's not just one error. The typical accident involves seven consecutive human errors. One of the pilots does something wrong that by itself is not a problem. Then one of them makes another error on top of that, which combined with the first error still does not amount to catastrophe. But then they make a third error on top of that and then another and another and another and *another* and it is a combination of all those errors that leads to disaster. These seven errors, furthermore, are rarely problems of knowledge or flying skill. It's not that the pilot has to negotiate some critical technical maneuver and fails. *The kinds of errors that cause plane crashes are invariably errors of teamwork and communication* (emphasis by author). One pilot knows something important and somehow doesn't tell the other pilot. One pilot does something wrong, and the other pilot doesn't catch the error. A tricky situation needs to be resolved through a complex series of steps – and somehow the pilots failed to coordinate and miss one of them".

Gladwell goes on to describe another incident of fuel exhaustion causing Avianca flight 052 to crash in January, 1990. Pilot fatigue had eroded decision making skills, thoughtfulness was left behind and problem-solving did not occur. The final blow was a crucial misunderstanding regarding Air Traffic Control (ATC) directions to "standby for clearance" for landing as the Avianca pilots assumed they were being jumped to the head of the line but they were not. They were just being added to the end of the queue. But did the pilots raise the issue again, looking for clarification? No. They did not bring up the issue of fuel again for 38 minutes. The cockpit recorder transcript from Avianca flight 052 ends with ATC instructions to turn left with the captain stating to crew "tell them we are in emergency!" The First Officer responds to ATC "that's right to one-eight-zero on the heading and, ah, we'll try once again. We are running out of fuel". The phrase running out of fuel does not have specific meaning in ATC terminology and an emergency was never stated. Gladwell writes "it's as if he were to say in a restaurant, "Yes, I'll have some more coffee and, ah, I'm choking on chicken bone". How seriously would the waiter take him?

Speech Matters

The first Officer spoke nonchalantly and without urgency, in what linguists describe as mitigated speech: attempts to downplay or sugarcoat the meaning of what is being said. While mitigation when being polite, or ashamed or embarrassed, or deferential can be OK, in situations like those in the cockpit of Avianca 052, mitigation is a problem and clear, unambiguous speech is necessary. Mitigation, says Gladwell, explains one of the great anomalies of plane crashes as unexpectedly, crashes have been far more likely to happen when the captain is the one in the flying seat. At first glance, a higher level of crashes with the most experienced pilot in the flying seat seems to make no sense but if the captain observing, not flying, unmitigated speech does not happen. The captain commands and provides direct, clear instructions and orders. For that reason, combating mitigation has become one of the great crusades in commercial aviation in the last 20 years via Crew Resource Management training.

Returning to Korean Air Cargo Flight 8509, once Korean Airlines recognized that an authoritarian culture was stifling the voices of talented team members, the airline focused efforts on rebuilding their cockpit culture. A flatter command structure resulted, where the captain's role is all about being a responsible individual who marshals the skills of others. This new culture later led to a markedly improved safety record.

- *Leveling of hierarchy facilitates team communication and promotes safety.*

Errors and a Raging Sea

In our maritime world, these issues still happen today. On October 1, 2015, the American container ship El Faro sailed into the eye of hurricane Joaqin and went down with all aboard, becoming the deadliest maritime accident in a generation. Boston based author Rachel Slade wrote about the El Faro in her 2018 book, *Into the Raging Sea* (Slade, 2018). What was the El Faro doing anywhere near the erratic, unpredictable Joaquin, pinned between the Bahama's Crooked Island and the hurricane? This event was heartfelt in Maine, as many of the 133 souls lost that day were from the great state of Maine and the Maine Maritime Academy. Unfortunately, even in 2018, deficiencies in vessel SOP's, poor communications and a harmful onboard culture can result in maritime tragedy.

Slade describes the El Faro as a poorly run ship writing "on these types of container ships, officers and crew rarely talked to one another and the gulf between the two classes of mariners could be a stark as black and white". In preparation for departure, uncomfortable relationships allowed cargo lashing to be done poorly and meanwhile, hurricane Joaquin continued to develop. Once underway, the second mate knew "getting close to any storm was plain stupid" and didn't like the captain's glibness. After expressing her concerns to the third mate, he "rolled his eyes and kept quiet. What else could he do?"

