Trainer's manual

1 Based on EASA Part-ORO CRM training syllabus

2 Extensive background information on all contents

3 14 Plug n' play lesson plans for each topic

THIS IS

CREW RESOURCE MANAGEMENT TRAINER'S MANUAL

Your all-in-one tool to assist you with your future task as a Crew Resource Management Trainer

No. 1

"Best Aviation Crew Resource Management Firm 2023"

- EU Business News

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NaviMinds ApS
Crew Resource Management Training

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Dear Crew Resource Management Trainer,

This CRM Trainer Manual is an easy-to-use tool for you as a Crew Resource Management Trainer. We have put great effort into designing this manual in a layout and format that can be easily adapted to all your future CRM and Human Factors training assignments.

We have taken all reasonable care in designing a manual, which starts with an introductory section describing the essence of a facilitator's role. In addition to the preceding section, you will discover 13 chapters describing all the various elements of CRM. Finally, chapter 14 contains instructions for group exercises.

Each of the 13 chapters is further divided into these parts:

- The first part of each chapter contains essential 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 trainer notes. The lesson plan serves as a tool for you as a trainer, and you can keep it in front of you as a backup. It is meant to help you feel confident in facilitating the proposed lessons. The lesson plans are all quite extensive, designed to let you use them entirely as they are or take out the bits that you find relevant - either for the timeframe of a training course or taking into account the previous experience of your students.

Before using the lesson plans, we suggest you familiarise yourself with all the chapters and background information.

I wish you and your future students all the best of success and lots of inspiring training.

Kind regards

Anne G. Sølvsteen Knudsen

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PowerPoint slide

Hand out to students

Show a video clip

Read boxed text out aloud

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, hand out a paper, describe or inform.

Italic text indicates additional advisory information for the trainer.

Text in boxes indicate optional exercises that can be used at the discretion of the trainer if time permits.

Indicates that it would be a good idea to write down your students' answers on a flip chart/whiteboard

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Table 1: Flight Crew CRM training

CRM training elements	Initial operator's CRM training	Operator conversion course when changing aircraft type	Operator conversion course when joining an operator	Annual recurrent training	Command course
General principles					
Human factors in aviation; General instruction on CRM principles and objectives; Human performance and limitations; Threat and error management.	In-depth	Not 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	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

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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
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

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Table 1: Cabin Crew CRM training

CRM training elements	Operator's CRM training	Operator aircraft type conversion training	Annual recurrent training	Senior cabin crew member (SCC) course
General principles				
Human factors in aviation; General instructions on CRM principles and objectives; Human performance and limitations; Threat and error management.	Required	Not required	Required	Required
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.	Required	Required	Required (3-year cycle)	Required
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 inexperiences cabin crew members;	In-depth	Required when relevant to the type(s)	Required (3-year cycle)	In-depth

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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
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. Participation in cabin safety incident and accident reporting	In-depth	Required when relevant to the type(s)	Required (3-year cycle)	In-depth
Case studies	In-depth	Required when relevant to the type(s)	In-depth	In-depth

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INTRODUCTION TO CREW RESOURCE MANAGEMENT

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CRM - introduction and history

Crew Resource Management (or Team Resource Management) is a complete training programme initially designed to increase safety and minimise accidents in aviation caused by the crew. Nowadays, the programme is mandatory worldwide, meaning that all flight crew (pilots, cabin crew, and engineers) must attend a CRM or Human Factors course regularly.

Crew Resource Management incorporates communication and behaviours, leadership and management skills, decision making, situational awareness, man/machine interface (automation), stress and stress management, fatigue, vigilance, information acquisition and processing, and resilience development - a comprehensive 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. This is done via new and secure technology at the technical and non-technical levels (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, followed by 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, a failure of aircraft handling skills, or a lack of technical knowledge on the part of the crew. Instead, they are caused by the inability of crews to respond appropriately to the situation they find themselves in.

