



# Single Pilot Resource Management (SRM)

CRM PRESENTATION

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# Background



What is Crew Resource Management (CRM) or (Single Pilot Resource Management)?



Definition- CRM: As defined in part by EASA: "CRM is the effective utilization of all resources including crew members, aircraft systems, supporting facilities and persons to achieve safe and efficient operations. The objective of CRM is to enhance communication, interaction, human factors and management skills of the crew members concerned. Emphasis is also on the non-technical aspects of crew performance".

# How does Single Pilot Resource Management apply to me?



When an system of an aircraft is determined faulty and contributes to an accident or poses a risk of an accident. The system is evaluated and if necessary an airworthiness directive (AD) is issued to replace the defective parts in all existing aircraft of that type.



However when a faulty human element contributes to an accident or poses a risk of an accident, how do we fix that element? Better yet how do apply that correction to all the operational pilots out there?



SRM is a tool to help pilots understand these faulty behaviors within themselves and how to deal with them to mitigate the risk that they pose to the flight.

# Core Elements of SRM

- ▶ 1. Threat and Error Management
- ▶ 2. Communications
- ▶ 3. Situational Awareness
- ▶ 4. Pressure and Stress
- ▶ 5. Fatigue
- ▶ 6. Workload Management
- ▶ 7. Decision Making
- ▶ 8. Leadership and Team Building
- ▶ 9. Automation and Technology Management
- ▶ Case Study



# Putting the theory to practice

As a company perform these exercises with the following personnel: Pilots, Ground Crew, Maintenance Staff and Dispatchers

- ▶ Relevant Case Study
- ▶ Review and Discussion of Current Safety Trends within your Operation and Industry
- ▶ Emergency Drills and Contingency Planning

# Threat and Error Management (TEM)

The TEM Framework is composed of three basic components

- ▶ **Threats:** Any condition that increases the complexity of the operation. ie (weather, workload, fatigue.)
- ▶ **Errors:** When a threat is mismanaged, this mistake escalates the threat. ie (Missing a checklist item because of workload or distraction .)
- ▶ **Undesired aircraft states:** When an error leads to an aircraft state that could lead to an accident. ie (Fixating on a on a warning light while the aircraft descends unintentionally.)

# Threats

Threats can decrease safety margins and lead to errors. There are two types of threats:

- ▶ **External**- Outside of your control (weather, system errors, lighting, public perception)
- ▶ **Internal (Human)**- Those within your control (fatigue, stress, workload)

Strategies should be developed to avoid, trap or mitigate known threats.

# Errors

## Error Outcomes:

- **Inconsequential**- The error has no immediate effect on safety
- **Undesired State**- Risk of unsafe operational conditions are increased
- **Additional Errors**- The error triggers another error

## There are five types of errors:

- **Intentional Non-Compliance**
- **Communication**
- **Operational Decisions**
- **Procedural**
- **Proficiency**

Error Avoidance Strategies include: Planning, Procedures and Standard Operating Procedures (SOP's)



# TEM Management Model

- ▶ **Threat Management:** Recognizing a threat exists, then developing a strategy to deal with that threat so not to reduce safety margins.
- ▶ **Error Management:** The process of correcting an error before it becomes consequential to safety. This is achieved by developing Resist and Resolve Strategies.
- ▶ **Aircraft State Management:** The process of maintaining the desired aircraft flight profile.
- ▶ **Resist Strategies:** Things that exist within the system to protect against errors (SOP's, Checklists, Procedures, Inspections)
- ▶ **Resolve Strategies:** Identifying the error and performing the right actions to correct it before it leads to an unwanted consequence.

# Analysis of Failures



Apply the TEM Management Model in reverse

▶ **Consequences>Resist&Resolve>Errors>Strategies>Threats**

▶ Be specific

▶ Use TEM language in reports

▶ Identify threats, errors and error outcomes.

▶ Identify Resolve and Resist strategies

▶ Recognize human factors affecting behaviour choices

Recommend solutions for change

# Communication

The importance of clear and unambiguous communication must be stressed in all training activities involving all operational crew members (Pilots, Ground Crew and Aircraft Dispatchers)

## Communication Barriers

### External Factors

- Rank
- Age
- Gender
- Organizational culture
- Identification of inadequate practices.

### Internal Factors

- Speaking Skills
- Listening Skills
- Decision-making Skills
- Conflict resolution techniques
- Appropriate assertiveness
- Advocacy

# Communication cont.

Good decisions are base off of good information.



