Recommended Practice

Detection and Management of Risk Level Changes During Flight by Pilots and Non Flying Crew

Helicopter-Safety Enhancement 22A

Stephen D. Earsom, US Fish and Wildlife Service
Dawn Groh, Embry Riddle Aeronautical University
Dr. Dudley Crosson, Delta-P

"Creating a team of experts requires open channels of communication – making it psychologically safe for the most junior staffer to approach the captain about an important safety issue. Because it isn't about who's right, but what is right." - Capt. Chesley "Sully" Sullenberger

Background

On January 5, 2010, a Bell 206B conducting a low-level wildlife survey flew into power lines and crashed. The commercial pilot and three biologists conducting the survey were killed. The pilot had almost 17,000 total flight hours, over 13,000 of which was in helicopters, and over 3,000 of which was in the Bell 206 series. The pilot had been flying for over 47 years, and was experienced in helicopter air ambulance, search and rescue, aerial survey, photography, mapping and animal capture. How could such an accident have happened with such an experienced pilot at the controls?

The NTSB determined that the cause of the accident was the pilot's failure to see and avoid the power lines, and the pilot had been admonished by two other biologists about a month earlier for "trying too hard" to see deer during the survey. The employees working for the agency that sponsored the flight, however, stated that they were not aware of any formal surveying guidelines explaining the duties of each person on board the helicopter, and that no formal training regarding survey flights was provided by the agency. Clearly, this accident, and many others like it, might have been avoided had the pilot and nonflying crewmembers been trained in, and practiced, crew resource management skills.

The Goal

The US Helicopter Safety Team (www.USHST.org) recognized that the flight environment is often dynamic, and not every contingency can be anticipated or scripted in advance. The pilot in command

(PIC) is ultimately responsible for the safety of a flight; however, non-flying crewmembers can play a pivotal role in working with the PIC to ensure the safety of a flight.

The goal of this USHST Helicopter-Safety Enhancement (H-SE) is to develop and promote recommended practices for pilot and nonflying crew members to:

1. Detect increased risk levels during the course of a flight
2. Effectively communicate the increased risk level to each other, and
3. Make a decision and execute an appropriate mitigation strategy.

H-SE 22A and Crew Resource Management

Crew resource management (CRM) got its formal start in aviation in the late 1970s after high profile accidents including United Flight 173, which ran out of fuel while troubleshooting a landing gear issue, and Tenerife, where two Boeing 747s collided on a runway in poor visibility. The tenets of CRM include interpersonal communication, de-emphasis of authoritarian leadership, and empowerment of all flight crew members to identify errors or potential problems when they first arise, and work together toward resolution.

H-SE 22A was developed because the practice of CRM has not been formally adopted throughout the helicopter industry. There are many reasons for this. For example, many helicopter operations include an interdisciplinary crew of one pilot and one or several specialists with other functions that are not aviation related (*e.g.*, nurses on air ambulance). These non-flying crewmembers may be hesitant to speak up both because they have not received formal CRM training and they are not pilots. They may believe that they do not have useful observations to share about the flight. Likewise, many helicopter pilots may not have received CRM training, and may not be used to or comfortable with considering the input of a non-pilot crewmember. The goal of this H-SE is to reduce incidents by developing and disseminating the general concepts of CRM, modified for interdisciplinary crews, that helicopter operators can adopt, develop, and teach to their personnel.

Decision Frameworks

Several industries have developed structured frameworks for decision-making that overlap to some extent and have been applied to aviation. For example, the FAA DECIDE model[1], ethical decision making[2], and naturalistic decision making (NDM)[3] have all been applied to the aviation context. Some are analytical and prescriptive (DECIDE), while others are intuitive and descriptive; *i.e.* how the mind actually works (NDM and recognition-primed decision-making[4]).

Decision-making frameworks provide excellent tools for pilots. What must be made explicit is the need for pilots to consider non-flying crewmembers in decision-making (known as participative management training), as well as communication “break-through” tools for these non-flying crewmembers to get the attention of the pilot in a timely manner and make sure their concerns are heard and addressed (assertiveness training).

In-flight Communications Tools

General training on communication encourages crewmembers to be accurate, bold, and concise – the ABCs of communication. Crews also can be taught to use Bishop’s 5-step model[5] in communicating when the need for action is not immediate:

1. Get the attention of the person: Hey Captain Ted!
2. State your concern: I'm concerned about this thunderstorm!
3. Describe the problem as you see it: If we stay on this heading, we might get struck by lightning.
4. Suggest a solution: Let's change headings to stay further away.
5. Achieve buy-in: Does that sound reasonable to you?