The captain was concerned about advancement and his corporate relationship. Slade writes "in industries in which human error can lead to devastating consequences, it's important to foster good communication that respects the hierarchy while allowing room for debate". But she noted, not in the US Merchant Marine, as you did not succeed in the industry by questioning authority "where on a ship the captain reigns supreme". The captain was described as carrying a dangerous swagger and fragile ego. The second mate knew she wouldn't be able to convince the captain to change course and encouraged the chief mate to give a shot, concerned that Joaquin was tracking farther south and west, right on her ships track. Next, the third mate hinted his concerns regarding weather issues to the captain by questioning when a new weather report might arrive.

Meanwhile, the helmsman, used to keeping his mouth shut, was getting nervous enough to say something to the chief mate as the rapidly expanding and intensifying storm was noted. The helmsman said "It looks like we're getting close to that eye" and chief mate responded "I'll make a recommendation". Slade writes "the helmsman chuckled. Making a recommendation

sounded so namby-panby. What they really had to do was turn the ship around. Get the hell out of there". Weather forecasts were compared and seen to be aligning with one another and the chief mate saw his chance, noting that Joaquin was moving farther south. The captain didn't respond and Slade writes that chief mate "clearing his throat, finally said "um, would, would you consider going the other side of San Salvador?" Preoccupied with corporate concerns, the captain agreed. But Slade notes the captain "did have another option that wasn't discussed. He could have hove to right there – turned 180° and followed El Yunque's (another container ship) path toward Key West. There was no guarantee that Joaquin wouldn't chase them all the way back to Jacksonville, but if the captain turned around he had the option of sailing west if he had to, through the straits of Florida. Beyond that, he had all of the Gulf of Mexico and his disposal. El Faro was fast, much faster than the storm." But the captain wanted to prove that he was a corporate kind of man that didn't back down.

The slow cavalcade of errors continued. Deck scuttles were not properly dogged by a careless crew. Poorly maintained steam engines were managed by inexperienced engineers and flooding and loose cargo gave El Faro a pronounced list which endangered function of the steam turbines. And when the third mate called the captain's quarters with a new weather forecast demonstrating Juaquin's building strength and a track that brought it 22 miles from El Faro's course, the captain responded that they would be in the safe quadrant. Slade wrote "Records show that Captain did not download the eleven o'clock forecast until five o'clock the next morning. His third mate had told him the truth. But he didn't want to hear it".

Fire!

Here is another example where miscommunication results in improper actions and dangerous consequences. On June 2nd 1982, Air Canada Flight 797, from Dallas to Toronto, ended in a fatal tragedy due failure in communication and coordination between the cabin and cockpit crew. The captain underestimated risk posed by smoke and hidden fire in the cabin and vital time was lost until an emergency landing was initiated. Although pilots eventually brought the aircraft safely to the ground, 23 people were killed by the toxic smoke or the fire that engulfed the airplane shortly after touch-down (National Transportation Safety Board, 1983).

At about 1900, a passenger seated in the last row informed a flight attendant of a strange odor in the rear of the airplane. The lavatory was full of light gray smoke and was sprayed with a CO_2 fire extinguisher as passengers were moved and air vents opened. The flight crew was informed of a "fire in the washroom" and the captain ordered first officer to go back and investigate. Thick smoke was filling the last three to four rows of seats, and the flight attendant informed the first officer that the source of the fire was not seen. Because smoking was not banned at the time, a regular cause of aircraft lavatory fires was disposal of cigarettes in the lavatory trash bin. The flight attendant told the first officer, however, that he did not believe the fire was in the trash bin. Four minutes after the initial alert, the first officer returned to the cockpit, told Captain Cameron about the smoke, and suggested descending. *However, the first officer did not report flight attendant's comment that the fire was not a mere trash bin fire*. A few seconds later, the captain was told that passengers were moved forward and that the

smoke was "easing up." Hearing that the smoke was "clearing" and still believing the fire was in the lavatory trash bin, the captain did not descend because he expected the fire would be put out. Seven minutes after the alert, the first officer found the lavatory door handle was hot to the touch and told the Captain, "I don't like what's happening, I think we better go down, okay?" Urgency was detected which the captain took to mean an immediate descent was needed. Shortly thereafter however, the "master caution" light in the cockpit illuminated, indicating a loss of main buss electrical power. The captain then called the air traffic control (ATC) in and notified them that Flight 797 had an "electrical problem." Flight 797's instrumentation went down next. Their transponder signal then disappeared from ATC radar displays and the flight was monitored by switching to radar tracking.