For example, inadequate communication between crew members and other parties could lead 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 perform better than two (or three) individuals in the cockpit. CRM aims to ensure 1+1>2 instead of 1+1<2 (in a two-pilot cockpit). This phenomenon is often referred to as the "synergy effect". Synergy can be defined as; "the sum of information held by individuals of a team". Effective communication is necessary to ensure that the information required is constantly flowing. 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.

To be effective, team members must be able to talk to each other, listen to each other, share information and be assertive (assertiveness is described in further detail in this manual) when required.

Commanders/Captains should take particular responsibility for ensuring the crew function effectively as a team.

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

From the beginning of a flying career, pilot training programmes have focused almost exclusively on the technical aspects of flying and individual pilots' performance and problem-solving capabilities. But accident statistics show that many problems flight crews encounter have very little to do with the technical aspects of flying. Therefore, to improve flight safety, the priorities must shift (have shifted) from operating independently in a multi-crew environment to problem-solving using all available resources (crew, aircraft systems, equipment, passengers).

From the cabin crew's perspective, 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. In our day and age, we have come a long way in integrating these ways of thinking. However, a continued effort is crucial to changing and maintaining these ways of thinking, which in many ways are opposites to the culture we have grown up in.

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 stemmed from NASA research which indicated that failures of interpersonal communication and leadership caused the majority of aviation accidents 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 between the airline industry and other industries is that good and poor accomplishments are exceptionally well documented—the so-called "black box" on board a commercial aircraft documents every event leading to an accident. And the effects of every word spoken are scrutinised by experts to take learning from the accident.

Technical failures or weather hazards account for 25 to 30 % of causes of accidents, whereas human factors-related causes account for the remaining 70 to 75 % of the accidents. So, the human factor is the area we need to work on.

Different generations of CRM

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 on cabin crew (Crew RM)

3rd Generation

An attempt at integration with technical training i. e. in simulator sessions focuses 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 Threat and Error Management

CRM concepts are not designed to challenge the Captain's authority 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 coordination 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 aircraft, and they were both on the ground when the accident happened. Nevertheless, 583 people lost their lives. This accident initiated a more extensive investigation:

How could two such big aircraft operated by experienced professionals end in disaster?

During this investigation, the focus was drawn to the human factors that resulted in the accident. In brief, Human Factors are explained as the physiological limitations in performance and psychological factors. Human Factors played a vital role in the worst aviation disaster in history, perhaps more importantly: our ignorance about these issues and their importance at the time.

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

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.

As a pilot, tapping another crew member as an available resource will help compensate for the subjective human factors and performance errors involved in decision-making on board an aircraft. In addition, managing the crew resources will help ensure that all decisions and actions follow 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 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 crews must undergo strict medical examinations at regular intervals. The law dictates that our bodies are in the physical shape required. In addition, they have to attend refresher, recurrent and simulator training at intermediate intervals to check their knowledge and skills.

As already stated, CRM focuses mainly on the psychological side of things. So, what a medical examination is for the physical functions, and 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 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."

"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"

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 – Software, Hardware, Environment, and Liveware. Thus, each block represents the components and complexities of Human Factors. The blocks must be carefully matched to avoid breakdowns and stress in the system. This building block diagram does not cover the interfaces outside Human Factors (hardware-hardware, hardware-environment, software-hardware) and is only intended to aid in understanding Human Factors. Below is the Shell model, which you can draw on a whiteboard to illustrate.