Perhaps used less frequently outside the military and firefighting, but potentially very useful for helicopter crews, is the use of key phrases or "break-through" tools with instantly recognizable and previously agreed upon actions to be taken immediately and without question—especially under time constraints or if the communication has not been effective. Some refer to this as the "This is stupid!"[6] technique. For example:

> **Knock it off**: Cease the operation and return to base.
> **Red flag**: Cease the operation, climb to a safe airspeed and altitude and discuss the issue prior to continuing.
> **This is stupid**: Let's reconsider what we're doing before we proceed.

Personality Types

The interaction of communication styles and personality types is another aspect that must be addressed. Personalities affect every step of the process from problem detection to the resulting action. It is plausible that an introvert, as described in a Meyers-Briggs[7] analysis, may be less willing to communicate a concern in a crew atmosphere, especially if other crewmembers are extroverts. Berens'[8] work on temperaments could suggest that a "Theorist" might obsess over a relatively small issue, whereas an "Improviser" might become reckless under stress.

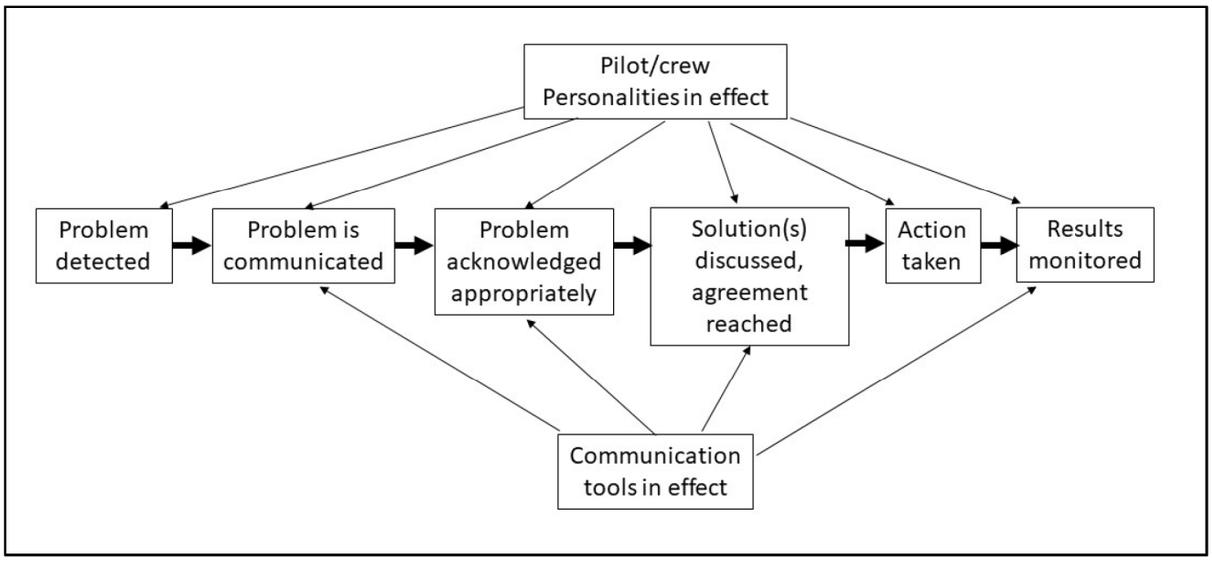
Further, to the extent that personality variables cannot be pushed into the background through the use of scripted actions like a command-response checklist, they will create challenges that might best be overcome by realistic training as a crew, and by the crewmembers knowing and understanding what drives and motivates themselves and each other.

Cultural Influences

Cultural influences are another potential stumbling block for crews. Crews with members of different nationalities or native languages could impede normal communication. A crew from the same culture where great deference is given to the leader at the expense of a team atmosphere, or the safety culture that company management establishes, also could limit successful communications.

