

Operational Safety: The Practitioner Perspective

Ken Cerney

Introduction

In 2016, there were two helicopter accidents that were outwardly very different, and yet the real cause of each accident was the same.

The first was an Army Blackhawk on a training mission with a second Blackhawk as 'chalk 2': two experienced crews with the newest and most capable helicopters to date. With Marines on each helicopter they headed out into the Gulf of Mexico. Their mission was to drop the troops onto the back of ships in a training exercise that was already preceded by several days of training.

The second was an AS-350 A-Star Helicopter Air Ambulance (HAA), with a pilot, two medical crew members and a patient on board. After accepting a flight to pick up the victim of an automobile accident, they crashed en-route to the hospital. The pilot was also experienced and, like the Blackhawk pilot, had over 5,000 hours of total flight time.

These were both night flights, and both were using night vision goggles. Both were limited to remaining on Visual Flight Rules (VFR) for the duration of the flight. The Blackhawk on this flight was a highly capable Instrument Flight Rules (IFR) aircraft with the latest in glass cockpit technology, autopilot and instrument certified. The A-star, although not certified for Instrument Meteorological Conditions (IMC), included the instrumentation and an autopilot capable of maintaining aircraft attitude, altitude and heading and bringing the crew back home in an emergency should they find themselves in the clouds.

Both pilots were experienced instrument-rated pilots and should have been able to recover their flights when they each found themselves suddenly unable to see in the clouds. When all the investigation and scrutinizing was complete, the cause of both accidents was deemed to be the same: loss of control due to disorientation from flying into IMC conditions and losing all visual reference to the horizon.

I disagree with that statement and hold that the real cause of each of these accidents, and probably many more I do not know about, was that both of them took off even though it was below the minimum weather requirements for a VFR flight, and they knew it before they left the ground.

So how does that happen? Why do professional pilots continue to ignore rules, regulations, orders, or Standard Operating Procedures (SOPs) and fly when they shouldn't? Why did they not use their training and experience to recognize their situation and stop before going in IMC? Why, after all else failed, did they not transition as trained into instrument flight? This is what I set out to try to answer when I started this study two years ago.

We, as pilots and crew members, have accepted the risks we take, or we would not be in this business. We each have different ways of controlling and mitigating risks that work for us as individuals. When we use good communication techniques, we can better mitigate any risks involved by utilizing those skills associated with varying personality traits. And that is a powerful tool for safety that technology cannot replace.

As a certified practitioner in several personality assessments for 13 years, I am also a part of this study with 33 years as a retired Army pilot and current Helicopter Air Ambulance (HAA) pilot. My personal data is buried in here with the rest of the individual data in the sample. Like most pilots, I have made good and bad decisions. Through it all I believe in the power of a crew that is not afraid to say what needs to be said in the cockpit and on the ground. We have had a good start with this study, but we need more honest input and participation to provide an even more accurate picture in the future. While the statistics below are noteworthy, statistics seldom tell the whole story. I include personal anecdotes, thoughts, and insights trying to decipher what we are seeing in this data. I would suspect and hope that upon gathering more data, we would see statistical changes in some areas and more clarity in others. When that happens, I will happily amend my thoughts. Until then I put them out here to encourage discussion.

The Risk Type Compass

Please read Part One of the white paper, 'Operational Safety: The Human Factor', for more details on the Risk Type Compass. I will be referring to those details throughout this paper.