The Cockpit Voice Recorder reports: https://www.youtube.com/watch?v=wwdffTfRkb0

The National Transportation Safety Board determined that the probable causes of the accident were a fire of undetermined origin, underestimation of fire severity and misleading fire progress information provided to the captain. The time taken to evaluate the nature of the fire and to decide to initiate an emergency descent contributed to the severity of the accident, and poor communication was a root cause of the incident. This assessment of the Air Canada 797 accident illustrates that in safety-critical contexts, a failure in team collaboration can have severe consequences. In an emergency, crews, in the air or on the water, despite their differences in tasks, roles, and responsibilities, need to work together interdependently to make rapid decisions and fulfill a multitude of problem-solving tasks in a dynamic and highly stressful environment.

Teamwork, Communication and a Howling Wind

It was only *eight minutes* from the notice of smoke and fire to the Mayday call and another twelve minutes to landing. This situation could happen on-board your ship. Imagine that the smoke and fire occurred with you on a passage, halfway through an ocean crossing. Precise communication and urgent problem solving is the key. During any safety-critical situation aboard a yacht: smoke and fire, water ingress, dismasting, collision, hurricane or medical emergencies, crews need to swiftly change from normal to emergency tasking in order to respond to unexpected events. Crews must enact vessel SOP's, share input, corrective measures and outcome interdependencies all the while transferring critical information to coordinate individual activities. Overall success depends upon the need to accomplish separate and sometimes competing tasks, placing unique challenges on the leadership which is paramount for operational success. Commercial vessels require a "Station Bill" listing crew assignments and function in the most common emergencies - fire, flooding, MOB, abandon ship. The Station Bill details who goes where (station) with specific equipment and their specific duties. A simple plastic laminated page with crew assignments written in wax pencil serves the purpose, and this concept can be adapted to pleasure yachts as well. When prominently placed, the Station Bill can be a visual reminder of the safety culture itself, engendering discussion and review on its own.

Ralph Naranjo in his book The Art of Seamanship (Naranjo, 2015) writes: Communication when the wind is howling and everyone is engaged in efforts to keep things under control is most effective based on these principles:

Eliminate distracting (nonessential) side conversations.

If assigned a task, repeat it for confirmation.

If you observe something astray or a pending problem, tell the watch captain or skipper and make sure they acknowledge they understand what you're saying.

Whether reefing or going through a heavy weather sail change, fighting a fire or preparing to abandon ship in the event of water ingress, a quick description in advance of "who does what" is often worth the time.

Deposits in the Bank of Experience, Education and Training

Most of us have heard of Captain Chesley "Sully" Sullenberger. Sully's accomplishment, ditching an airliner into the Hudson River in New York City, is a demonstration of CRM in action: outstanding leadership actuating safety practices and protocols.

US Air flight 1549 in the Hudson River

Captain Chesley Sullenburger is famous for "The Miracle on the Hudson" when in 2009, he safely ditched US Air flight 1549 into the Hudson River, after a bird strike and loss of propulsion. The plane struck a flock of Canada geese about 4.5 miles northwest of LaGuardia Airport at an altitude just over 2,800 feet shortly after takeoff. Realizing that both engines had shut down, Sullenberger assumed the conn while co-pilot worked the checklist for engine restart.

