

## **Crew Resource Management (CRM)**

Crew Resource Management (CRM) training originated from a NASA workshop in 1979 that focused on improving air safety. The NASA research presented at this meeting found that the primary cause of the majority of aviation accidents was human error and that the main problems were failures of interpersonal communication, leadership, and decision making in the cockpit. CRM training encompasses a wide range of knowledge, skills and attitudes including communications, situational awareness, problem solving, decision making, and teamwork.

CRM can be defined as a management system which makes optimum use of all available resources (equipment, procedures and people) to promote safety and enhance the efficiency of flight operations.

CRM is concerned not so much with the technical knowledge and skills required to operate an aircraft but rather with the cognitive and interpersonal skills needed to manage the flight within an organized aviation system. In this context, cognitive skills are defined as the mental processes used for gaining and maintaining situational awareness, for solving problems, and for making decisions. Interpersonal skills are regarded as communications and a range of behavioral activities associated with teamwork. In aviation, as in other walks of life, these skill areas often overlap each other and the associated technical skills. Furthermore, they are not confined to multi-crew aircraft: They are equally important in single-pilot operations, in which optimum use of people, procedures, and equipment are just as important as they are in a multi-person crew environment.

CRM training for crewmembers has been introduced and developed by many airlines. It is now a mandated requirement for pilots working in revenue operations under most regulatory bodies worldwide.

Single pilot CRM operations can be less complex than multi-crew operations. There is no inter-crew communication and there are no cockpit issues involving authority and leadership. However, in other areas such as error management, decision making and planning, lack of an additional crewmember can make the situation more demanding. The single pilot does not have the advantage of learning from the experience of other crewmembers in the cockpit and often has to learn from his own mistakes. The only debriefing and evaluation available to the single pilot during normal operations is self-evaluation.

The following are considered the key principles of sound CRM:

**Make optimum use of available assets:** These obviously include the knowledge and skill of the flight crew, but extend to capability of the airplane, equipment installed in the airplane, assistance available from ATC, and – when possible, assistance available from the company via radio.

**Communication:** While communication across the cockpit may not be relevant to pilots of single pilot operations, there are many situations in which communication is equally important. Such situations would include keeping non-flying personnel informed during normal and abnormal operations, liaising with ground crew, and communications with ATC, the latter being particularly critical for flight safety – as the cross check of instructions between crews on multi-pilot aircraft may not be available in the single pilot situation. It is absolutely vital, therefore, that if there is any doubt at all about ATC instructions, clarification is sought. Standard phraseology should always be used particularly when talking to ATC units that do not have English as their first language. Other factors which may affect the correct understanding of communications are high workload, fatigue, distractions and interruptions, and pre-conceived ideas.

It must also be recognized that communications with the company by way of keeping up to date with changes in procedures, new information, additional airport and route information is more demanding as there is no one else on the cockpit with whom to crosscheck the information. However, much can be gained from liaison with fellow crewmembers before and after flights.

Health incapacitation procedures have reduced the accident statistics for multi-crew operations. However, these procedures are not available to safeguard against incapacitation of the single pilot. It is even more important, therefore, that pilots ensure that they are fit to fly if they are the only member of the flight crew. In the event of feeling unwell during flight do not press on. Land at the nearest suitable airport making use of all assistance available by declaring an emergency and making full use of any automation.

**Workload Management:** Workload management is probably the most important element of single pilot CRM. There is no opportunity to delegate tasks in the air and there is a greater potential for the single pilot to become overloaded – especially during an unusual, abnormal or emergency situation. Flying the airplane while maintaining situational awareness and preserving mental capacity for planning, decision making, and dealing with new developments is more difficult. Orderly prioritization of cockpit tasks is a must if some “reserve” capacity is to be maintained.

Comprehensive self-briefing and pre-flight planning are essential. The aim should be to have a thorough understanding of all aspects of the flight: Weather conditions, airport procedures, routing, aircraft performance, aircraft equipment (and deferred items, if applicable), etc. – and that as much of the work as possible should be carried out on the ground prior to flight or during periods of low cockpit workload. Problems should be anticipated and "what if?" procedures thought through so that in the event of any unplanned events the contingencies can be put into place without the workload increasing to an unmanageable level.

In the event of an abnormality or emergency it is even more important to comply with standard operating procedures. This will help you to stay calm, properly diagnose the problem, and take the appropriate action. Reduce workload as much as possible, engage the autopilot if available, advise ATC, and request radar vectoring as appropriate. Many accident investigations highlight the fact that the checklists were not used and that inappropriate action was taken which prevented or reduced the likelihood of a successful conclusion.