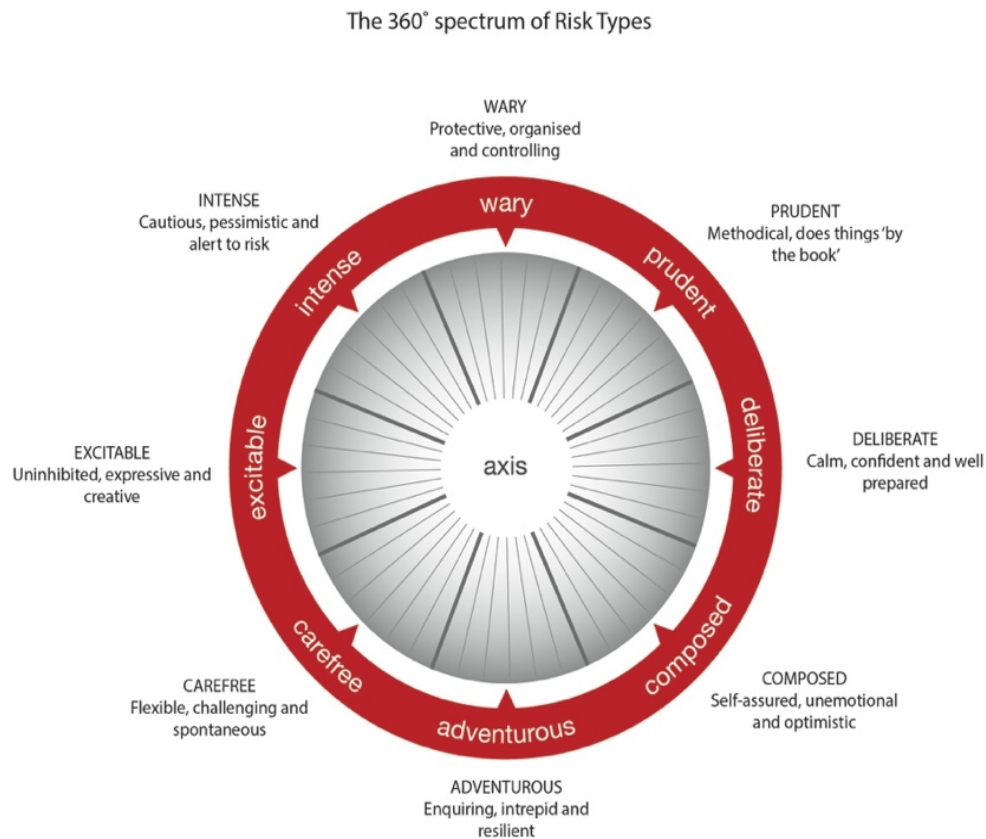


Figure 1 The Risk Type Compass

Which Subthemes Drive Risk Type Variations?

Pilots vs Crew

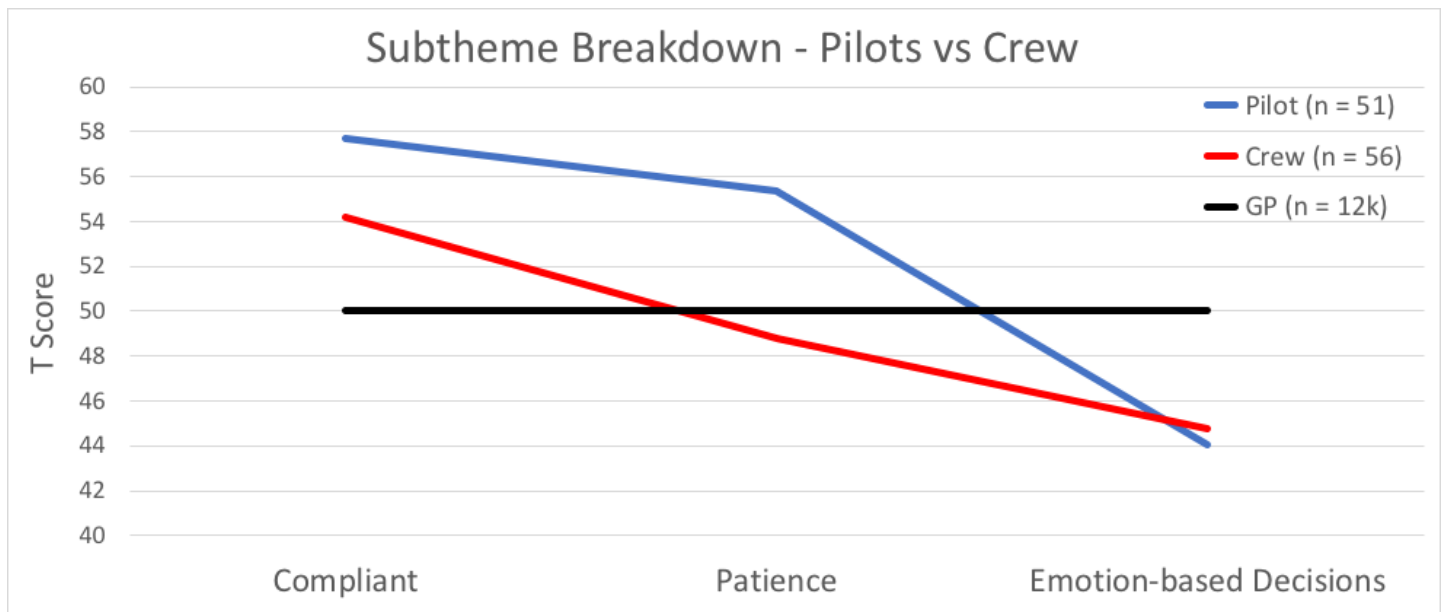


Figure 2 Pilots vs Crew Subthemes

Compliant:

Higher scores distinguish those who respect rules, regulations and authority from those who are happy to bend the rules and may not feel the need to comply.

Pilots and Medical crew members have a lot of things in common. But they are also quite different in their thinking about air ambulance flights. Aviation and medicine are two industries that are highly regulated; both involve real-time life or death decisions. Those involved in aviation and medicine make precise decisions using a plethora of guidelines, SOPs, general operating manuals, flight standards, policies, and protocols to remain in compliance with regulations. Wrong decisions in either of these occupations can literally mean life or death for those involved.

It is not surprising then that these two occupations attract those who would score higher in the Compliant subtheme. And even more so when they are combined as in the helicopter air ambulance industry.

Patience:

Higher scores distinguish individuals who accept that it may take time to achieve an objective, from those who may be impatient with delays and obstructions and want quick results.