Inquiry: Enhance your knowledge base by asking proper questions about a situation.



Assertiveness/ Advocacy: By stating your concerns, problem or position clearly, you asserted your stance on a topic. This will either enhance a decision or offer possible alternatives to the end result.



Listening: Practice good active listening techniques, meaning not presuming their position, asking for clarification on misunderstandings, and be empathetic towards their message.



Feedback: Create a positive climate for feedback. As this will allow for you to improve on your methods and techniques for future interactions.

# Situational Awareness (S.A)

Relates to ones ability to accurately perceive their position and the surrounding environment and the projection of their status in the near future.

There are three levels of Situational Awareness

- ▶ **Perception:** What **HAS** happened
- ▶ **Comprehension:** What **IS** happening
- ▶ **Projection:** What is **GOING** to happen

Affected by unexpected, unusual and stressful situations, including interruptions and distractions.

If you lose your situational awareness you have to prioritize your actions to get it back, think about “what is next”. Give yourself some time by orbiting or requesting a hold. Ask for clarification or assistance.

# Pressure and Stress

Stress is both beneficial and detrimental to our lives. Not enough and we are left uninitiated and can't function at a desirable level. Too much and we breakdown, mentally and physically unable to cope with our situation. For the purposes of aviation stress can be categorized into four classes depending on both intensity and/or duration.

- **Low:** Can lead to boredom and complacency.
- **Acute:** Occurs as a result of what is perceived to have just occurred or is occurring. It can cause a strong immediate physiological response, which can enhance performance for a short duration. However when experienced for a long duration or for several intense events can produce fatigue.
- **Chronic:** A negative type of stress that plagues a persons life (emotions, mood, performance, relationships.) Is usually developed by an untreated underlying stressor. It is hazardous in pilots as it may lead to the loss of awareness or the motivation to deal with an unfavorable situation. In extreme cases it can be the onset to various health or mental problems.
- **Traumatic:** When a event occurs that is of sufficient size to affect your core personality. Usually associated with death or extreme loss, violent actions, or major life changes. Often the cause of Post-Traumatic Stress Disorder (PTSD). It will affect ones memory, attention, perception, and motivation.

