



Crew Resource Management Applies To Single-pilot Flight Operations

The single helicopter pilot can use crew resource management (CRM) techniques to improve communication, decision making, workload management, stress management and other skills for improving the safety margin.

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Training to refine the human-factors aspects of crew operations can be traced back to the early 1970s, when KLM Royal Dutch Airlines introduced a program for its flight crews. In 1979, the U.S. National Aeronautics and Space Administration (NASA) suggested that business managerial concepts could be applied in the cockpit to reduce the high number of “human-factors” accidents occurring to airlines. Within 10 years, cockpit resource management (CRM) — later expanded conceptually to crew resource management — was included in training worldwide at most major airlines, and the U.S. Air Force had begun full-scale CRM training of all crews of multiperson aircraft.¹ Today, there is sufficient evidence that CRM training and practice have improved safety.²

CRM skills are no substitute for technical proficiency. Nevertheless, high technical proficiency cannot guarantee safe operations without effective resource management.

Not all helicopter pilots and operators agree, however, on the value of CRM training in the single-pilot cockpit. To some, CRM is about multi-pilot crews learning to work together, and has little relevance in the single-pilot environment. Although

it is true that traditional CRM training emphasizes interpersonal behavior to improve group dynamics among crew members (for example, junior crew members are encouraged to be more assertive toward veteran superiors, and veterans are encouraged to give more attention to input from less-senior crew), this is only one aspect of CRM. The U.S. Federal Aviation Administration’s (FAA’s) Advisory Circular on CRM includes a training curriculum, which recommends training in such areas as teamwork, communication skills, decision making, workload management, situational awareness, preparation and planning, cockpit distractions and stress management.³

These concepts must be applied somewhat differently to the single-pilot operator, and the AC instructs the reader to “customize the training to reflect the nature and the needs of the organization” to increase CRM’s relevance.

By definition, CRM is the effective *management* of all resources available to the pilot. The captain of a multicrew aircraft can and should delegate many tasks to the first officer (FO) — for example, checklists, radio calls, approach briefings, etc. The single pilot simply has a different set of resources

and therefore must manage them differently. Nevertheless, cockpit management for the single pilot may be more demanding than for pilots in a multiperson crew.

According to Lonney McCann, director of training at Indianapolis Helicopter Corporation (IHC), Indianapolis, Indiana, U.S., “CRM is more critical in single-pilot cockpits than in those with multiple crew members. In a multiple-crew cockpit, even a poor manager will benefit from the self-preservation instincts of the other crew members. The single pilot does not have the luxury of checks and balances provided by other crew members. He or she must invest an even greater effort in organizing the cockpit and thought processes to accomplish all of the same tasks that are required of a multiple-crew operation.”⁴

The FAA makes the following observations:

- CRM is a comprehensive system of applying human-factors concepts to improve performance;
- Human factors is a field devoted to optimizing human performance and reducing human error;
- CRM embraces all operational personnel;
- CRM can be blended into all forms of training;
- CRM concentrates on attitudes and behaviors, and their impact on safety;
- Success of CRM training programs depends on check airmen, instructors and supervisors who are highly qualified and specially trained in CRM;
- CRM training requires commitment from all managers, starting with senior managers, to be received positively by operations personnel;
- CRM training should be customized to reflect the nature and needs of the operation;
- CRM training should include initial indoctrination, recurrent practice, feedback and continuing reinforcement; and,
- CRM should be an inseparable part of the organization’s culture.

The topics outlined below are included in the FAA AC, but have been interpreted to more readily fit the single-pilot operator.

Teamwork. CRM includes the effective use of human resources. Human resources include groups that routinely work

with the pilot and are involved in operating a flight safely. These groups can include, among others, dispatchers, medical attendants on emergency medical service (EMS) flights, maintenance personnel, air traffic controllers, other pilots and management.

One advantage of teamwork is that it facilitates the transfer of information. Many accidents and incidents were precipitated by a lack of knowledge. The ideal flight operation might function in the same way as a sports team: Each member has a particular assignment and is responsible for fulfilling it, while at the same time never losing sight of the ultimate goal. In sports, that goal is winning. In aviation it is the safe and efficient operation of an aircraft.

The team concept must begin with management and be constantly reinforced. The FAA recommends that instructors and check airmen use team concepts as grading criteria during training and checking.

Communication skills. Miscommunication with air traffic control (ATC) is often cited as a causal factor in aircraft accidents and incidents. Good communication skills are essential in developing teamwork.

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Pilots increase the probability of a safe flight by learning to effectively seek and evaluate information, overcoming barriers to communication and being assertive at appropriate times.

Decision making. The single pilot makes decisions with fewer resources. Nevertheless, fewer does not mean none. One frequent error observed in simulator training is the failure of a captain to seek all relevant information before making an important decision, an error made by single pilots too. The single pilot’s resources may include:

Other persons aboard the aircraft, such as passengers and medical crew members;

- Aircraft gauges and sensations — vibrations, sights, smells, etc.;
- ATC;
- Other pilots who can be contacted by radio;
- Flight manuals, checklists and other documentation; and,
- Ground-based support personnel.