Summary

In brief, many of the important aspects of CRM for H-SE 22A might be summarized in a diagram like this:



Recommended Practices

1. Helicopter operators should provide recurring formal classroom training for their interdisciplinary crews in crew resource management. This training should be provided to interdisciplinary crews as a unit, rather than separating the training by discipline (pilot, flight nurse, etc.). This furthers the concept of "training the way we work." At a minimum, training should include concepts of crew resource management, decision frameworks, communication tools, personality types, and cultural influences, and should be incorporated into the operator's Safety Management System.
2. Helicopter operators should develop and provide recurrent scenario-based training for interdisciplinary flight crews. Ideally, this would be conducted in a flight training device that allows the entire crew to be located at their normal stations, while realistic weather and aircraft issues can be simulated. Scenarios should be built around common problems that arise during the operator's flights. This could be added to existing simulator-based Line Oriented Flight Training.
3. Helicopter operators should develop a document, customized to their flight task types, that explains the CRM roles that each person plays onboard the aircraft. This document should be signed by each person, thereby formally acknowledging their understanding of their CRM roles.
4. Helicopter operators should develop briefing cards, customized to flight task types, which remind each person about the CRM roles everyone plays, hazards that are common for the flight task type, and specific communication protocols. These briefing cards should be kept on the aircraft, and each member of the crew also should carry a copy. The pre-flight briefing should include all elements listed on the card.
5. During low workload in-flight periods, pilots and crewmembers should create and discuss scenarios that help solidify roles, responsibilities and specific actions that crewmembers should take. These real-time in-flight scenarios are extremely valuable since they encourage participation by all crewmembers in a realistic setting, and hone naturalistic decision-making skills.

References

1. FAA, 1991. Advisory Circular 60-22. Aeronautical Decision Making. Retrieved 16 January 2019 from http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_60-22.pdf.

2. Neal and Rhodes, 2017. Failure predicts success: Professional ethical decision-making in aviation simulators. J. Character and Leadership Integration.

3. Simpson, 2001. Naturalistic decision making in aviation environments. Department of Defence. Defence Science and Technology Organization, Aeronautical and Maritime Research Laboratory, Australia.

4. Klein, 1989. Recognition primed decisions. In W.B. Rouse (ed), Advances in Man Machine Systems Research, vol 5, pp 47-92. Greenwich, CT. JAI Press.

5. Bishop, Todd (2000). Preventing Human Error Study Guide. Error Prevention Institute, Inc. Payson, AZ.

6. International Association of Fire Chiefs (2003). Crew resource management: a positive change for the fire service.

7. Myers-Briggs Personality Type Indicator. https://www.mbtionline.com/

8. Berens, 2015. The Leading Edge of Psychological Type (Part 2 of 2). Bulletin of Psychological Type.

Additional Reading

FAA 2004. Advisory Circular 120-51E. Crew Resource Management Training.

FAA 2005. Advisory Circular 00-64. Air Medical Resource Management.

SAMPLE

CREW RESOURCE MANAGEMENT BRIEFING CARD

Keep 1 card in aircraft. Give one copy to each crewmember during briefing.

1. FLIGHT TASK: LOW-LEVEL WILDLIFE SURVEY

2. COMMON HAZARDS: Powerlines, rising terrain, cell towers, birds, weather, fatigue

3. IN-FLIGHT RESPONSIBILITIES MATRIX

PILOT		**FRONT OBSERVER**	
FLIGHT VETO AUTHORITY:	**Yes**	**FLIGHT VETO AUTHORITY:**	**Yes**
AIRCRAFT CONTROL:	Primary	AIRCRAFT CONTROL:	Emergency
HAZARD IDENTIFICATION:	Primary	HAZARD IDENTIFICATION:	Primary
SITUATION COMMS:	Primary	SITUATION COMMS:	Primary
DATA COLLECTION:	None	DATA COLLECTION:	Secondary
LEFT REAR OBSERVER		**RIGHT REAR OBSERVER**	
FLIGHT VETO AUTHORITY:	**Yes**	**FLIGHT VETO AUTHORITY:**	**Yes**
AIRCRAFT CONTROL:	Emergency	AIRCRAFT CONTROL:	Emergency
HAZARD IDENTIFICATION:	Primary	HAZARD IDENTIFICATION:	Primary
SITUATION COMMS:	Primary	SITUATION COMMS:	Primary
DATA COLLECTION:	Secondary	DATA COLLECTION:	Secondary

4. COMMUNICATION PROTOCOLS
    a. Make your communications ACCURATE, BOLD and CONCISE
        i. State the pilot's name
        ii. "I am concerned about….."
        iii. "I think we should…"
        iv. "Is that okay with you?"
    b. Make your concerns known early; waiting can reduce available options
    c. Use the following phrases under the given circumstances. Say the phrase three times to ensure others understand.
        i. **THIS IS STUPID!** – Something is happening and you can't get anyone to listen to your concerns.
        ii. **RED FLAG!** – Abort the task, return to base and discuss the situation.
        iii. **YELLOW FLAG!** – Pause the task, climb to a safe altitude, and discuss the situation.

I understand that I am required crewmember, not a passenger. I understand, accept and will perform my crewmember duties described above.

SIGNATURE_____