



CREW RESOURCE MANAGEMENT

Trainer Manual

Rev. 4 August 2016

INDEX

- **FOREWORD** **LEGAL NOTICE**
 - **FOREWORD** **ABOUT NAVIMINDS COURSE MATERIAL
EASA TRAINING REQUIREMENTS**
 - **CHAPTER 0** **INSTRUCTIONAL TECHNIQUES**
 - **CHAPTER 1** **CRM INTRODUCTION AND HISTORY**
 - **CHAPTER 2** **COMMUNICATION**
 - **CHAPTER 3** **THREAT AND ERROR**
 - **CHAPTER 4** **STRESS AND WORKLOAD MANAGEMENT**
 - **CHAPTER 5** **CONFLICT AND BEHAVIOURS**
 - **CHAPTER 6** **SLEEP, FATIGUE AND VIGILANCE**
 - **CHAPTER 7** **INFORMATION PROCESSING AND COGNITION**
 - **CHAPTER 8** **SITUATIONAL AWARENESS**
 - **CHAPTER 9** **LEADERSHIP AND TEAM DYNAMICS
(INCLUDING NOTECHS)**
 - **CHAPTER 10** **STANDARD OPERATING PROCEDURES (SOPs)**
 - **CHAPTER 11** **DECISION MAKING**
 - **CHAPTER 12** **AUTOMATION**
 - **CHAPTER 13** **STARTLE EFFECT AND STRESS MANAGEMENT**
- RESILIENCE DEVELOPMENT**

NAVIMINDS

Important legal notice

© This Crew Resource Management Trainer Manual is produced and published by NaviMinds I/S. NaviMinds reserves all rights. No part of this publication may be reproduced or transmitted in any form, by any means (photocopying, recording, distributed on the internet or otherwise without permission from NaviMinds.

License

This manual is licensed only for use by the licensee for the purpose of training employees of the licensee only. The licensee may make copies as required for this purpose. However none of the work in this publication may be used for professional or occupational purposes. If trainees wish to use this publication for such purposes, an additional copy must be purchased.

NaviMinds retains complete ownership of the manual. The license agreement does NOT transfer title or ownership to the licensee. The licensee must NOT resell this manual without the written permission from NaviMinds.

Liability

NaviMinds has taken all reasonable care in the preparation of this publication. NaviMinds makes no representation or warranties with respect to the completeness or accuracy of this publication and its contents. NaviMinds specifically disclaims any implied warranties or merchantability or fitness for any particular purpose and shall in no event be liable for any loss of profit or any other commercial damage, including but not limited to special, incidental, consequential, or other damages.

Contact

NaviMinds I/S

Greisvej 22

DK 2300 Copenhagen S

Denmark

Phone: +45 26 80 61 10

Phone: +45 26 37 39 39

Email: ask@naviminds.com www.naviminds.com

ABOUT NAVIMINDS COURSE MATERIAL

Dear CRM Trainer,

This CRM Trainer Manual is intended as an easy-to-use tool for you in your future task as a Crew Resource Management Trainer, hence we have designed it in a layout and format that can be easily adapted to all your CRM and Human Factors assignments in the future.

We have taken all reasonable care in designing a manual, which starts with an introductory section that describes the essence of the role of a facilitator. In addition to the introductory section you will discover 12 chapters describing all the various elements of CRM.

Each of the 12 chapters is further divided into these parts:

- The first part of each chapter contains substantial background information. Information that will provide you with the knowledge needed to facilitate the subject
- The second part of each chapter contains an easy-to-use lesson plan with trainers notes. The lesson plan serves as a tool for you as a trainer, and you can keep it in front of you as backup. It is meant to help you feel confident in the process of facilitating the proposed lessons. The lesson plans are all quite extensive, designed to let you use them complete as they are or take out the bits that you find relevant - either for the timeframe of a training course or taking into account previous experience of your students.

We suggest that you familiarise yourself with all the chapters including background information prior to using the lesson plans.

Abbreviations and the use of colours in the lesson plans:

PowerPoint	PP
Hand out to students	HO
Show video clip	VC
Read text out aloud	RT

Please note that not all colours are applicable to all lesson plans



● A question mark indicates a question to ask your students

Regular text indicates an “action” for the trainer; such as show/read a slide, read a text, hand-out, describe or inform.

EASA Regulations from:

Annex to ED decision 2015/022/R

This table illustrates what elements of CRM should be included in different types of training:

Flight Crew

CRM training elements	Initial operator's CRM training	Operator conversion course when changing aircraft type	Operator conversion course when changing operator	Annual recurrent training	Command course
General Principles					
Human factors in aviation General instructions on CRM principles and objectives; Human performance and limitations; Threat and error management.	In-depth	Required	Required	Required	Required
Relevant to the individual flight crew member					
Personality awareness, human error and reliability, attitudes and behaviours, self-assessment and self-critique; Stress and stress management; Fatigue and vigilance; Assertiveness, situation awareness, information acquisition and processing.	In-depth	Not required	Not required	Required	In-depth
Relevant to the flight crew					
Automation and philosophy on the use of automation	Required	In-depth	In-depth	In-depth	In-depth
Specific type-related differences	Required	In-depth	Not required	Required	Required
Monitoring and intervention	Required	In-depth	In-depth	Required	Required
Relevant to the entire aircraft crew					
Shared situation awareness, shared information acquisition and processing; Workload management; Effective communication and coordination inside and outside the flight crew compartment; Leadership, cooperation, synergy, delegation, decision-making, actions; Resilience development; Surprise and startle effect; Cultural differences.	In-depth	Required	Required	Required	In-depth

Continues on next page

Relevant to the operator and the organisation					
Operator's safety culture and company culture, standard operating procedures (SOPs), organisational factors, factors linked to the type of operations; Effective communication and coordination with other operational personnel and ground services.	In-depth	Required	In-depth	Required	In-depth
Case studies	In-depth	In-depth	In-depth	In-depth	In-depth

Cabin Crew

CRM training elements	Operator's CRM training	Operator aircraft type conversion training	Annual recurrent training	Senior cabin crew member (SCCM) course	Introductory course on CRM
General principles					
Human factors in aviation; General instructions on CRM principles and objectives; Human performance and limitations; Threat and error management	Not required (covered under initial training required by Part-CC)	Required	Required	Required	In-depth
Relevant to the individual cabin crew member					
Personality awareness, human error and reliability, attitudes and behaviours, self-assessment and self-critique; Stress and stress management; Fatigue and vigilance; Assertiveness, situation awareness, information acquisition and processing.	Not required (covered under initial training required by Part-CC)	Required	Required (3-year cycle)	Required	In-depth