**Error Management:** In an ideal world the process itself will have eliminated latent errors. However, in the real world latent errors exist and are ready to trap the unwary pilot. Therefore you need to be constantly alert for these traps and be conversant with the aircraft and the operation to the greatest extent possible. Full familiarity with, and routine adherence to SOPs is again one of the main defenses. All pilots should be alert to situations which are new, untried, distract from normal operations, or are outside SOPs. Workload planning will allow the pilot to make decisions in good time and to cross check any critical actions before implementation.

**Decision Making:** The decision making process generally involves:

- Assessing the situation and gathering data
- Considering options
- Deciding upon the best option
- Communicating your intentions
- Carrying out the actions
- Checking/reviewing the situation
- Adapting to new information or changing situations.

Research shows that experienced pilots use previous experience of similar situations to shortcut the decision making process. However, no two situations are exactly the same and it is important to recognize that the decision making process is driven by the pilot's situation assessment. In single pilot operations there is usually no one to help gather the information and cross check actions. Also, facing an abnormal or emergency situation alone can be a frightening and traumatic experience. A natural reaction can be one of shock or disbelief. This initial startle reflex can provoke a desire to try to resolve the situation quickly – perhaps leading to incorrect actions being taken. Therefore, one should try to stay calm and above all continue to fly the aircraft. There are some situations which require immediate action but the majority of incidents will tolerate a short delay while you gather your thoughts and assess the situation.

**Situational Awareness:** Situational awareness relates both to the status of the aircraft, its systems, and its geographic position. Careful monitoring of the aircraft systems together with a good technical knowledge will help the pilot maintain situational awareness and to stay ahead of the aircraft. This, combined with good workload management, will increase spare capacity and allow better anticipation of potential problems.

A mental picture of geographic position and lowest safe altitude must be kept in mind and refreshed using available aids. In an era where pilots are increasingly reliant upon “moving map” GPS displays, complacency in this area can be a problem. Environmental influences, such as bad weather and high terrain should also be anticipated and alternatives formulated in case the planned flight path or destination has to be changed.

Situational awareness is particularly critical in the departure/approach and landing phases of flight. Many Controlled Flight Into Terrain (CFIT) accidents have occurred due to loss of situational awareness and proximity of terrain. Statistics indicate that this is a high risk area to the single pilot. The risk may be increased due to the aircraft being fitted with less sophisticated equipment but a lack of planning and mental awareness of position, terrain, and obstacles will aggravate the situation.

**Commercial Pressures:** In the single-pilot environment commercial pressures may be greater and more personalized. The pilot may be influenced by perceived pressure to “get the job done.” With no one else with whom to share the burden you may be more prone accede to such pressures and accept a situation which is against your better judgment. Such pressures may also come from simply wanting to get home.

**Summary:** Airline pilots are trained to use cockpit resource management (CRM) as a vital decision-making tool. The CRM concept goes beyond just seeking input from crewmembers. All resources at the airline pilot's command are tapped to help manage the flight with sound decisions.

Crewmembers engaged in single pilot operations are faced with virtually the same decision-making tasks as captains of jumbo jets. The only difference is that they are scaled down in altitude, payload, speed and distance. Even a single pilot in the smallest cockpit can make use of CRM tools to help manage the flight with sound decisions and to safe conclusion.

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Compiled by Ameriflight Capt. Robert Mugford from the following sources:

Ballough, James, J, *Crew Resource Management Training*. Washington, D.C., Federal Aviation Administration, 2004

Helmreich, Robert L, Ashley C. Merritt, and John A. Wilhelm, *The Evolution of Crew Resource Management Training in Commercial Aviation*. Austin, TX, Aerospace Crew Research Project at University of Texas, (date unknown)

CrewResourceManagement.net, *CRM for Single Pilots*. Flight.org Internet Website (location and date not available)

[Flight Training Department Documents], *Crew Resource Management Training*. Burbank, CA, Ameriflight, LLC (various dates)

# FLIGHT RELEASE GUIDE

*This flight release guide is intended to provide for a flight release system with scaled level of authority so that simple, routine flights can be released easily, but more complex ones will require authorization from more senior management personnel. It presumes several levels of management authority, but can be revised to match the structure of any Part 135 operation.*

*The guide has two objectives:*

- To establish an orderly and uniform process for releasing flights that maximizes safety and minimizes risk.*
- To insure that a qualified person representing the company's management philosophy is involved in the flight release process*
- To insure that, as complexity and variables increase, higher echelons of company management are involved to manage elements of potentially increased risk.*

For purposes of this guide the following assumptions are made about the operator:

- The Director of Operations is the senior official of the company who exercises flight release operational control (recognizing that the Chief Executive or others may have authority to cancel or refuse flights).
- The operation's Chief Pilot is a different person than the Director of Operations.
- When flight operations are being released, the company provides flight following personnel with sufficient training to be generally aware of company policies, either on duty at the airport or immediately available by telephone (landline or cellular).