Note that all blocks have rounded edges to indicate that they can change in size and shape. The shape and size and how well they match depend on the situation.
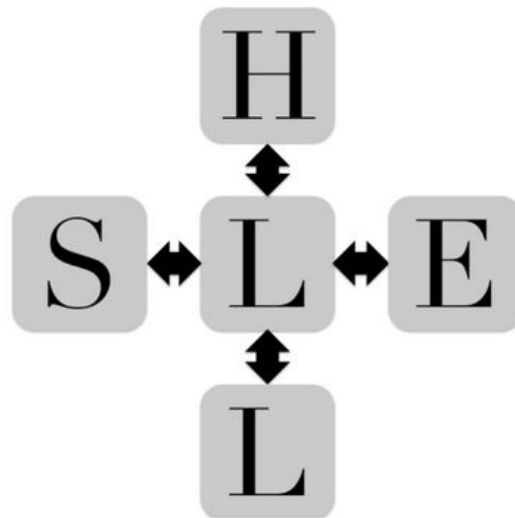
Software - the rules, procedures, written documents etc., which are part of the standard operating procedures.

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 the system.

A more detailed description of the components and their meanings follows in the following.

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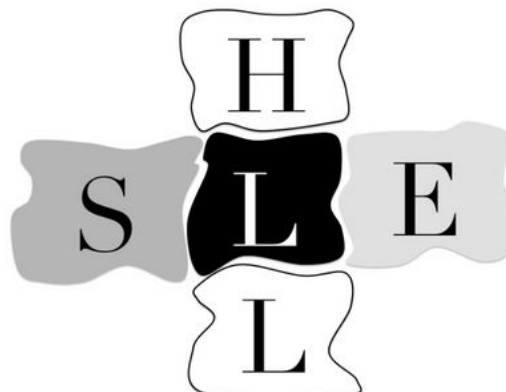
In the centre of the model is the person or the human being. It is not a coincidence that the person is placed in the centre – humans are the system's most critical and most flexible component. Remember that in 75% of incidents and accidents, human error is the primary cause.

However, of all the dimensions in the model, the human being is the 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, removing the liveware dimension would make no sense because we are an inevitable part of the system. However, humans are prone to making errors – regardless of how much training we get and how well we do when we are evaluated. The fact is that humans cannot be removed or replaced entirely by computer systems or computer-controlled devices.

Liveware - Liveware (people and other people)

This is the interface between people. In this interface, we are concerned with leadership, cooperation, teamwork and personality interactions. Staff and management relationships are also included as company culture, climate, and operational pressures affect human behaviour and performance.

Earlier, it was assumed that if each team member were proficient, these individuals would make up a skilled and effective team. However, studying many accidents and teams has shown this is not always a correct assumption.

Many groups are involved in the operation of an aircraft; Flight crews, air traffic controllers, management, caterers, and engineering. Group influences and individual cultures are strong and can significantly determine behaviour and affect 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 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 usual way things are done. Increasingly, software also refers to the computer-based programmes developed to operate automated systems.

To achieve a safe, effective operation between the liveware and software, it is crucial to ensure that the software, particularly if it concerns rules and procedures, can be implemented. Furthermore, the implementation needs to be easy to understand, simple and easy to use.

For example, symbology and standardisation of symbols and colours for lights and warnings – Red for an 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 chair for a long time.
- displays that match the symbology that the user is familiar with. i.e. a warning light that usually 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 on 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 workstations. For example, the press-to-talk switch is a hardware component that interfaces with liveware. The switch will have been designed to meet several 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 controllers in various situations can easily access, and the manipulation of equipment should not impede the reading of displayed information or other devices that might need to be used simultaneously.

The user may never be aware of a 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 its existence.

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

Designers must be alert when designing new systems, as Liveware-Hardware deficiencies could be a potential safety hazard.