Continues on next page

Relevant to the entire aircraft crew					
Shared situation awareness, shared information acquisition and processing; Workload management; Effective communication and coordination between all crew members including the flight crew as well as inexperienced cabin crew members; Leadership, cooperation, synergy, delegation, decision-making, actions; Resilience development; Surprise and startle effect; Cultural differences; Identification and management of the passenger human factors: crowd control, passenger stress, conflict management, medical factors.	In-depth	Required (when relevant to the type(s))	Required (3-year cycle)	In-depth	Not-required (covered under CRM training required by Part-ORO)
Specifics related to aircraft types (narrow-/wide-bodied, single-multi-deck), flight crew and cabin crew composition and number of passengers	Required	In-depth	Required (3-year cycle)	In-depth	Not-required (covered under CRM training required by Part-ORO)
Relevant to the operator and the organisation					
Operator's safety culture and company culture, standard operating procedures (SOP's), organisational factors, factors linked to the type of operations; Effective communication and coordination with other operational personnel and ground services; Participation in cabin safety incident and accident reporting.	In-depth	Required (when relevant to the type(s))	Required (3-year cycle)	In-depth	Not-required (covered under CRM training required by Part-ORO)
Case studies	In-depth	Required (when relevant to the type(s))	In-depth	In-depth	Not-required (covered under CRM training required by Part-ORO)

CHAPTER I.

**CRM - INTRODUCTION
AND HISTORY**

• CRM INTRODUCTION AND HISTORY	1-3
• DIFFERENT GENERATIONS OF CRM	1-4
• DEFINITIONS OF CRM	1-6
• SHELL MODEL OF HUMAN FACTORS	1-7
• LIVEWARE (HUMANS)	1-8
• LIVEWARE LIVEWARE (THE INTERFACE BETWEEN PEOPLE AND OTHER PEOPLE)	1-8
• LIVEWARE SOFTWARE (PEOPLE AND SOFTWARE PROCEDURES, CHECKLIST....)	1-9
• LIVEWARE HARDWARE (PEOPLE AND MACHINE)	1-9
• LIVEWARE ENVIRONMENT (PEOPLE AND AND THE ENVIRONMENT)	1-10
• A FEW STATISTICS	1-11
• SUMMARY	1-13
• LESSON PLAN INTRODUCTION TO CRM	1-15

CHAPTER 1 - CRM - INTRODUCTION AND HISTORY

CRM - Introduction and History

Crew Resource Management (or Team Resource Management) is a complete training programme that was originally designed to increase safety and minimise accidents in aviation caused by crew. Nowadays the programme is mandatory worldwide, meaning that all flight crew (pilots and cabin crew as well as engineers) have to attend a CRM or Human Factors course on a regular basis.

Crew Resource Management incorporates subjects such as: Communication and Behaviours, Leadership and Management skills, Decision Making, Situational Awareness, Man/Machine interface (automation), Sleep, Fatigue, Vigilance, Information Processing and Cognition..... As such is a very broad spectrum of elements. CRM focuses on the non-technical (interpersonal skills) aspects and on gradually integrating these into every operation.

In aviation we have developed safer and safer systems for decades. At the technical level this is done via new and safe technology, and at the non-technical level (human interaction and interpersonal skills) via Crew Resource Management training.

CRM was developed as a response to new insights into the causes of aircraft accidents which followed from the introduction of flight recorders and cockpit voice recorders into modern jet aircraft. Information gathered from these devices has suggested that many accidents result not from a technical malfunction of the aircraft or its systems, nor from a failure of aircraft handling skills or a lack of technical knowledge on the part of the crew; it appears instead that they are caused by the inability of crews to respond appropriately to the situation in which they find themselves. For example, inadequate communications between crew members and other parties could lead in turn to a loss of situational awareness, a breakdown in teamwork on the aircraft, and ultimately to a wrong decision or series of decisions which result in a serious incident or a fatal accident.

One of the basic underlying premises of CRM is that a team can, and should, perform better than two (or three) individuals in the cockpit. The aim of CRM is to ensure that $1+1>2$, as opposed to $1+1<2$ (in a two pilot cockpit). This phenomena is often referred to as the "synergy effect". Synergy can be defined as; The sum of information held by individuals of team. Effective communication is necessary to ensure that the information required to achieve this is flowing at all times. And that team performance takes precedence over individual performance. Good CRM is getting the balance right as a team, whilst recognising that the Captain has the final say and responsibility for the safety of the aircraft.

In order to be effective, team members must be able to talk to each other, listen to each other, share information and be assertive (assertiveness will be described in further detail in this Trainer Manual) when required. Commanders/Captains should take particular responsibility for ensuring that the crew function effectively as a team.

Whilst the emphasis in CRM is primarily upon the cockpit crew, and how they work as a team, it is also important to look at wider team effectiveness, namely the whole flight crew. CRM principles may also extend to situations where ATC, maintenance, company experts, etc., are considered to be part of the team (especially in emergency situations).

From the beginning of a flying career, pilot training programmes have focused almost exclusively on the technical aspects of flying and on an individual pilot's performance and problem solving capabilities. But accident statistics show that many problems encountered by flight crews have very little to do with the technical aspects of flying. It would appear that to improve the safety of flight, the priorities must shift from operating independently in a multi-crew environment to problem solving using all available resources (crew, aircraft systems, equipment, passengers...) From the perspective of a cabin crew, it is about learning to accept, and even feel - that any observations or concerns they have are as valid as those of anyone else. Regardless of rank or experience.

The origin of Crew (or Cockpit) Resource Management (CRM) training is most often traced to a NASA workshop in 1979 that focused on improving air safety by reducing human error. The workshop was convened to consider NASA research which indicated that the majority of aviation accidents were caused by failures of interpersonal communication, leadership, and as a result - decision making in the cockpit.