Once in a while we hear about significant conflict between the pilot and one or more crew members at an air medical base. One of the conflicts may be around the subtheme of Patience. I have noticed in my ten years of flying HAA, and teaching Air Medical Resource Management classes to numerous bases, that for the most part the medical personnel involved in Air Ambulance flights are already a sub-group of medical personnel in general. They tend to be more reactive because they, like 911-medics and fire fighters, are treating immediate life-threatening injuries and illnesses. Their decisions are quick and may even be more extreme than their counterparts in a hospital ward (this is from a non-medically trained individual who watches and listens to them on every flight with extreme awe).

This may be the reason for the lower score on the Patience subtheme. Likewise, pilots tend to be trained to be patient and take the time needed to make a good decision. With the advent of more twin-engine helicopters, the need to be patient in an emergency situation is more heavily emphasized, as there is time to react even if you lose an engine. You are encouraged to take that time to make a better decision.

Emotion-Based Decision Making:

Distinguishes those that base decisions on facts and logic, rather than feelings (lower score), from those that seem easily influenced by their emotions (higher score).

At the other end of the spectrum is the Emotion-Based Decision-Making subtheme. Again, in both the medical fields and aviation fields, emotion-based decision making is something that is not considered desirable and is regulated or trained out of the individuals for many good reasons. In the HAA community, for example, recent regulations in the US require communication centers that are relaying a flight request from a customer to NOT provide any information about the patient's condition until after the decision to take the flight has been made. The thinking here is that undue emotion about the patient provides excessive pressure on the pilot and crew to take the flight despite weather or other excessive risks involved.

Subtheme Combinations

Combinations of two or more subthemes can create unique thought processes and reactions within anyone of us. These differences in members of a crew are where conflicts arise, and the more extreme an individual's Risk Type (represented by their proximity to the Compass's circumference), the better the probability they may conflict with someone who is an extreme polar opposite. Of course, if those individuals understand their differences it can also lead to an awesome decision-making team, even if there are some momentary blow-ups.

Figure 3 is an actual group report from a single HAA base showing how several different combinations of a three-person crew could be flying together on any given day.

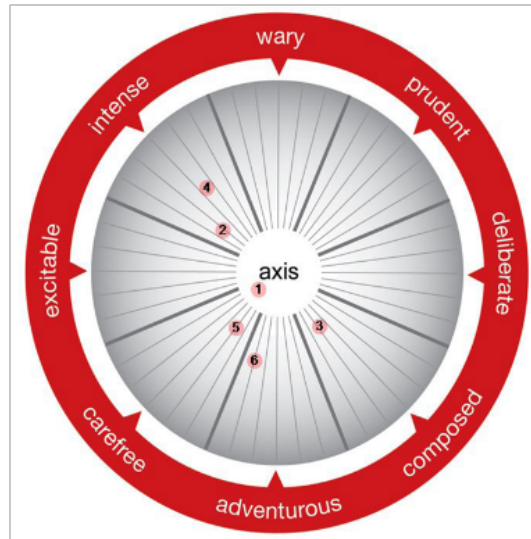


Figure 3 RTC showing Risk Types of a pilot and 5 crew members at one base

As we look at the subtheme variations I was reminded of Figure 4 taken from the US FAA Risk Management handbook. It shows three pilot personalities and how different pilots can handle differing amounts of risk due to their differing personalities. Assessments like the RTC try to get to who you were born to be. In this graphic it is called our predispositions. But we are much more than that, as the graphic shows. Our Background, Education, Training and Attitude, combined with our predispositions, create how we approach and look at risks. This is what is called our personality, or the whole person. In other words, who we are has a lot to do with how much risk we can tolerate and are willing to manage. Of all these aspects it is the predispositions that may give us our biggest advantage or disadvantage in controlling stress effects that if allowed to build may severely hinder our ability to deal with higher risk levels. This has been the subject lately of my talks at both the Helicopter Association International Heli-Expo, and the Air Medical Transport Conference over the past couple of years.

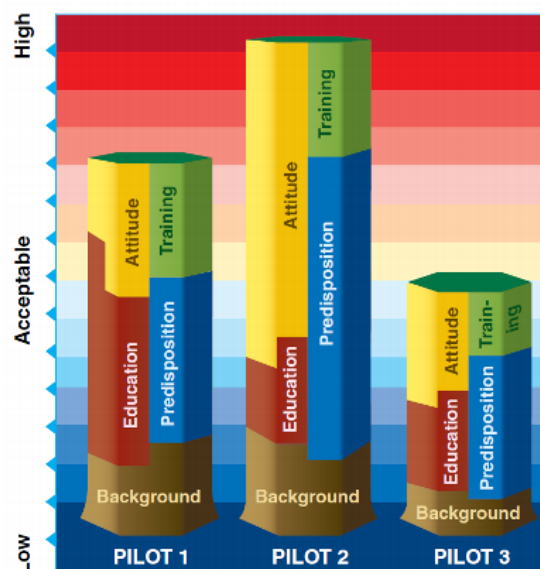


Figure 4 Three pilot personalities from FAA Risk Management Handbook (Federal Aviation Authority, 2009)

Military-Trained vs Civilian-Trained Pilots

When we asked this question on the survey, we were assuming a difference between the two. Unlike my initial training in a piston powered TH-55, for many years the military has conducted their initial flight training in turbine engine helicopters while civilians are, virtually 100% of the time, getting their initial training in smaller piston engine aircraft. Not until later do the civilian trained pilots move on to turbine engine aircraft. This difference is even more significant with the US Army now conducting initial training in twin engine turbine helicopters. I am not even discussing the combat aspect involved in training the military. So, it was not surprising to see a shift on the Compass based on where pilots got their initial training. Below are the three largest subtheme differences between the two groups of pilots.