Some other matters, more unique to individual operators but dealt with at the Chief Pilot or Director of Operations level, should be included in the flight release process. These do not fit neatly into the checklist below, such as –

- Is a member of the flight crew having any personal or other problems that would make him/her a bad candidate for the flight?
- Is one fleet aircraft better suited for this flight than others?
- Are there language, personnel, or customer issues at the airports to be used that make some crewmembers better for this trip than others?

Issues like these – and undoubtedly others we haven't thought of – make it very important that this generic guide be “customized” to fit the specific operator that will use it.

## SECTION 1

1. Is the flight a repetitive operation, using aircraft type, airports, and route frequently used by the operator?  YES  NO
2. Is the assigned pilot familiar with the route and airports?  YES  NO

3. Is the departure, enroute, and arrival weather significantly above any minimums applicable to the flight?  YES  NO
4. Does the aircraft have any MEL or other Deferred Maintenance Items that will affect the flight?  YES  NO
5. Will any MEL or other deferred items expire (or get close to expiration) during the anticipated flight?  YES  NO
6. Will any flight hour, flight cycle, or calendar-tracked items expire (or get close to expiration) during the anticipated flight?  YES  NO
7. Does the aircraft have minimum dispatch fuel required for the flight?<sup>1</sup>  YES  NO
8. Are the pilot(s) within flight/duty/rest limits, and do they appear rested and fit to take the flight?  YES  NO
9. Is the payload well within limits for the aircraft in view of fuel requirements?  YES  NO
10. Are there any unique cargo restraint, HazMat, or other special requirements associated with the load?  YES  NO

***If all shaded answers in Section 1 are checked, release the flight. If not, continue to Section 2.***

## **SECTION 2**

*Flights that do not meet Section 1 criteria (other than ferry or maintenance test flights)*

1. Has the Director of Operations previously determined that the airports to be used are suitable for the aircraft type in view of current conditions?  YES  NO

***If "yes" proceed to Question 8; if "no" answer Questions 2 through 7***

2. Is the runway length greater than XXXX ft.?<sup>2</sup>  YES  NO
3. Is the field elevation less than YYYY ft.?<sup>3</sup>  YES  NO
4. Will there be a control tower in operation at each airport when the flight arrives/departs?  YES  NO
5. Is there an official weather report available at the times the airport will be used?  YES  NO

6. Is there an ILS or VOR approach available at each landing airport?  YES  NO
7. Will a circling approach at night be necessary?  YES  NO

***If shaded answers to Questions 2-7 are marked, continue to Question 8. If any are not shaded contact the Director of Operations for release authorization.***

8. Are you the Chief Pilot?  YES  NO

***If Section 2, question 1 is "yes," or Section 2, questions 2-7 are all "yes" release the flight. Otherwise, continue to Section 3.***

### **SECTION 3**

1. Have you previously dispatched a flight in the same type aircraft over this route?  YES  NO
2. Is the departure and arrival weather VFR?  YES  NO
3. Is there any significant weather enroute?  YES  NO

***If all shaded answers in section 3 are checked, release the flight. Otherwise, contact the Director of Operations for flight release.***

### **Maintenance test flights and flights on Ferry Permits**

Individual operators will need to develop release procedures for ferry flights and maintenance test flights according to their unique requirements and directives of their manual system. It is recommended that ferry pilots and test pilots be briefed on specific requirements of such flights by the Chief Pilot or Director of Operations, or other person within the organization familiar with those operations and qualified to brief the pilot on specific requirements of those flights.

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#### **NOTES:**

<sup>1</sup> Minimum dispatch fuel is the quantity required to comply with applicable regulations or as required to land at the planned destination with whatever additional amount of reserve and/or contingency fuel is necessary to comply with general company policy, or as approved for a specific route by the Director of Operations.

<sup>2</sup> Minimum runway length to be determined by the operator, in view of equipment operated.

<sup>3</sup> Maximum field elevation to be determined by the operator, in view of equipment operated.