That we accomplish more working as a team is a conclusion that has been reached, not only in the aviation industry. The difference from the airline industry to other industries is that good accomplishments as well as poor accomplishments are extremely well documented. The famous so-called "black box" on board a commercial aircraft documents every tiny bit of events leading up to any accident. And the effects of every word spoken are scrutinised by experts in order to take learning from the accident.

Technical failures or weather hazards account for 25 to 30 % of causes for accidents whereas human factors related causes account for the remaining 70 to 75 % of the accidents. So the human factor is the area that needs to be worked on.

CRM programmes have developed over time, and are continuing to do so.

Following is an overview of the generations of CRM as they have gradually been implemented:

1st Generation

Concentrated on attitudes and personal management styles, primarily in the cockpit.(Cockpit RM)

2nd Generation

Introduction of modular training, with a focus including cabin crew (Crew RM)

3rd Generation

Attempt at integration with technical training i. e. in simulator sessions, focus on specific skills

4th Generation

Developed alongside the introduction of AQP (Advanced Qualification Programme) and LOFT (Line Orientated Flight Training)

5th Generation

Introduced the concept of Error Management.

CRM concepts are not designed to challenge the authority of the Captain or the high degree of technical proficiency essential for safe and efficient flight operations. But a high degree of technical proficiency alone cannot guarantee safe operations. Studies have shown that marrying technical proficiency with effective crew co-ordination will provide the best opportunity for a successful flight.

Almost everyone in aviation knows that the worst aviation disaster to date happened in Tenerife in 1977, when two massive Jumbo jets collided on the runway. There were no technical failures with either of the aircraft, and they were both on the ground when the accident happened. 583 people lost their lives. This accident initiated a larger investigation: How could two such big aircraft manned by experienced professionals end in disaster. During this investigation focus was drawn to the human factors that resulted in the accident. In brief Human Factors are explained as the physiological limitations in performance as well as psychological factors. Human Factors played a vital role in the worst aviation disaster in history, and perhaps more importantly: our ignorance about these issues and their importance at the time.

Pilots are conditioned to believe that they are automated, performance-oriented beings, capable of amazing feats. The fact that pilots are now encouraged to acknowledge that they have feelings, or to admit that they might be in a bad mood, seems to conflict with the very fibre of the pilot's existence. To admit any "weakness" may appear to show a loss of confidence contrary to the image of what a pilot is expected to portray. But the fact of the matter is, pilots are human. Humans are not perfect 100% of the time, as we have seen in many accident cases.

As a pilot, the ability to tap another crew member as an available resource will help to compensate for the subjective human factors performance errors involved in decision making on board an aircraft. Managing the crew resources will help to ensure that all decisions and actions are in accordance with safe flight practices, and reduce the risk of an incident or accident.

Humans make errors. The rate of human error as the main factor in 75% of accidents has remained more or less constant over the last century. Simultaneously the number of accidents in aviation has fallen dramatically. But the fact remains: humans make errors, and in 75% of cases – human error is still the main contributing factor to things going wrong,

despite a decrease in the total amount of serious accidents.

With the acceptance and understanding that humans do make errors every day, it makes more sense to try and deal with the errors rather than try and eliminate them. This includes the ability to recognise when errors are present, to communicate observations and act accordingly.

Flight crew have to undergo strict medical examinations at regular intervals. The law dictates that our bodies are in the physical shape required. They have to attend refresher, recurrent and simulator training at intermediate intervals with the purpose of checking knowledge and skills. As already stated CRM focuses mostly on the psychological side of things. So what a medical examination is for the physical functions, exams for skills and knowledge – CRM is for the cognitive and psychological functions that control our behaviours and attitudes.

Definitions of Crew Resource Management

Crew Resource Management may be defined as follows:

“Crew Resource Management is the effective utilisation of all available resources (e.g. all crew members, aircraft systems and supporting facilities) to achieve a safe and efficient operation”

This may however sound quite abstract. Another way of defining CRM could be:

“CRM is about creating an expanded awareness and acceptance of human capabilities and limitations in various situations aiming to achieve a consciously modified approach”

Objective of CRM Training

The objective of CRM training in this manual follows the Authorities’ intentions:

“The objective of CRM is to enhance the communication and management skills of the flight crew members concerned. The emphasis is placed on the non-technical aspects of flight crew performance”

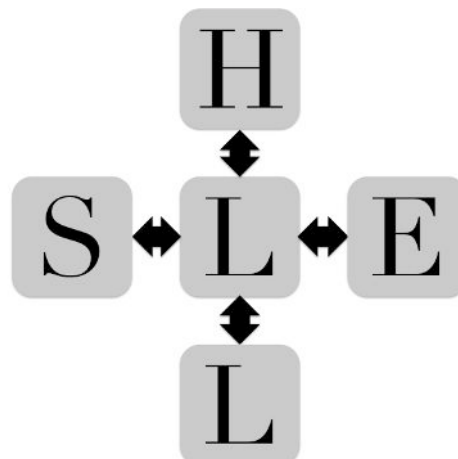
Intentionally left blank

Shell Model of Human Factors

The SHELL model is a conceptual model of CRM. The model is intended to facilitate a gradual understanding and comprehension of Human Factors.

The model consists of 5 “building blocks” – each block contains the initial letter of its components – **S**oftware, **H**ardware, **E**nvironment, **L**iveware thus each block representing the components and complexities of Human Factors. To avoid breakdowns and stress in the system the blocks must be carefully matched.

This building block diagram does not cover the interfaces which are outside Human Factors (hardware-hardware; hardware-environment; software-hardware) and is only intended as a basic aid to understanding Human Factors. Below a Shell model which can be drawn on a whiteboard to illustrate. *Note that on the models to follow the blocks all have rounded edges to indicate that they can change both in size and shape. The shape and size and how well they match depends on the situation.*



Software - the rules, procedures, written documents etc., which are part of the standard operating procedures.

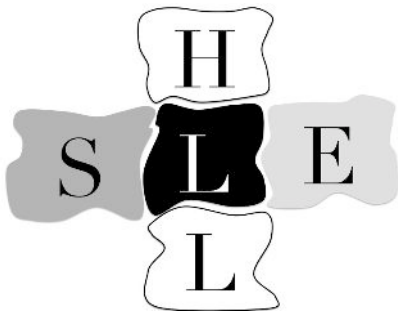
Hardware - Machine, the Air Traffic Control suites, their configuration, controls and surfaces, displays and functional systems.