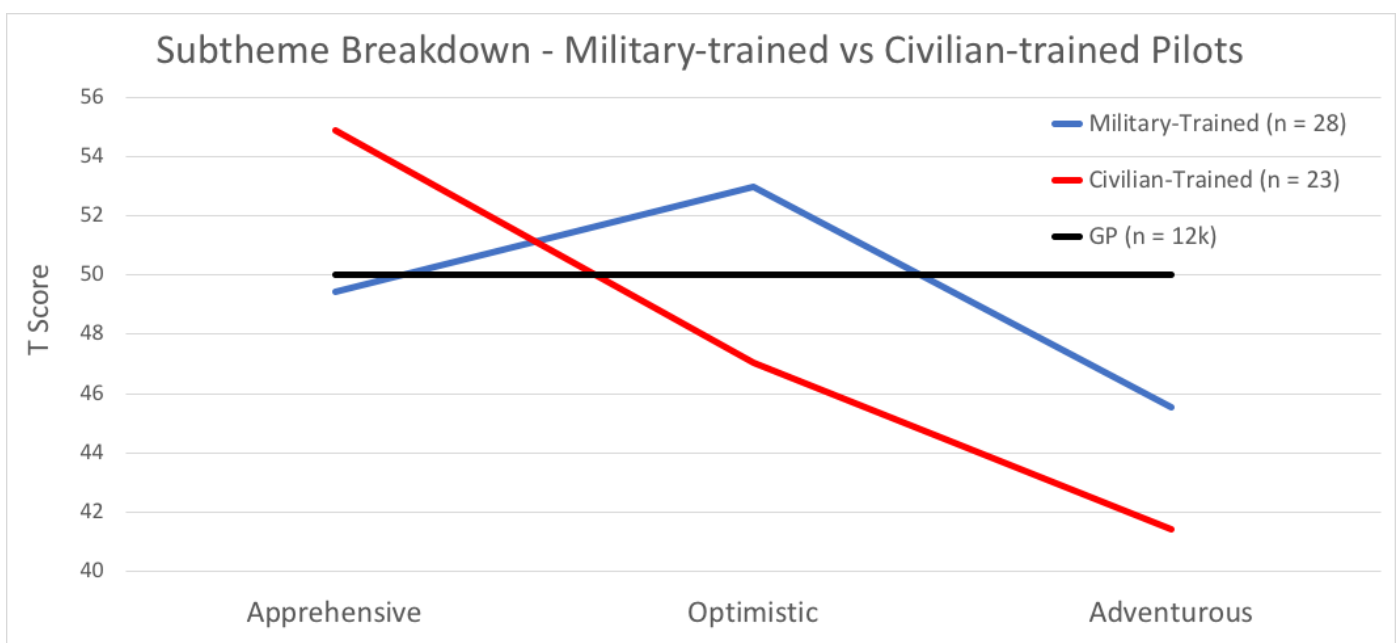


Figure 5 Subtheme breakdown of Military-trained Pilots (n=28), Civilian-trained Pilots (n=23) and General Population (n=12k)

Apprehensive:

Distinguishes those who will rarely worry about things unnecessarily (lower score) from those who are apprehensive and need reassurance (higher score).

When I transitioned from the Army to civilian life, one of the things I noticed in general was an increased concern and worry about legal issues that I seldom thought of when I was in the Army. This apprehension or worry shows up here in the split between the military-trained pilots and civilian-trained pilots.

One example I came across involved another pilot I worked with for a short time who was sure someone was going to fire him. He took screenshots of weather reports, wrote memos to himself about events that happened, and basically was always worried about losing his job. I never quite got what was driving all that concern. This is an extreme example, but I

think the civilian-trained pilots I know now may be, as a whole, more concerned about the regulations and following policies than those of us trained in the military. Military pilots on the other hand may take the approach to “do first and ask forgiveness later” a little too far. They may push ahead without as much concern about ramifications as their counterparts. This is not to say there is a huge difference between these types of pilots, but at times it is noticeable.

Optimistic:

Higher scores distinguish those with a positive and upbeat approach from those who are more pessimistic, who expect the worst and are more easily discouraged.

Military-trained pilots are more optimistic than the general public, and the civilian-trained pilots are less optimistic. Harry Reasoner in 1971, while covering the Vietnam war as a reporter, wrote “...helicopter pilots are brooders, introspective anticipators of trouble. They know if something bad has not happened, it is about to...” It seems as if the civilian-trained pilots may still feel this way more so than their military counterparts, and military pilots may no longer feel this way as much as they did during the Vietnam war. Technology has come a long way toward making helicopters – both military and civilian – much safer.