Liveware - Environment (people and the environment)
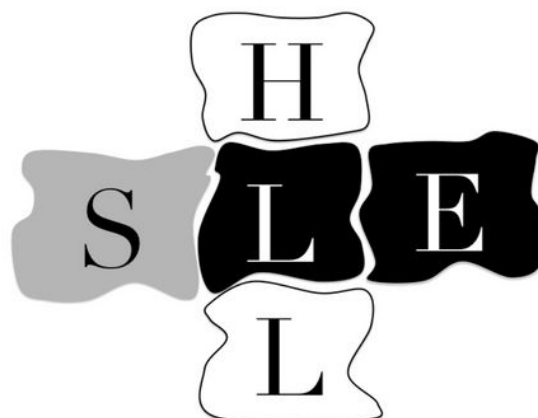
The liveware-environment interface refers to those interactions which may be out of the direct control of humans, namely the physical environment - temperature, weather. It also refers to the "artificial environment" within the aircraft.

Much of the human factor development in this area has been concerned with designing ways in which people or equipment can be protected and developing protective systems for lights, noise, and radiation. The old days focused on adapting humans to the environment; Helmets, flying suits, oxygen masks, and G-suits.

Later the trend was to reverse this process by adapting the environment to match human needs; Pressurisation, air conditioning, soundproofing, and suspension.

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 greater 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 grown over the last 50 years, skyrocketing in the last 18-20 years. As a result, more and more aircraft find their way through a crowded sky. However, this air travel remains the safest way of travelling. With only 59 lives lost worldwide, 2017 was the safest year in commercial aviation. And although 2019 has surpassed this number, this trend is expected to continue. On average, you would have to get on a plane 1.4 million times (some statistics suggest 2 million times) to risk being involved in a severe accident.

2017 – the safest year in the history of aviation

Airliner accident fatalities by year from 1971 to 2017

Source: Aviation Safety network
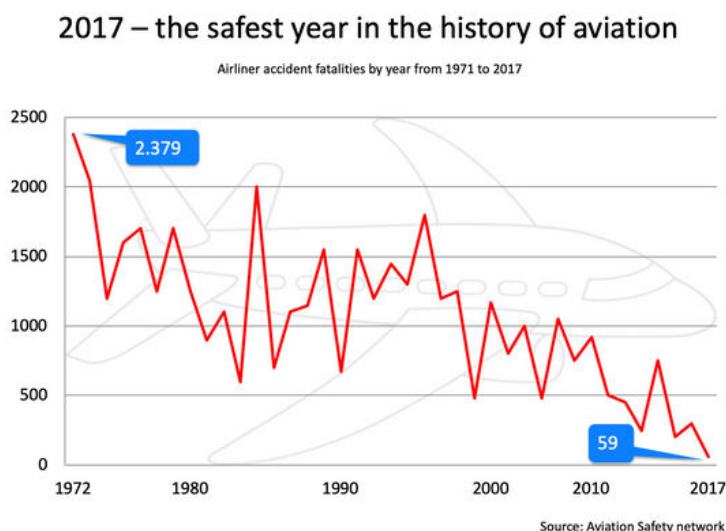
The Tombstone Imperative by Andrew Weir states that journey for journey (rather than a mile for mile, which is the traditional way of measuring transport safety),*"you are 12 times more likely to die in a car than on a flight".* Mile for mile, the aviation industry wins due to the vast distances they travel. In that light, it is easy to understand why the aviation industry prefers this comparison. However, most accidents occur in the four per cent of the journey, representing takeoff and landing. It is interesting to note that since 1940, three out of four accidents have had at least one contributory factor relating to human performance.

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, human error was the primary factor in the vast majority of deadly accidents.