Environment - the situation in which the L-H-S system must function, the social and economic climate as well as the natural environment.

Liveware - the human beings - flight crews, ATC controllers, engineers and maintenance personnel, management and administration people - within in the system.

On the next pages a more detailed description of the components and their meanings follows.

Liveware (humans)



In the centre of the model is the person or the human being. It is not a coincidence that the person is placed in the centre – humans are the most critical and most flexible component in the system. Remembering that in 75% of incidents and accidents, human error is the primary cause.

However, of all the dimensions in the model, the human being is the one which is least predictable and most susceptible to the effects of internal (hunger, fatigue, motivation etc.) and external (temperature, light, noise, workload, etc.) changes.

Human Error is often seen as the negative consequence of the liveware dimension in this model. There are two alternatives proposed when trying to limit error;

As long as humans work in the system, it would make no sense to remove the liveware dimension, because we are inevitable part of the system. However humans are prone to making errors – regardless of how much training we get, how well we do when we are evaluated. The fact is, humans cannot be removed or replaced completely by computer systems or computer controlled devices.

Liveware-Liveware (the interface between people and other people)

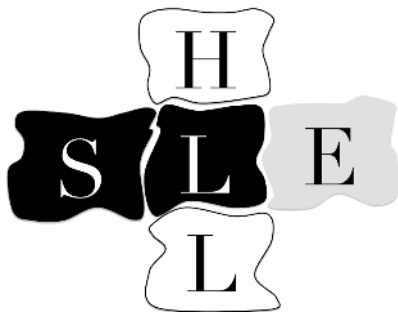


This is the interface between people. In this interface, we are concerned with leadership, co-operation, teamwork and personality interactions. Staff and management relationships are also included as a company culture and climate along with operational pressures has affects on human behaviour and performance.

Earlier it was assumed that if each individual team member was proficient, then these individuals put together would make up a team which was proficient and effective. The study of many accidents and teams has shown that this is not always a correct assumption.

Many groups are involved in the operation of an aircraft; Flight crews, air traffic controllers, management, caterers, engineering..... Group influences and individual cultures are strong, and they can play a significant role in determining behaviour and affecting performance. In brief, although these groups work toward a common goal – they are separate groups (separate cultures) within the system, not one team. Culture determines behaviour, and behaviour can affect human performance.

Liveware-Software (people and software – procedures, checklists, rules....)

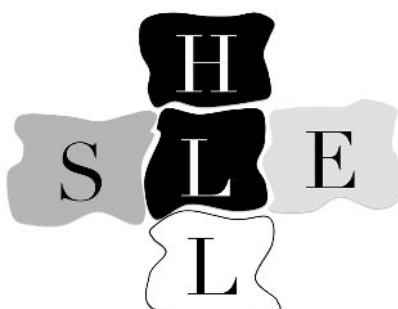


Software is the collective term which refers to all the laws, rules, regulations, orders, standard operating procedures, customs and conventions and the normal way in which things are done. Increasingly, software also refers to the computer-based programmes developed to operate the automated systems.

In order to achieve a safe, effective operation between the liveware and software it is important to ensure that the software, particularly if it concerns rules and procedures, is capable of being implemented. That they are easy to understand, simple and easy to use.

Symbology and standardisation of symbols and colours for lights and warnings – Red for emergency, green for go. Imagine a car; regardless of which car you get in you would be able to turn on the lights because the symbols used are the same in any car.

Liveware-hardware (people and machine)



Another interactive component of the SHELL model is the interface between liveware and hardware. This interface is the one most commonly considered when speaking of human-machine systems:

design of seats to fit the sitting characteristics of the human body. A pilot has to sit in his seat for a long time.

displays that match the symbology that the user is familiar with. i.e. a warning light that normally is red has been fitted with a green cover. This could lead to confusion and failure to discover the warning if activated.

the workspace in the flight deck is very restricted. In the cabin the galleys and aisles may be restricted. Imagine giving CPR to a pilot in the flight deck or in a narrow aircraft aisle.

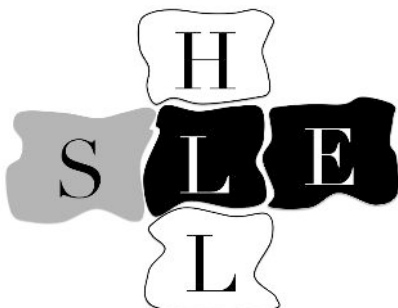
Hardware, for example in Air Traffic Control, refers to the physical features within the controlling environment, especially those relating to the work stations. As an example the press to talk switch is a hardware component which interfaces with liveware. The switch will have been designed to meet a number of expectations, including the probability that when it is pressed the controller has a live line to talk. Similarly, switches should have been positioned in locations that can be easily accessed by controllers in various situations and the manipulation of equipment should not impede the reading of displayed information or other devices which might need to be used at the same time.

The user may never be aware of an Liveware-Hardware deficiency, even where it finally leads to disaster; the reason being that humans are so good at adapting to such deficiencies – in doing so we will not remove it's existence.

As computers and advanced automated systems become more and more widespread, the issue of “man/machine” has become one of the most important aspects of Human Factors.

It is important for designers to be alert when designing new systems, as Liveware-Hardware deficiencies could be a potential hazard to safety.

Liveware – Environment (people and the environment)



The liveware - environment interface refers to those interactions, which may be out of the direct control of humans, namely the physical environment - temperature, weather.

It also refers to the “artificial environment” within the aircraft.

Much of the human factor development in this area has been concerned with designing ways in which people or equipment can be protected, developing protective systems for lights, noise, and radiation.

In the old days focus was on adapting humans to the environment;

Helmets, flying suits, oxygen masks, G-suits.....

Later the trend was to reverse this process by adapting the environment to match the human needs;

Pressurisation, air conditioning, soundproofing, suspension.....

A few examples of how humans are constantly faced with new challenges as technology advances:

Because it no longer takes several days to travel to for instance Australia, the body rhythm and sleep patterns of humans is disturbed to a higher extent than earlier. We simply do not have time to adjust to time zone differences naturally.

Due to aircraft flying at much higher altitudes than earlier, humans are exposed to much greater levels of ozone and radiation.