So, without further knowledge, one might assume that civilian flight training is still teaching this philosophy of always anticipating trouble, more so than military training does. The difference, however, may be in the aircraft that are used for initial flight training as well as primary operating aircraft.

In the US, where 82% of responses came from, piston engine helicopters (TH-55) were no longer used in any manner by the military by the early 1990s. In contrast, single-engine piston aircraft are still the primary training aircraft in civilian training. By the late 1990s, when the Army Cobra helicopter was retired, with a few exceptions (notably the OH-58D, OH-6 and a few UH-1H and OH-58A/C aircraft in training and special units) the US military switched to using single engine helicopters in initial training only, and they were all turbine-powered. The majority of operational aircraft have been twin-engine helicopters since the beginning of this century. This would, by the simple nature of how the emergency procedures are taught and trained, provide for this more optimistic point of view.

In the general operating manual for at least one HAA operator, when talking about flying over hostile terrain where landing areas may not be available in an emergency, the requirement is that “As much as possible, single engine helicopters are to be flown over terrain which will allow for a forced landing in the event of an engine failure or other emergency.” This same concern is not there for twin-engine helicopters. With a majority of helicopters in the civilian market being single engine, turbine and piston, it is no wonder that civilian trained helicopter pilots may feel more pessimistic than today’s military-trained helicopter pilots.

Adventurous:

Distinguishes those who are conservative and prefer to stick to what they know (lower score) from those who are excited by variety, novelty and new ventures (higher score).

It may not be too surprising that those with military flight training also come out as more Adventurous than those without the military training. Indeed, this very subtheme may play a part in the choosing of the military lifestyle in the era of the all-volunteer military. The variety, lifestyle, missions, and constant change are all a central part of military life. While civilian pilots also have different missions (i.e. jobs), may be constantly on the move, and have unique lifestyles, etc. I think the fact that the civilian pilot has more control over what they do and how they do it affects their responses to questions for this subtheme. They may show their conservative side in staying with what they know or prefer to do and not change quite as often as those who trained and fly (or flew) in the military.

Single- vs Dual- Pilot & VFR vs IFR Preferences

Social media is full of arguments about what criteria creates a safer flight. Arguments are often about the difference between one engine or multiple, one pilot or two, and VFR or IFR. While this study was not intended to answer those questions some data around these questions was gathered as it pertains to decision making and communications.

The first question, whether we are safer with one engine or two, was not even asked, and the hypotheses made above when referencing training is not an attempt to compare numbers of engines. It was about the thinking and decision-making by pilots, and at this point is nothing more than speculation about how it affects decision-making. Below we will discuss the other two arguments, but we do not have enough data gathered at this time to do anything more than provide current hypotheses and hope more pilots and crew members will participate so that we can improve our findings.