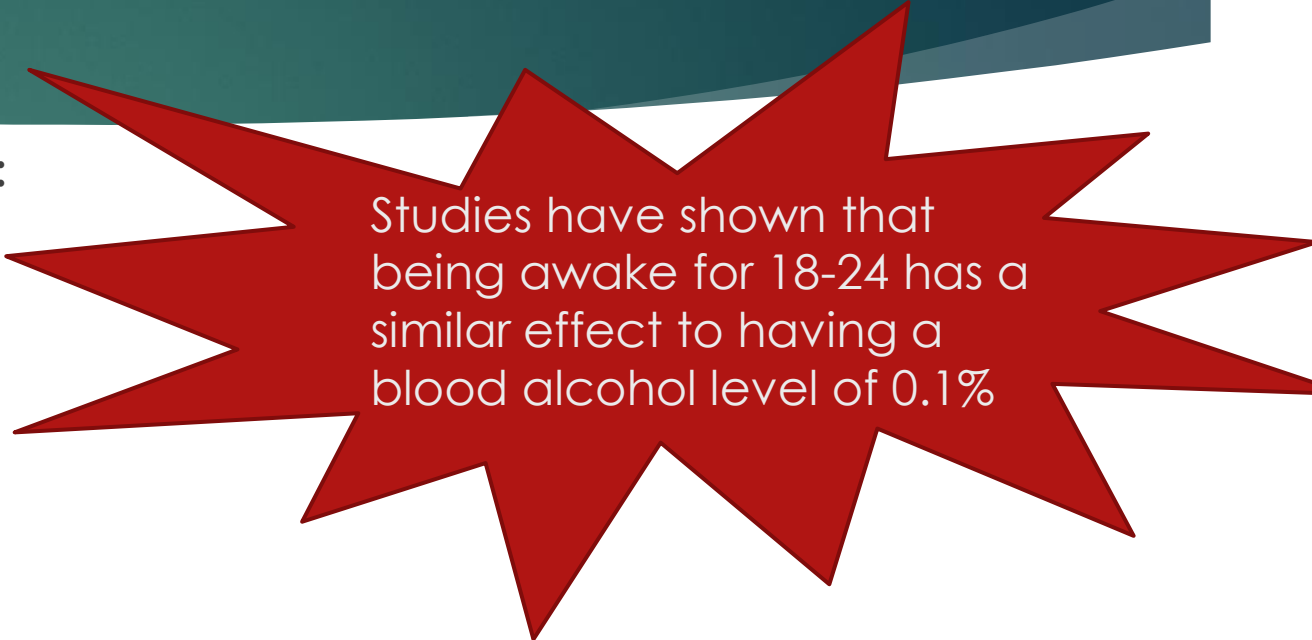
# Fatigue

## **Fatigue can be the result of many different factors:**

- Lack of sleep or quality of sleep
- Interruption of circadian rhythm
- Length of duty day
- Medical Conditions
- Health and Physical Fitness

**Acute Fatigue:** caused by intense mental or physical activity over a short period of time. Is easily cured by rest or a good night sleep.

**Chronic Fatigue:** the result of many episodes of acute fatigue along with factors such as; stress, jet lag, or insufficient sleep over several days. Usually there is an underlying condition causing reoccurring stress or sleeplessness. Can take a long time to correct its effects.



Studies have shown that being awake for 18-24 has a similar effect to having a blood alcohol level of 0.1%

# Workload Management

- ▶ Perform the required actions in a timely manner and anticipate what future actions are going to be needed.
- ▶ Do not add unnecessary tasks when you are completing a job (Radio Calls, Phone Calls, Texts, Customer Interactions, Future Jobs.)
- ▶ Organize workorders, people, and necessary resources before hand to ensure efficient operations.
- ▶ Don't waste time when you can be completing tasks "If you are doing nothing then you are doing something wrong."
- ▶ Standard Operating Procedures may allow for better judgement and prevent task saturation in times of high workload. ie (GPS programming is to be completed on the ground, while the aircraft is stationary.)



# Decision Making

## What is the decision making process?

It depends; how much knowledge, attention and time do you have?



- **Dr Klien recognition primed decision making model:** Using experience to recognize patterns within a problem and to trigger an appropriate response in a short timeframe. It's the memory of how to perform an action by the association to a learned experience.
- **Hangar Talk:** A pilot can only draw on their experience (which can be extensive or limited) to make sound decisions. This is where having experienced and inexperienced pilots share stories of mistakes or tough decisions can add to that experience pool, and may help with a future situation.

# Leadership and Team Building

**Authority:** is the right to give orders and make decisions.

**Leadership:** is the action of leading a group of people.

Authority is usually held by one individual, however leadership can come from any member of a group.

## **Leadership Qualities:**

- ▶ Coordinating activities and maintaining proper balance between respecting authority
- ▶ Practice assertiveness
- ▶ Staying centered on the goals of safe and efficient operations

# Automation (Technology Management)

Automation and technology can improve a pilot's ability to complete the task of flight. However, it should be approached with a sense of caution, as it creates a false sense of dependency on the system.

- ▶ You lose control of the interface, or feel of the aircraft. When an emergency or abnormality happens, turn off the automation, and FLY THE AIRPLANE!!!

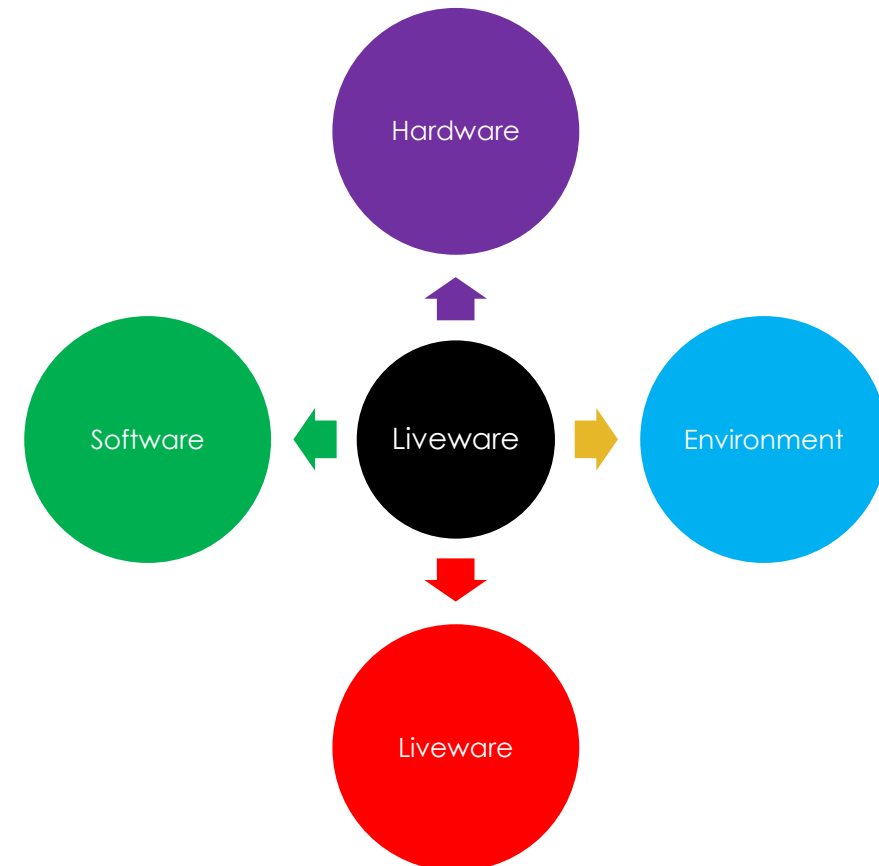
Technologies in our industry > Autoboosts, flow control, iPad, cellphone, GPS, flow control. How much do you use and rely on these technologies to complete your flight?