A few statistics

Air travel has been growing during the last 30 years. More and more aircraft find their way through a crowded sky. Despite this air travel remains the safest way of travelling. The year 2012 was the safest year in commercial aviation. And this trend is expected to continue. On average you would have to get on a plane 1.4 million times (some statistics even suggest 2 million times) to risk being involved in a serious accident.

The Tombstone Imperative by Andrew Weir states that journey for journey (rather than mile for mile which is the traditional way of measuring transport safety) "you are 12 times more likely to die in a car than on a flight".

It is clear that mile for mile the aviation industry wins due to the huge distances they travel. In that light it is easy to understand why the aviation industry prefers this comparison. However most accidents take place in the four percent of the journey which represents takeoff and landing.

It is interesting to note that since 1940, three out of four accidents have had at least 1 contributory factor relating to human performance.

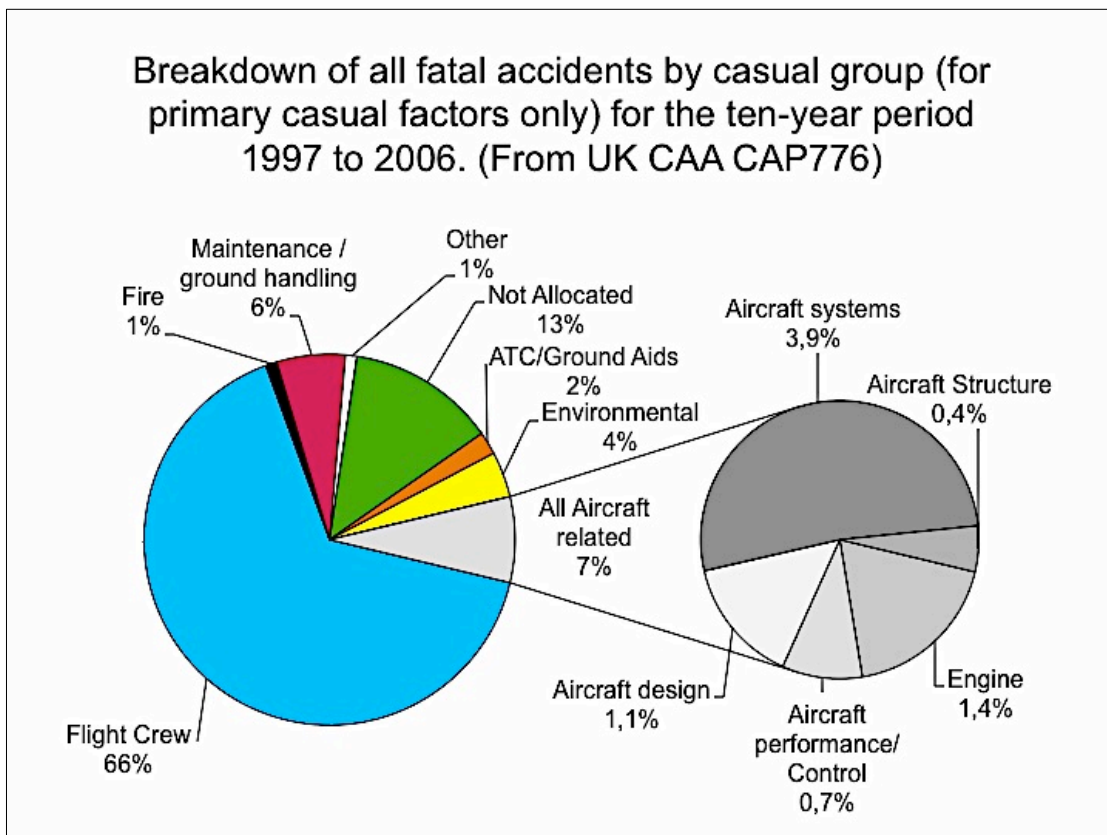
UK CAA Document CAP 776 "Global Fatal Accident Review 10997-2006" provides the following statistics:

Two thirds of all fatal accidents involved a flight crew related primary causal factor, and 7% involved an aircraft primary related factor. In other words; in the vast majority of fatal accidents human error was the primary factor.

The most frequently identified primary causal factor was "omission of action/inappropriate action", which was allocated in 22% of all fatal accidents. This generally referred to flight crew continuing their descent below the decision height or minimum descent/safety heights without visual reference, failing to fly a missed approach or omitting to set the correct aircraft configuration for take off.

Three quarters of all fatal accidents involved at least one flight crew related causal factor and 42% involved at least one aircraft related causal factor.

It is likely that human factors issues also played a primary role in some of the one third of fatal accidents where the primary causal factors were not directly flight crew related. For example human factors in:



- Maintenance
- ATC
- Equipment Design

However these are not so easy to detect due to the fact that Cockpit Voice Recorders and Black Boxes only exist on board aircraft.

Summary

The lesson plans in NaviMinds' CRM Trainer Manual are designed to promote group participation and encourage feedback. We have included numerous examples of group exercises that are not only fun and engaging - they are also designed to help bridge theory into practice.

CRM training is all about raising the issue of human error without pointing the finger of blame at any individuals.

Machines are logical - humans are not. We can be rude or unpleasant to a machine, and it will still provide the correct information provided we have pressed the right buttons and controls. But people are different, we are emotional individuals. Emotions are a fact as far as human are concerned. And it is most often our emotions that inhibit a free flow of information despite the common knowledge, that communication and sharing information is vital. Many accidents have showed, that individuals of a team were in possession of vital bits of information that never saw the light.

It will never just be the leader or the Captain who fails - it is the group as a whole. Because it is the group as a whole that holds all the relevant bits of information. However it is important that any leader (or trainer) develops an in-depth understanding of humans, our capacities and limitations as well as an increased understanding of communication enabling them to stimulate information sharing.

Crew Resource Management aims at creating an awareness around the mechanisms that make us react and "stray" from the ideal way of handling things.