Single vs Dual Pilot

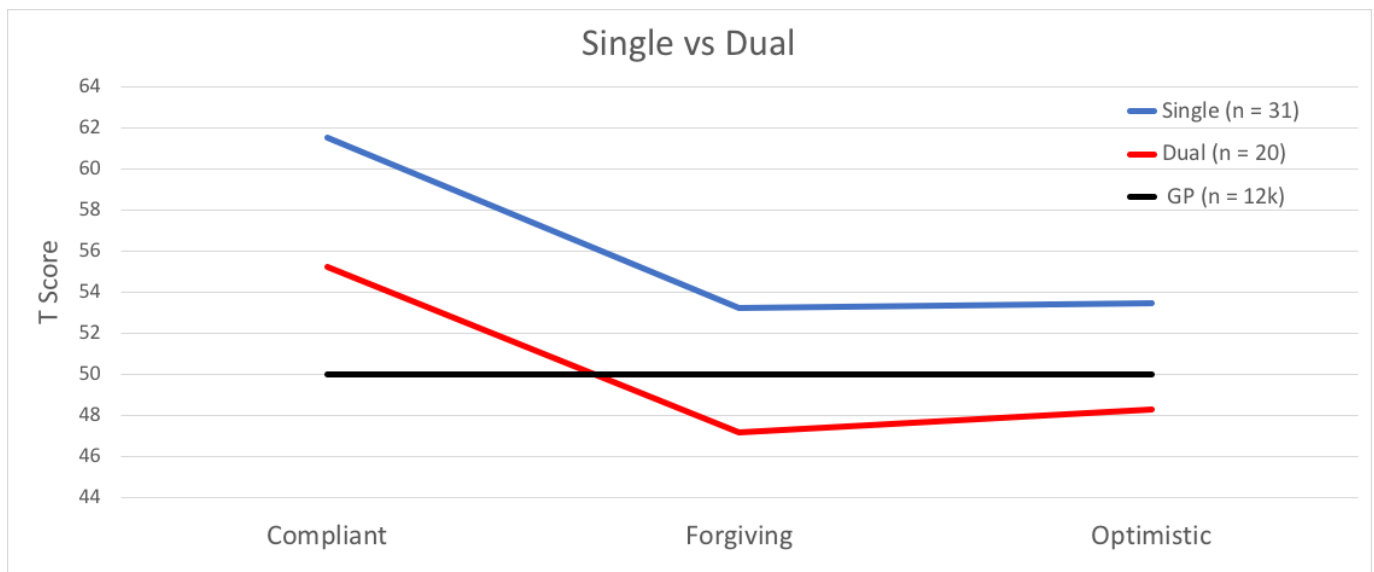


Figure 6 Single Pilot vs Dual Pilot Preference

The assumption going into the study was that individuals who prefer dual pilot flying, with its additional cross-checking and monitoring of each other, may reflect a preference for more rigorous controls, reducing risk by collaboration in rule-following and use of checklists and other procedures. This would lean more toward the upper-right to right-middle quadrant of the Risk Type Compass. In this scenario, those preferring the single pilot flight mode would be expected to lean more toward the lower-left or lower-middle. These pilots would prefer more freedom and ability to control risks their own way rather than relying on others to control their actions and reduce possible mistakes through specific controls.

Compliant:

Higher scores distinguish those who respect rules, regulations and authority from those who are happy to bend the rules and may not feel the need to comply.

The first subtheme (Compliant) seems to contradict this. While those who prefer single-pilot flying and those who prefer dual were both above the general population average, those who stated they preferred to fly single pilot were higher in the compliant subtheme than those who preferred dual pilot crews. This would seem to mean that, on average, single pilot flyers lean more to the upper-right quadrant, or at least to the right, than those who prefer dual-pilot flying.

One scenario may be that we have collected more data from the more inexperienced pilots who are still flying the smaller helicopters single-pilot with little or no experience in larger ships that may require or at least be better controlled with two pilots on board. If this is the case, they may not have much experience flying with another pilot and therefore chose single. This is an area where additional completions of the survey may provide better insight.

Optimistic:

Higher scores distinguish those with a positive and upbeat approach from those who are more pessimistic, who expect the worst and are more easily discouraged.

Another seeming contradiction to a previous discussion is the subtheme Optimistic. We see here that pilots preferring single-pilot flying are more optimistic than those who prefer dual-pilot flying. Flying is not always easy when there are changes to routine, unanticipated weather, mechanical issues, or time/fuel decision issues. When you are the only pilot and need to make all the decisions, optimism about your own abilities may be an important ingredient in dealing with trouble. There is also a connection between single-pilot and single-engine flying. Being optimistic about the maintenance and reliability of their helicopter is a very important aspect of flying, and a pilot's willingness to take risks on their own. Dual-pilot preferences may again be related to the fact that they are mostly flying dual-engine aircraft. However, in this case their Optimism score is below the average of the general public.

The arguments we see on social media may illuminate this issue. After every HAA accident, and even before any information about the cause of the accident is provided, the discussion will invariably come around to the safest combination for flying HAA. One of the arguments is the fact that Air Ambulances in nearly all countries outside the US fly twin-engine helicopters and use dual-pilot crews only. These discussions usually point out everything that could possibly go wrong with flying single-pilot and or single-engine. This is a decidedly pessimistic point of view and almost always comes from those flying with two pilots. Whether they are right or wrong is not a part of this study.

Forgiving:

Higher scores distinguish those who are likely to quickly get over upsets and who don't harbour grudges from those who may be resentful and find it hard to put the past behind them.

This subtheme combines with others that drive the overall score towards the Composed Risk Type segment at the lower right of the compass. For the single pilot a higher Forgiving subscale score may be a reflection of flying and making decisions on their own. With no one else to blame they may not have anyone to hold a grudge against. The single pilot may also need to forgive themselves when they make mistakes in order to keep flying. For a Prudent Risk Type, lower scores on the Forgiving subscale suggest a degree of emotionality pulling the individual towards the Wary Risk Type boundary. Those pilots preferring dual-pilot flight may also prefer a more structured/regulated flying style. Mistakes made by other pilots may be harder to forgive when the "right way" is spelled out for you.

IFR vs VFR

Small sample size and twice as many pilots preferring VFR to IFR make the comparison very difficult without additional participants, but, as above, some assumptions can be drawn from the subthemes.