To effectively use a resource, a pilot must know that the resource exists, understand its use and limitations and — most important — the pilot must ask for assistance. Some pilots

feel a self-imposed pressure to perform without outside assistance. For example, a single pilot was flying a turbine helicopter that experienced a tail-rotor malfunction. Because the pilot was new to the aircraft, he was not sure of the appropriate emergency procedure. Rather than instruct a passenger to read him the procedure from the flight manual (his hands were busy controlling the aircraft), he elected to execute an unapproved procedure. Fortunately, he was successful, but this pilot's unwillingness to use every resource available to the pilot at a critical moment could have resulted in an accident.

Workload management. Captains of multipilot crews are encouraged to manage the cockpit workload by sharing duties with other crew members. Workload management is even more important to the single pilot, because he or she has fewer resources and therefore must carefully prioritize tasks.

Learning to prioritize, while avoiding distraction from the primary duty of flying the aircraft, requires training and practice. Yet learning to prioritize tasks often receives too little emphasis during training.

The single pilot can also benefit by sharing tasks: requesting ATC assistance during heavy workloads; asking for help from the company dispatcher; prudently using automation such as an autopilot; and, in the case of EMS operators, involving trained medical personnel in certain flight duties.

Situational awareness (SA). SA is defined as the accurate perception of the factors that affect the aircraft and crew during a specific time period. Or, put more simply, it is knowing what is going on around you. Helicopters normally operate in airspace that is considered hazardous by many jet crews, below 10,000 feet (3,050 meters) mean sea level (MSL). SA becomes imperative in this environment. Maintaining a high level of awareness is more challenging for a single pilot, and automation and other resources should be used effectively.

One method to help maintain a high level of SA is simply remaining aware of SA's importance. For example, in a recent study of fatal turbine-helicopter accidents, six (7.1 percent) were midair collisions.⁵ All six accidents occurred during daylight and in the immediate vicinity of an airport. Five occurred at uncontrolled fields and each of these involved one aircraft climbing after takeoff. The lesson learned in this study is that, when operating in an area where takeoffs and landings are occurring, special vigilance must be maintained. Other required tasks — such as entering navigation coordinates and communicating with base operations or with passengers — may need to be delayed, to focus full attention on the hazards of other air traffic.

Preparation. For the single-pilot operator, preflight preparation is of special importance. No first officer is available to confirm radio frequencies and make radio calls, fix positions

and call out checklists. The single-pilot operator may commit to memory information, such as frequencies and emergency procedures, that otherwise might be difficult to confirm in an emergency or unexpected high-workload situation.

Careful cockpit organization also simplifies many tasks and allows the single pilot to do more with less.

Cockpit distractions. The NASA Aviation Safety Reporting System (ASRS) studied pilot distraction, based on reports submitted by crew members and controllers.⁶ The study's conclusion was that human susceptibility to distraction is one of the most frequent causes of hazardous events in air-transport operations.

If this is true in the multiple-crew air-transport cockpit, how much more adept at dealing with routine distractions must a single crew member be? The study showed that cockpit distractions are often the result of routine cockpit tasks interrupting or preventing the pilot's performance of other routine tasks. A single pilot must recognize and prevent distractions, while performing the primary task of the flying the aircraft.

Table 1 shows some of the types of distractions recorded in the NASA study. The occurrences fell into two categories — operational and nonoperational tasks. These events occurred

Table 1
Types of Reported Distractions in
NASA ASRS Study

Operational Factors	
Traffic Watch	16
Checklist	22
Malfunctions	19
Air Traffic Control Communications	6
Studying Approach Chart	14
Radar Monitoring	12
New First Officer	10
Looking for Airport	3
Fatigue	10
Miscellaneous	2
Total	114
Nonoperational Factors	
Paperwork	7
Announcements	12
Cockpit Conversation	9
Flight Attendant Interruption	11
Company Radio	16
Total	55

Source: Joel S. Harris, U.S. National Aeronautics and Space Administration (NASA) Aviation Safety Reporting System (ASRS)

in multiple-crew cockpits, but the single pilot may be able to relate to these distractions.

Stress management. The effects of stress often are difficult to recognize. Single pilots must be especially vigilant, through self-awareness and comments of others, to recognize the stress generated by personal issues such as divorce, illness, dissatisfactions, etc. Such stress can degrade judgment, decision making, situational awareness and communication skills.⁷ These deficiencies can be hazardous.

We must further explore the techniques and application of CRM in the unique and challenging single-pilot helicopter cockpit. In the EMS industry, training programs that are already emerging teach CRM skills and principles not only to pilots, but also to dispatchers, medical crew, maintenance personnel and management. This trend can only have a positive effect on helicopter accident rates. ♦

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