Breakdown of all fatal accidents by casual group (for primary casual factors only) for the ten-year period 1997 to 2006. (From UK CAA CAP776)
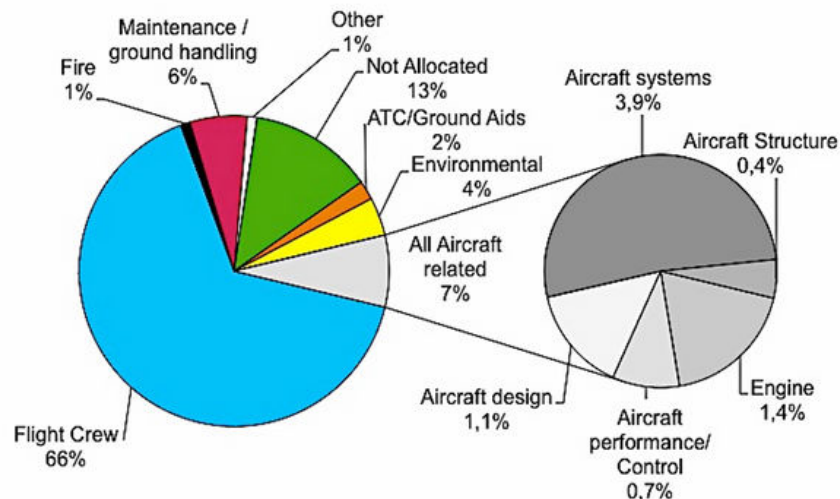
The most frequently identified primary causal factor was "omission of action/inappropriate action", which was allocated in 22% of all fatal accidents. This generally referred to flight crew continuing their descent below the decision height or minimum descent/safety heights without visual reference, failing to fly a missed approach or omitting to set the correct aircraft configuration for takeoff. 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.

- Maintenance
- ATC
- Equipment Design

However, these are not so easy to detect since Cockpit Voice Recorders and Black Boxes only exist on board aircraft.

Summary

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

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 humans are concerned. And most often, our emotions inhibit a free flow of information despite the common knowledge that communication and sharing information are vital. Many accidents have shown team members had crucial 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, any leader (or trainer) must develop 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 awareness around the mechanisms that make us react and "stray" from the ideal way of handling things.

Introduction to crew resource management
Main topics

Introduction to CRM and the history of CRM, General instructions on CRM principles and objectives, Human factors in aviation

Other topics

Attitudes and behaviours, human error and reliability

Welcome students and make a brief introduction to the human factors course. Then move to introduce the trainer/trainers:

Introduction

Student Intro

- Name
- Position
- Experience (teaching, human factors, other)
- Why do **you** want to be a CRM trainer?
- Anything else of interest
- Expectations of the course.

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 auditory and visual information will help students remember who you are.

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 human factors 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 and experience.

Then tell students you have some practical information and show the following slide:

Nice to know

Nice 2 know

- Emergency Exits
- Lunch and timings during the course
- How the course will be conducted
- Your participation
- Your silence.

(The slide can, of course, be edited to contain the points which you find the most relevant).

Timings during the day: Tell them you aim for lessons of approx—50 minutes to an hour. Students should always be allowed to ask for a break if needed. Knowing this will help your students relax and get the most out of the course.

Smoking: Explain the smoking policies in the building. Where can people smoke? Escape routes: If students are unfamiliar with the surroundings, point out the emergency exits. That is professional in a safety-critical industry.

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

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

Your silence: This point is meant to help you, the trainer, remember to tell students that some exercises have a point to them. And that you would like them to be silent about these and not tell their colleagues who are coming on to the course at a later date what the exercises are about.

Feel free to create your own slide with the points applicable to the course. Other tips include sanitary facilities, lunch and refreshments, use of computers and wifi.

Programme for day 1

Programme for today

LESSON 1: Introduction to Human Factors
LESSON 2: Communication
LESSON 3: Safety culture and organisational factors
LESSON 4: Teamwork
LESSON 5: Professionalism and integrity
LESSON 6: Sitational awareness

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. Display each of the required lessons on a slide – or make a hand-out that you can place on the tables for when students arrive.

Why crew resource management

Why Crew Resource Management?

• What is CRM about?

• The origin of CRM?

• What is meant by "resources"?

? 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 as 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 acknowledge 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

?   **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 leading cause has been some 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 1970s. 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. Crew Resource Management soon replaced this title 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.