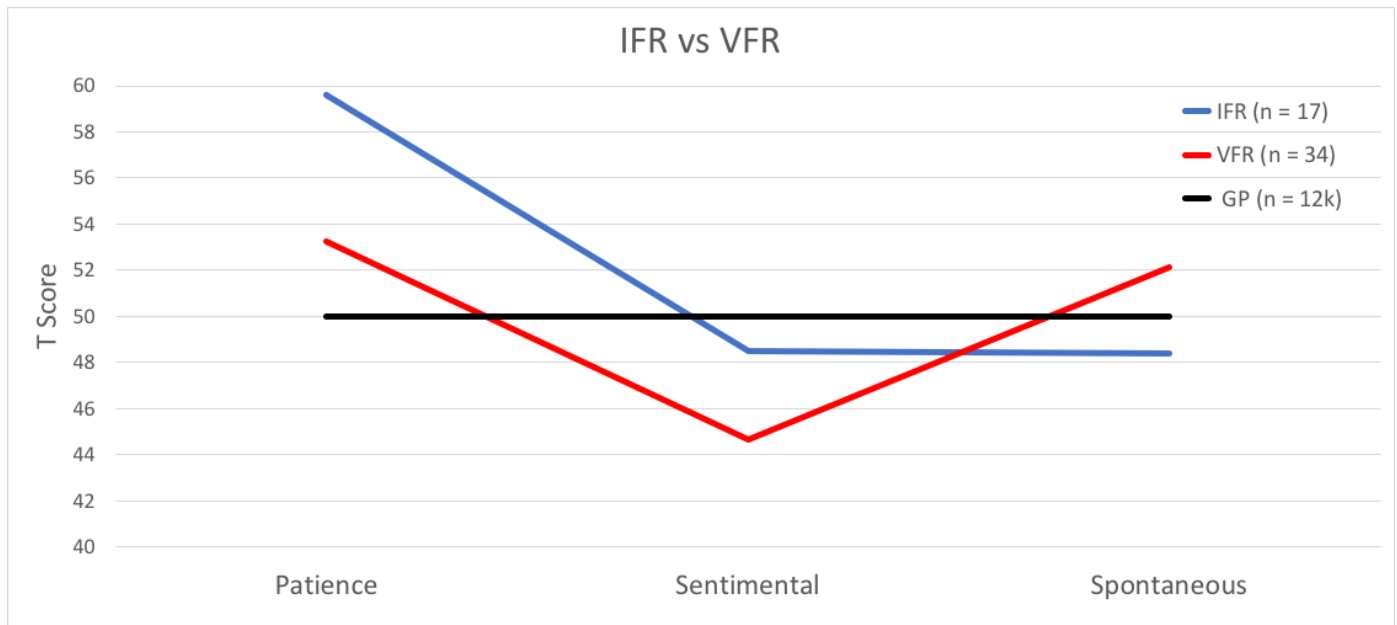


Figure 7 IFR vs VFR Preference

Patience:

Higher scores distinguish individuals who accept that it may take time to achieve an objective, from those who may be impatient with delays and obstructions and want quick results.

IFR operations by their very nature of planning and control demand a higher amount of patience than VFR flying. VFR pilots on the other hand can jump in their helicopter and take off with or without a plan.

Sentimental:

Distinguishes those who seem practical and down to earth (lower score) from those who appear sensitive and sentimental (higher score).

As would be expected, both types of pilots score below the average of the general population. This fits with pilots generally being located to the right on the Compass while the Sentimental subtheme is one of five associated with the more emotional Compass segments towards the upper-left.

Spontaneous:

Distinguishes those who plan things and think things through carefully (lower score) from those who seem spontaneous, quick witted and rarely lost for words (higher score).

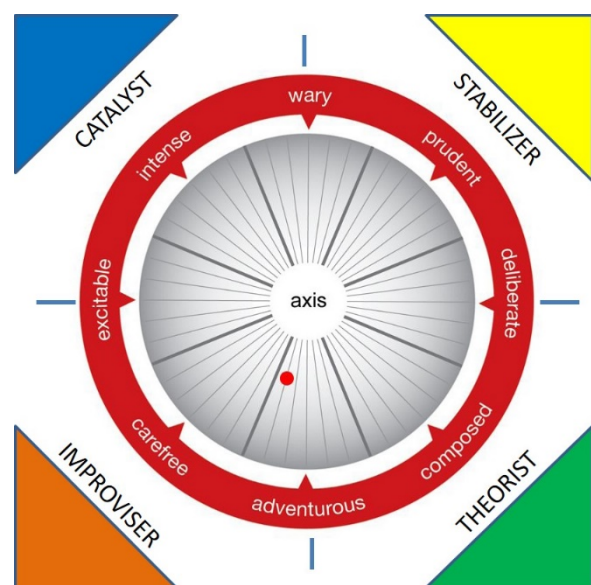
Just as those with a preference for IFR flight tend to be more patient, it makes sense that they are also less spontaneous. These two subthemes tend to support each other in pulling towards the right side of the compass for most pilots. Those with a preference for VFR show a higher than average score for spontaneity. Again, not particularly surprising given their lower score for patience compared to the IFR pilot.

Statistics are Good, But Application is Better

This research project was never about the research; for me, it has always been about gathering data that would eventually lead to a better understanding of the human factor of aeronautical decision making. I was looking for research that could turn the data collected into usable knowledge to bring back to training and ultimately make HAA operations a safer place to work. Decision making in this line of work, and, by extension, all helicopter operations, is virtually about instant life and death decisions. Understanding how those decisions are made and why no two individuals will go about the same exact process is critical to preventing accidents.

While the RTC is an incredibly accurate and valuable tool in understanding how individuals and small groups tolerate and take risks, the one thing it does not do well is provide an understanding of what motivates a pilot or medical crew member to take the risks they take. Taking extremely high risks that are known to have severe consequences, or ignoring them altogether, have been a major cause of the lion's share of accidents in the history of HAA operations.