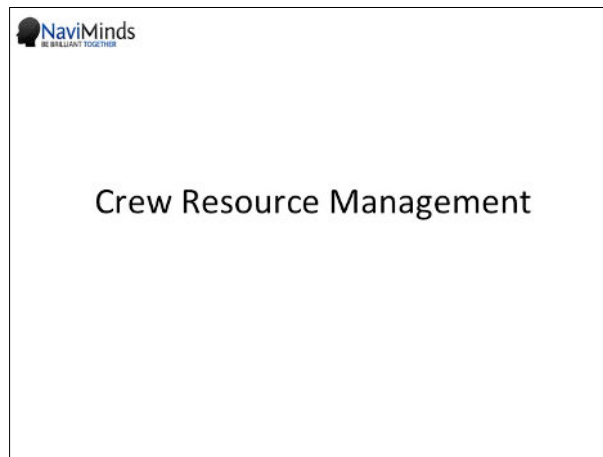
CHAPTER 1 - CRM - INTRODUCTION AND HISTORY

INTRODUCTION TO CRM

LESSON PLAN

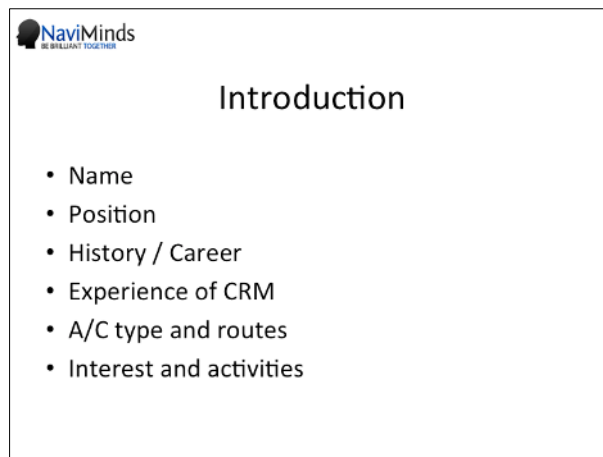
Crew Resource Management

PP



Trainer Introduction

PP




Trainer introduction: Firstly introduce yourself according to the points on the slide. It is a good idea to make your own slide, writing down your name, position, your brief history. Getting both the auditory and visual information is going to help students remember who you are. Leave the slide on for students to introduce themselves one by one afterwards.

Student introduction: Secondly ask students to introduce themselves according to the points on the slide. This is important, as it will give you clues as to how much CRM experience exists within the group. A good tip is to take notes of students' names, their seating position in the classroom and

short points that help you memorise their backgrounds, experience.....If students do not know each other the mention of their interests could create a good base for discussion amongst them during their breaks. This is also a good time to hand out name cards to be completed if required.

Nice to know

PP



Nice 2 know information

- Timings during the day
- Smoking
- Escape routes
- How the course will be conducted
- Your participation
- Mobile phones

Timings: Especially draw attention to the fact that timings can vary. Tell them you aim for lessons of approx. 45-50 minutes. Students should always have the opportunity to ask for a break if they need one.

Smoking: Explain the smoking policies in the building. Where can people smoke.

Escape routes: It is a good idea to mention escape routes if students are not familiar with the surroundings


How the course will be conducted: A mix of theory, practical group exercises and video clips.

Your participation: Point out to students that you really want them to participate. It is their course, and their input and ideas are valuable to you and the group as a whole. The more they give - the more they will get out of it. CRM is a subject that allows for different viewpoints to submerge without being judged or leaving the room.

Mobile phones: Ask students to please turn off their mobile phones unless they are on call. It is a good idea to pass on this bit of information before the course starts. If you do not, you will without a doubt have to pick up on the subject later. The video clip “Teacher destroys student’s phone” could be shown to as an icebreaker to illustrate what might happen is they leave their phones on.

Teacher destroys students telephone


VC



Program for today

- Lesson 1: Introduction to CRM
- Lesson 2: Communication
- Lesson 3: Behaviors
- Lesson 4: Assertiveness
- Lesson 5: Stress
- Lesson 6: Fatigue, sleep and vigilance

It is always a good idea to set the agenda before starting the course. This will give your students a good idea of what to expect. A program can vary according to which type of course you are conducting. Above is an example of what a program could look like.



Why Crew Resource Management?

- What is CRM about?
- The origin of CRM?
- What is meant by "resources"?



Ask students: What is CRM about?

CRM is a complete training program affecting the way you think and the way you act. It is intended to:

- Adjust attitudes and behaviour
- Acknowledging that human error is a normal as breathing

- To enhance our knowledge of human limitations and just how much we are capable of, but also the limitations we have
- Lead us to acknowledging that human error is as normal as breathing and that if we know that humans do continue to make errors, it makes sense to accept that and deal with the effects of the errors rather than trying to eliminate them



Ask students: What do you know about the origins of CRM?

CRM emerged as a result of accident investigations:

The study of many aircraft accidents has led to CRM as we know it today. Contrary to what we might think, most accidents do NOT happen because of technical problems with an aircraft. Research has long shown that in 3 out of 4 accidents, the main cause has been some sort of human error. Human error can be described as an action, inaction or reaction to a situation, that causes an accident. Human error was also described as failures of interpersonal communication, leadership, and decision making in the cockpit. The industry wanted to address this awareness and this led to the introduction of CRM

This awareness became more apparent towards the end of the 1970's. In 1979 NASA held a workshop that focused on improving air safety by reducing human error. The training programs that came out of this workshop were initially titled Cockpit Resource Management. This title was soon replaced by Crew Resource Management as studies concluded that safety was under the influence of ALL crew, and all personnel in the aviation system (ATC, handling, engineering, management, finance....) – NOT only those on the flight deck. In many cases air accident investigations have shown that vital information (resources) was available to the Captain – but tragically it was not utilised.



Ask students: What is meant by “resources” (resource management)?

Examples of resources could be:

- Crew, people involved
- Aircraft Systems
- Standard Operating Procedures
- Supporting facilities (ATC, handling, baggage loaders, engineering, management)
- Pieces of information and the exchange hereof.

TIP: of the best examples of accidents that contributed towards the development of CRM is the Tenerife disaster involving to Boeing 747's from KLM and Pan Am in the 1970's. The film can be found in various variations on websites such as YouTube and Google. If you are conducting an initial training course, or dealing with a group of people who have limited knowledge of CRM – showing this video could be a good starting point. Remember – a training video should ideally be less than 25 minutes long.


Tenerife disaster

VC

Discuss the video clip. There were many factors involved. Workload, stress and time pressure but the Captain's attitude towards his colleagues is believed to have been a major contributor towards the accident. The resources were available on the flight deck, in this instance, however, the crew did not use them to their full potential. Every one involved in the accident all had a certain amount of skills, knowledge and attitude.