?   **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 Boeing 747s from KLM and Pan Am in the 1970s. The film can be found on various websites, such as YouTube and Google. If you are conducting an initial training course or dealing with a group of people with 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

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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 significantly contributed to the accident. The resources were available on the flight deck in this instance; however, the crew did not use them to their full potential. Everyone involved in the accident had a certain amount of skills, knowledge and attitude.

A - S - K
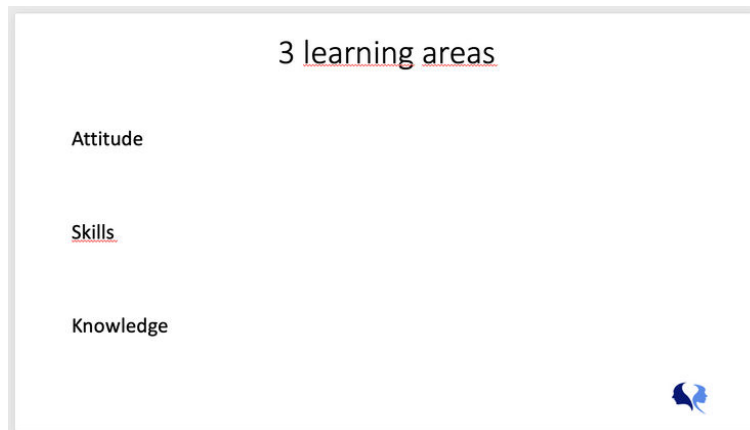
Define the difference between attitude, knowledge and skills:

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 others react. Our attitude reveals how we feel about a person, an issue, a 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 integrated into 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. For example, if compared to driving, it could be how well we know the road signs and 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 it.

?   **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 of attitude, skills and knowledge at the end of this lesson).

When CRM was first implemented, the crew had many objections towards it. Nowadays, this resistance has changed, and there is generally a greater acceptance and openness towards CRM amongst aircrew. 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.
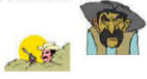
Success with CRM

Possible answers could be: Support from management, a 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 "psychobabble", 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. For example, the introduction of low-cost carriers caused the old flag carriers to lose money and become increasingly pressured. Using that as your stepping stone, move on to the next slide described below.

Wild west - 4 types

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 do not want to know about it. They think they were managing just fine, so why do they have to comply with 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 responding:

- **Pioneers – Make the change.**
Have a vision, be energetic, take risks, challenge conventional thinking, can be impatient.

- **Well Poisoners – Do anything to stop the change.**
Find ways to sabotage or delay advances, talk much, do nothing, promise much, deliver little, and spread unhelpful rumours. They 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 and come to the rescue when necessary.

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:
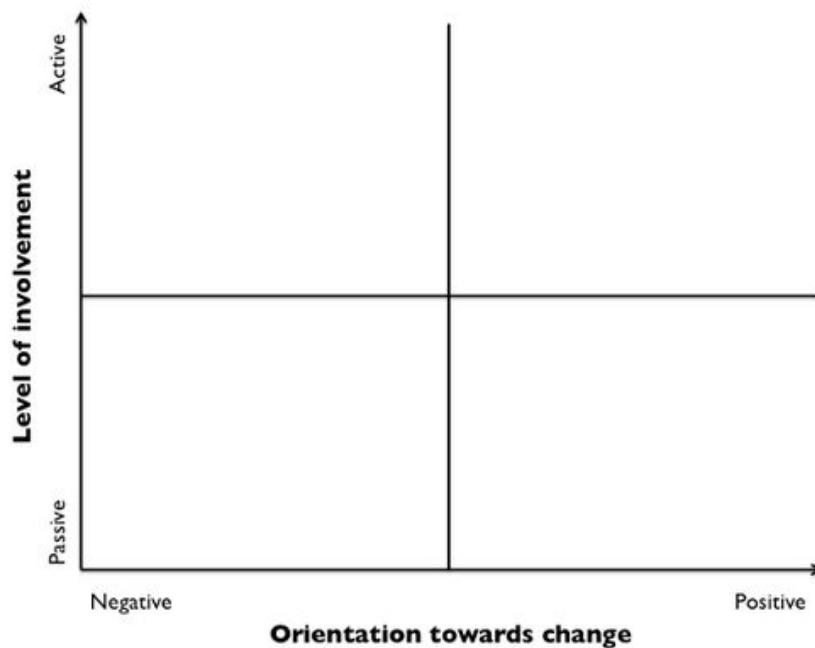
Then show the "correct" placing's on the next PowerPoint slide:

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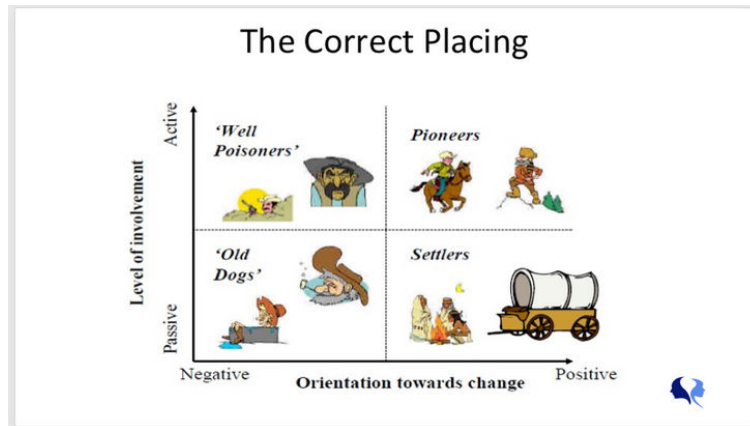
Elaborate and conclude that having the right people with the right attitude is vital for optimal crew performance.

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

? **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 the 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 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 an excellent contribution to teamwork. This is an excellent reason why CRM focuses on behaviour and attitudes. And this sums up the previously posed question about which of the three categories is most important: attitude, skills, or knowledge.

Now that we have agreed that attitudes are fundamental let's look at what groups are involved in a routine flight and whom we need to keep a good relationship with:

Groups involved

We must be aware of the effect of good interpersonal relationships with all the groups we have just mentioned.
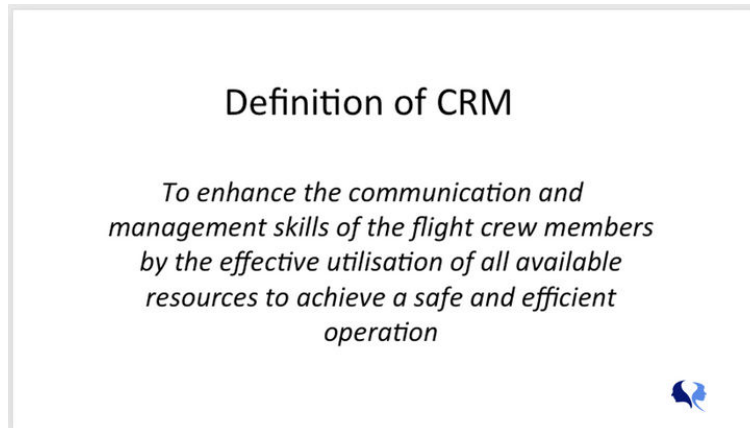
We need people to tell us if something looks out of the ordinary. If you have a good, open dialogue with them, the chances of people passing on vital information are better than if you have a poor dialogue or relationship with them. This creates a better working environment with less stress and arguments – 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 essential role in accidents:

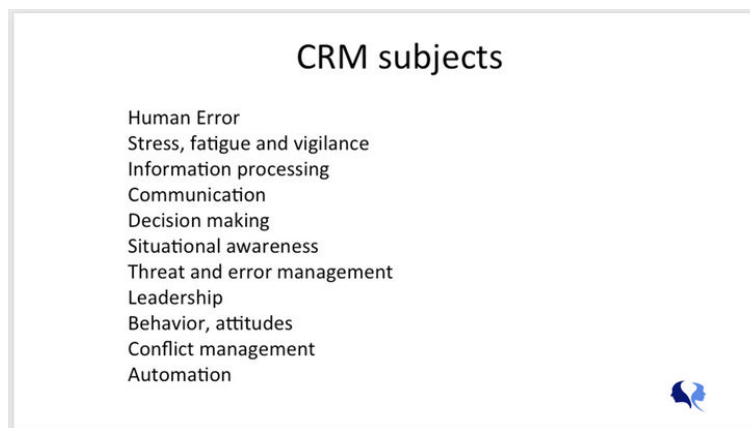## Breakdown of fatal accidents
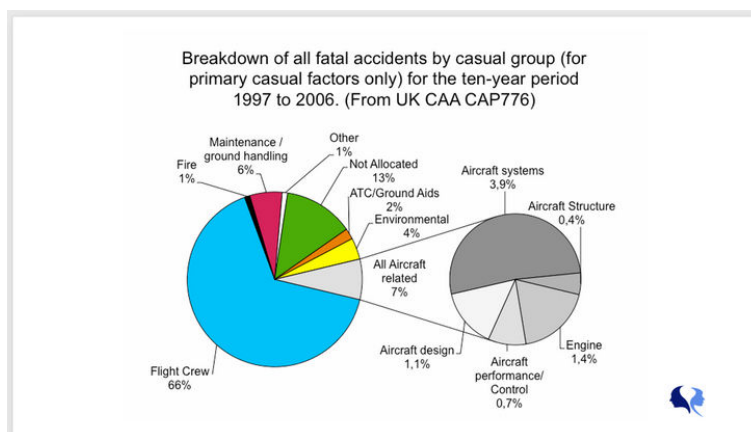
Statistics indicate that human factors cause most fatal accidents. Only 7% of accidents are caused primarily by problems with the aircraft. The diagram shows that a breakdown in teamwork and communication causes approximately 75% of all accidents. Just as we saw in the Tenerife accident and many more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

Definition of CRM

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

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

?   **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

CRM subjects

Human Error
Stress, fatigue and vigilance
Information processing
Communication
Decision making
Situational awareness
Threat and error management
Leadership
Behavior, attitudes
Conflict management
Automation

These are the subjects that will help us and provide some tools. That is why CRM focuses on practising 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

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Finish the lesson with this small, competitive exercise to stress the importance of attitudes. Tell students each number on the next slide represents a letter in the alphabet. For example, 1 is for A, 2 is for B, 3 for C and so on... There are 8 numbers total, so you must find 8 letters that correspond. The first person that 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
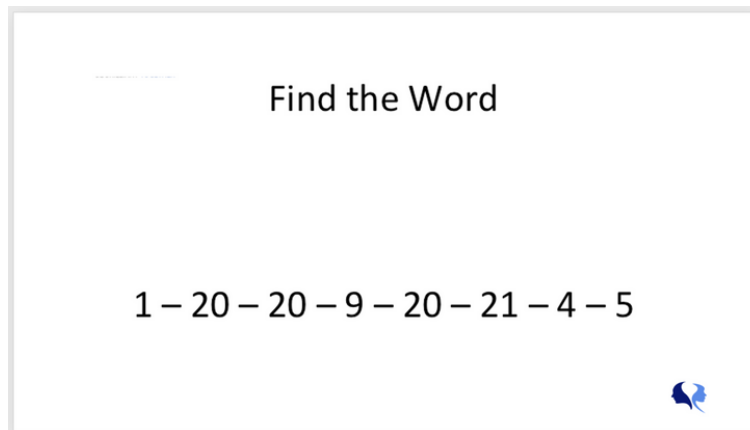
The word they are looking for is **ATTITUDE**.

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 safety.

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