To understand the motivations, I have been using a separate personality model called Essential Motivators®. Also known as temperaments, Essential Motivators, developed by Linda Berens, provide a way to look at the possible motivation behind our willingness to take risks. Using definitions of the Pure Risk Types (Prudent, Carefree, Intense and Composed), as listed in the RTC Technical Manual, and the Essential Motivators, as described on Linda Berens website, the graphic here shows how I was able to align the essential motivators almost perfectly with the RTC.



In Beren's Essential Motivators she also describes patterns which bridge the differences between the 4 corners and together they seem to perfectly describe motivations that go along with the 8 Risk Types. For instance, our 3 primary pilot types' motivations could be either about people cooperating and working together as a crew to accomplish the task, as in the Prudent Risk Type (upper-right), or the more autonomous and pragmatic "get the job done regardless", as in the Composed Risk Type (lower-right). A third motivational bridge that is shared by all three Risk Types to the right side of the Compass is the need for structure in the things they do.

Pilots cover a wide gamut of Types distributed mostly to the right-side of the Compass. When discussing pilots using this combination of personality models it might sound like this:

- the Prudent Risk Type superimposed with the Stabilizer motivator likes to work with others and may be more comfortable in a two-pilot crew or working with non-pilot crew members;
- the Composed Risk Type superimposed with the Improvisor motivator may be more comfortable making decisions on their own to get the job done.

Whether through our predispositions, education, background or training, the majority of the pilots share the need for structure and so the greatest number fall in between these two extremes as Deliberate Risk Types. Understanding the differences and similarities of these two personality models allows for a better understanding of the whole person.

Combining the two models in a training environment can lead individuals in an organization to better understand the other members of their team. This understanding in turn leads to a willingness to hold each other accountable and, in effect, watch out for each other while accepting corrections and constructive criticism from other crew members. The last part of the personality puzzle, our attitude, seems to be the wild card that can make this all work well and keep us safe, or hijack all common sense and not allow us to make decisions as an effective crew.

Conclusions

As I began putting together my conclusions, social media again placed an article in front of me that seems relevant to this paper and study. In New Zealand a pilot who crashed a small helicopter and killed his best friend is being charged "under the Civil Aviation Act with operating in a manner that can expose a passenger to unnecessary risk"; or, as also stated in the article, "reckless conduct and failing to comply with his duty, exposing individuals to risk of death or serious injury or serious illness, under health and safety legislation."

Risk management is a moving target. It is a continual give and take between protection and production. If we push to be ultra-safe, we may fail to accomplish that which we set out to do. If we only look at the benefits of accomplishing our

task and ignore any hazards, it may end in catastrophe. So, we flow back and forth between the two. Our ability to mitigate, tolerate, plan for and overcome risks keeps us somewhere in the middle zone, but if the risk is not completely removed, the danger is still there, no matter how much we work to prevent it from happening.

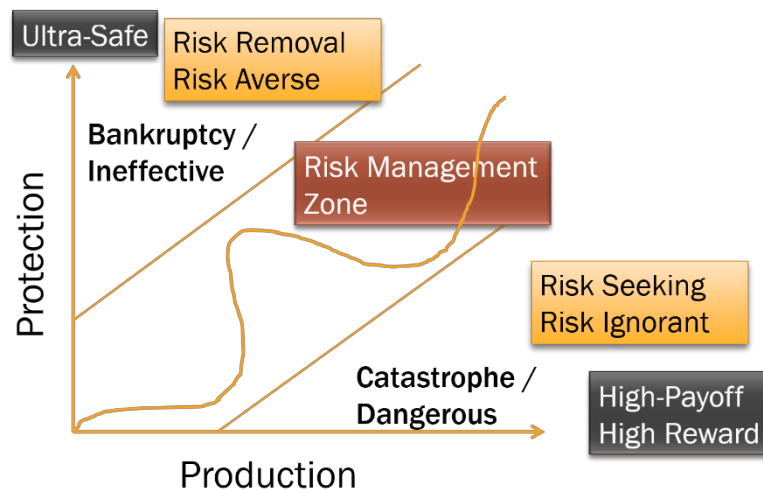


Figure 8 Risk Management Zone

All that remains then is the immediate decision-making process: the spur of the moment, left or right, stop or go, land now or try to push on, visual or instrument meteorological conditions, decisions. The helicopter by its very nature places those who fly in them at higher risk. They go places, do jobs, and fly in ways that airplanes never will, and yet someone who is not a helicopter pilot will decide whether this pilot flew in a way that created unnecessary risk.

Unfortunately this study won't provide a direct answer to this judgement. But, looking back at this study, I can say that I have known helicopter pilots with skills that are associated with every one of these Risk Types. And someone who knows their limits, whether on the riskier side or not, will be a safer pilot than one who does not recognize either their own limits or the limits of their aircraft. Looking at ourselves from the inside can help us know our limits, and it may help us navigate that risk management zone as we look to do as much as possible as safely as possible.

About the Author

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Ken is a retired US Army soldier, leader, and pilot entering service as an infantry private and retiring as an Army Aviator, Lieutenant Colonel and Chief of Leadership Training with the Army Reserve Readiness Training Command.

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