A - S - K

PP



A – S – K

- Attitude
- Skills
- Knowledge

Define the difference between attitude, knowledge and skills:

Attitude: Our attitude becomes evident in our verbal and non verbal communication. It is what other people can observe and make sense of - and it influences how other people react. Our attitude reveals how we feel about a person, an issue, situation or other.

Skills: Skills can be compared to driving a car. The first time we got into a car, we had to concentrate immensely on operating the clutch and the gears - however with practice they soon become an integrated part of our driving without further conscious effort.

Knowledge: Knowledge can be described as “what we know”. It is the books we have read, the sense we make on a conscious level. If compared to driving it could be how well we know the road signs, the traffic rules - it can also be knowledge on how to operate the clutch and gears. However this knowledge is not transformed into skills unless we practice.



Ask students: Which of these three categories would you consider most important?

Listen to their answers and be open to differences in opinions. (save the discussion for later as we will return to the three categories attitude, skills and knowledge at the end of this lesson)

When CRM was first implemented, there was quite a lot of objections towards it from crew. Nowadays this resistance has changed, and there is a greater acceptance and openness towards CRM amongst aircrew – generally. However, there are still people who object to CRM and who think they do not need it.

Realistically we are aware that sometimes even CRM does not reach some people.

Split the class into two halves and let them work on the two questions on the next PowerPoint slide. Give one half 5 minutes to discuss the first question and the other half of the class 5 minutes to discuss the second question. When the groups have finished working, discuss their answers in class.

Success with CRM

PP

The slide features the NaviMinds logo in the top left corner. The main title is 'Success with CRM?'. Below the title are two questions: 'What factors will help us be successful with our CRM training?' and 'What factors can block people's openness to CRM?'.

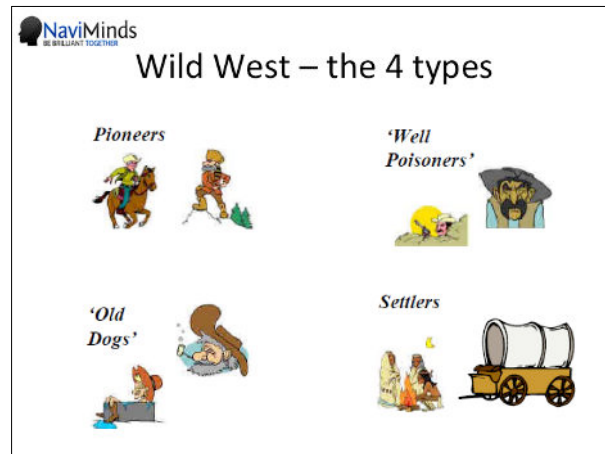
Possible answers could be:

- Support from management
- Dedicated team (who is that – just the aircrew?)
- Trainers who are role models
- A good working environment
- Fear of failure
- Trainers who are not role models
- Too much “psycho babble”
- Resistance to change

As the point “resistance to change” is to be looked at on the next slide, you should aim for students to mention this point themselves. If they do not you can shift the focus to the aviation industry being an ever changing business. The introduction of low cost carriers, the old flag carriers losing money and becoming increasingly pressured. Using that as your stepping stone move on to the next slide as described beneath.

Wild West - the 4 types

PP

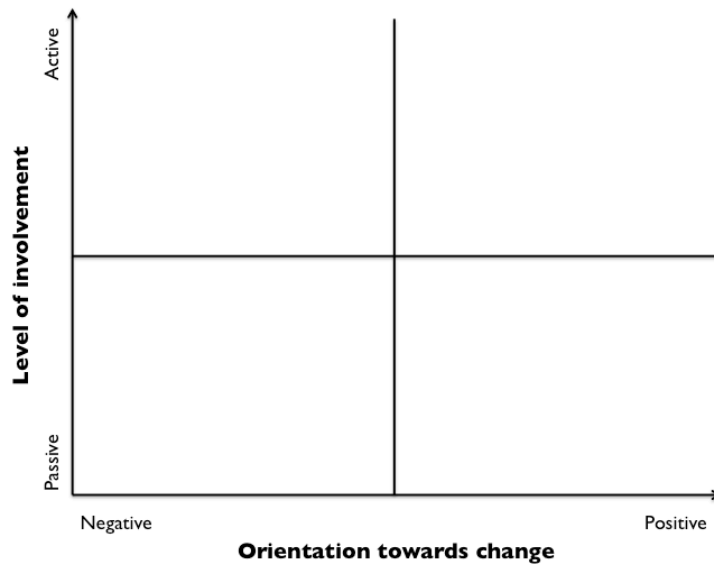


Explain that “resistance to change” is a very powerful mechanism. You introduce something new in the workplace (like CRM when it was first introduced) – and many people just do not want to know about it. They think they were managing just fine, so why do they have to comply with yet another change? Some people may even see it as a further demand on them. Some people will react adversely against this change and there are several ways of reacting:

- **Pioneers – Make the change.**
Have a vision, energetic, take risks, challenge conventional thinking, can be impatient.
- **Well Poisoners – Do anything to stop the change.**
Find ways to sabotage or delay advances, talking much – doing nothing, promise much – deliver little, spread unhelpful rumours. Can be terrific allies if they can be “turned” around.
- **Old dogs – Don’t want to change.**
Lament about how good things were in the old days, keep their heads down, happy as things are.
- **Settlers – Go with change.**
“Feed” pioneers with the physical and emotional resources they need, conservative by nature, warn pioneers of potential dangers, come to rescue when necessary.

LESSON PLAN - CRM - INTRODUCTION AND HISTORY

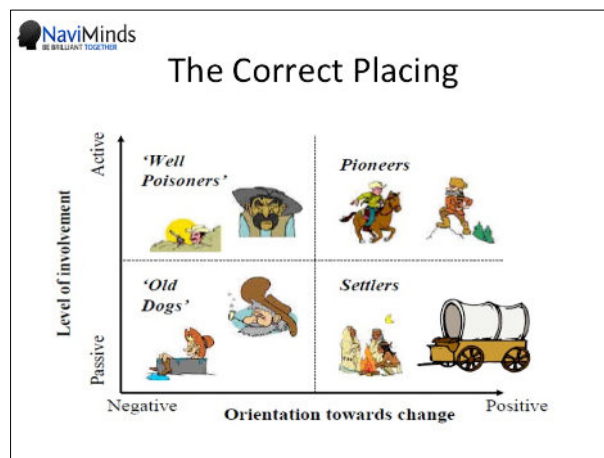
Draw the diagram below on the flip chart and ask students to place the 4 types you have just discussed in the 4 “boxes” where they think the 4 different types belong:



Then show the “correct” placings on the next PowerPoint slide:

The Correct Placing

PP



Elaborate and conclude that having the right people with the right attitude is vital for optimal crew performance.