The aircraft slowed and then began a glide descent, accelerating to 210 knots as it descended through 1,650 feet. US Airways did not have a checklist for the loss of both engines in an Airbus A320 at low altitude and the First Officer went through the checklist for restarting the engines, but of course had no success. Sully evaluated their options: returning to La Guardia, diverting to Teterboro airport, or the third choice, a water landing in the Hudson River. Based on his experience, and drawing on his background as a glider pilot, he determined that it was impossible to make it to either airport. Sullenberger radioed a mayday call to New York Terminal Radar Approach Control "…We're turning back towards LaGuardia" but then responded "Unable", also realizing they could not make nearby Teterborough, NJ airport indicating "We can't do it... We're gonna be in the Hudson". ATC responded "I'm sorry, say again Cactus?" At that point, air traffic control lost radar contact with the plane. On the flight recording, a pilot with a different airline can be heard confirming what the controller didn't seem to want to hear: "I think he said he was going in the Hudson."

As the aircraft passed less than 900 feet above the George Washington Bridge, Sullenberger commanded over the cabin address system, "Brace for impact", and the flight attendants relayed the command to passengers. About ninety seconds later, at 3:31 pm, the plane made an unpowered ditching, descending southwards at about 125 knots. Flight attendants compared the ditching to a "hard landing" with "one impact, no bounce, then a gradual deceleration." The ebb tide then began to take the plane southward. Sullenberger opened the cockpit door and gave the order to evacuate. The crew began evacuating the passengers through the four overwing window exits and into an inflatable slide/raft deployed from the front right passenger door. A panicked passenger opened a rear door, which a flight attendant was unable to reseal. Water was also entering through a hole in the fuselage and through cargo doors that had come open, so as the water rose the attendant urged passengers to move forward by climbing over seats. Sullenberger walked the cabin twice to confirm it was empty. Nearby ships and the Coast Guard assisted and no souls were lost that day.

AV clip: https://www.youtube.com/watch?v=YBUbxkBDtm4

The NTSB final report identified the probable cause as "the ingestion of large birds into each engine, which resulted in an almost total loss of thrust in both engines." The report credited the outcome to four factors: good decision-making and teamwork by the cockpit crew (including decisions to immediately turn on the auxiliary power unit and to ditch in the Hudson); the fact that the A320 is certified for extended overwater operation (and hence carried life vests and additional raft/slides) even though not required for that route; the performance of the flight crew during the evacuation; and the proximity of working vessels to the ditching site, with 34 additional recommendations (National Transportation Safety Board, 2009).

As air traffic control feverishly worked to clear runways at nearby airports for Flight 1549, Sullenberger calmly told them, "We're going to be in the Hudson." Sully later said "I never had an engine failure in 42 years in any flight I'd ever flown, but I was ready." Speaking with news anchor Katie Couric after the plane crash, Sullenberger said: "One way of looking at this might

be that for 42 years, I've been making small, regular deposits in this bank of experience, education and training. And on January 15, the balance was sufficient so that I could make a very large withdrawal". But Sully has been quick to point out that the "positive outcome" that resulted in all lives saved wasn't solely his doing. He credits the first officer working beside him, air traffic controllers, flight attendants, cooperative passengers and the first responders who came in all sorts of vessels to pluck people off the plane's wings and out of the freezing water.

Culture of Safety and Core Principles of CRM

On this occasion, Captain Sullenberger, a safety expert and CRM instructor, demonstrates the core principles of CRM: Situational awareness, problem solving and decision making, effective communication and leveling of the organizational hierarchy. Sully's coworkers not only adhered to safety protocols and routines but were trained to be active participants in the safety culture. The transformation of crew from adherence to safety protocols to one that participates in a culture of safety is the mark of both a successful safety program and effective leadership.

Conclusion

Vessel safety is a combination of safety protocols and gear, skipper leadership and crew participation. Practice of protocols and drills engages a crew and brings crew into the safety process as participants. Their involvement reinforces the on-board safety culture as the crew communicates and problem solves as a team.

The true culture of safety is only realized when yacht protocols and skipper leadership result in a crew ethos that not only adheres to safety practices, but develops a crew that actively participates in the safety culture of the ship. The transformation of crew from one that follows safety protocols to one that participates and builds a culture of safety is the mark of both a successful safety program and effective leadership. Incorporation of these principles into small vessel management will help make us better and safer out at sea.

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