The next question is supposed to help draw focus back to the fact that attitudes are fundamental to successful CRM and crew performance. Just ask the question and follow the three steps:



Ask students: Imagine you won 55 million in the lottery and you can finally make a dream come true and start your own business. What qualities would you look for in your future staff?

1. List all answers on a flip chart (make sure to get quite a few different answers)
2. Write A S K (for attitude, skill, knowledge) on next flip chart page
3. Divide the qualities they mentioned into the three categories

The point is that most of the qualities the students bring up in step 1 are in fact attitudes. Some might be skills and knowledge – but possessing knowledge and skill to perfection with the wrong attitude might create a problem. On the other hand people with the right attitude may not have the skills and the knowledge to begin with – but their attitude will make them go and get it. It will also be a good contribution to team work. This is a very good reason why CRM focuses on behaviour and attitudes. And this sums up the previously posed question about which of the three categories: attitude, skills and knowledge is most important.

Now that we have agreed that attitudes are very important, lets look at what groups are involved in a normal flight, and who we need to keep a good relationship with:

Groups involved

PP



Groups involved

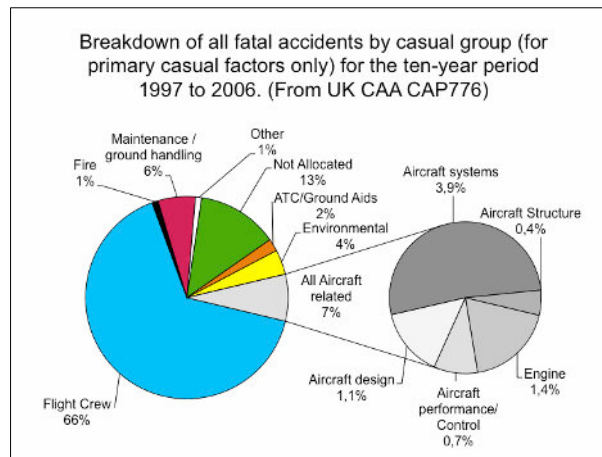
- Operations, rostering
- Training departments
- Crew
- Management
- Engineers
- Fuelling staff
- Cleaners
- Security
- Fire services
- Caterers
- Security
- ATC
- Handling

It is important that we are aware of the effect of good interpersonal relationships with all the groups we have just mentioned.

We need people to tell us if something is looking out of the ordinary. If you have a good, open dialogue with them, the chances of people passing on important information are better than if you have a poor dialogue or relationship with them. This creates a better working environment with less stress and arguments – stress is known to increase the risks of human error. This becomes evident when we look at statistics for primary causes of fatal accidents.

Move to the next PowerPoint slide to show that statistics confirm that “human error” plays an important role in accidents:


Breakdown of fatal accidents.... **PP**



Statistics clearly indicate that most fatal accidents are caused by human factors. Only 7% of accidents are caused primarily by problems with the aircraft. The diagram shows that approximately 75% of all accidents are caused by a breakdown in teamwork and communication. Just as we saw in the Tenerife accident and in many other more recent accidents. The aim of CRM is to reduce accidents caused by humans. This is also evident in many official definitions of CRM.

Move on by showing one of the most widely used definition used on the next PowerPoint:

Definition of CRM **PP**



Definition of CRM

To enhance the communication and management skills of the flight crew members by the effective utilisation of all available resources to achieve a safe and efficient operation

TGL 44 JAR-OPS

Clearly the objective is to ensure a safe and efficient operation.

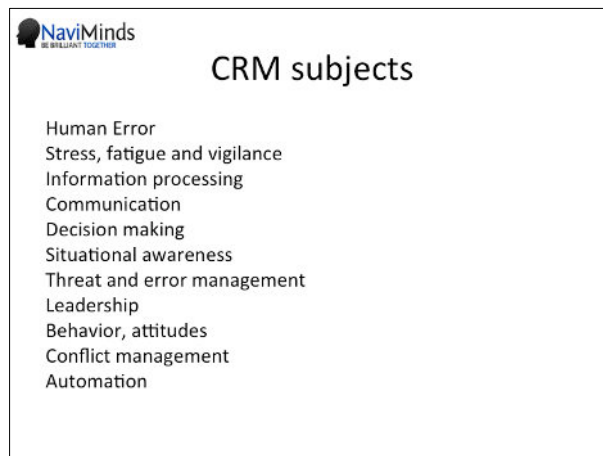


● Ask students: So how do we manage a safe and efficient operation. What are our tools to do that?

Take the students to some of the core elements of CRM training by showing the next slide.

CRM subjects

PP




These are the subjects that will help us and provide some tools. That is why CRM focuses on practicing these areas. Summarise the lesson with these points:

- CRM training is intended to raise the issue of human error without pointing the finger of blame at individuals
- CRM is about the safe operation
- To be effective CRM needs to become a state of mind, a culture
- Please participate – your thoughts, opinions and suggestions make the course
- We aim to promote an awareness of our attitudes and how they can affect communication, teamwork and ultimately safety

Finish the lesson with this small, competitive exercise to stress the importance of attitudes. Tell students that each number on the next slide represents a letter in the alphabet. 1 is for A, 2 is for B, 3 for C and so on.... There are 8 numbers in total, so you will have to find 8 letters that correspond. The first person who figures out the word says it out loud. Then show the next PowerPoint slide to reveal the numbers and “let the game begin”:

Find the word

PP



Find the Word

1 – 20 – 20 – 9 – 20 – 21 – 4 – 5

The word they are looking for is ATTITUDE..... Then ask who can most quickly add up the 8 numbers on the PowerPoint slide: 1+20+20+9+20+21+4+5 = 100 (for 100% important)

Finish the lesson by stressing that CRM focuses on the “soft skills” and that ATTITUDE is 100% important when it comes to the safety.