- ▶ What are your company policies regarding the use of technologies?

# SHEL Model

The SHEL model is designed to show how you interface with your surrounding environment in aviation

- ▶ **(S) Software-** The non-physical part of a system including policies, procedures, manuals, checklists and maps
- ▶ **(H) Hardware-** The actual equipment part of the system and the design of the workstation including the aircraft, its controls and displays.
- ▶ **(E) Environment-** The internal and external climate including temperature, visibility, vibration, noise. As well as the broader political, economic and regulatory climate. As they affect decision making, control and coordination.
- ▶ **(L) Livewire-** The human-human interaction of system. Including maintenance staff, ground crew, customers, suppliers and other crews.
- ▶ **(L) Livewire (YOU)-** As the operator of the system this component is you, which encompasses all your experience and training, as well as your mental state, physical and mental capabilities.



# Non-Technical Skills (NOTECHS)

The NOTECHS framework consists of four main categories:

- ▶ **Co-operation-** “the ability to work effectively in a team/ crew”
- ▶ **Leadership and Managerial Skills-** “Effective leadership and managerial skills achieve joint task completion within a motivated, fully functioning team through coordination and persuasion”
- ▶ **Situational Awareness-** “ones ability to accurately perceive what is in the cockpit and outside the aircraft.”
- ▶ **Decision Making-** “The process of reaching judgement or choosing an option.”

# Resilience Development

**Resilience** : The capacity to recover quickly from difficulties, which allows for immediate action after an extreme or unexpected event. This can be developed through effective training and running through various emergency scenarios.

- ▶ A key feature in dealing with emergencies, in flight abnormalities and unfamiliar situations.

## **An ongoing and adaptable process including:**

- ▶ Situation assessment
- ▶ Self-review
- ▶ Decision
- ▶ Action

# Surprise and Startle Effect

How are you going to react to abnormal and emergency situations

- ▶ What are your automatic behavioral responses, what do you default to in an emergency?

Most pilots will make drastic and uncoordinated control inputs when startled, without even knowing it. (Pull the nose up abruptly to a high angle, adding power well above the engine limits.)

Practicing emergency situations will condition your reactions and mental state in these situations.

- ▶ Recognize the loss and re-building of situational awareness and control.

# Safety and Company Culture

- ▶ What is your safety culture? Do you have a Safety policy?
- ▶ Do you have policies and procedures that portray this?
- ▶ Does every member of your operation know and endorse this culture, policies and procedures. If one individual in a company deviates from this it jeopardizes the integrity of the culture.
- ▶ Does the operator or head of the organization exhibit these safety qualities? “What is good for the goose is good for the gander.”



# Summary

Things to take away from this course and SRM elements.

- ▶ The uses of TEM in everyday operations to minimize or eliminate errors or potential incidents or accidents!
- ▶ Analyzing your company culture for safety elements that may be lacking or missing. Create your own SOP's and policies to aid in employees making safe decisions.
- ▶ Open discussion between experienced and unexperienced pilots/ staff to add to the experience pool. This will help with a persons decision making process, and can possible prevent a future accident.

# Case Study and Testing

- ▶ You must now complete a the provided test and relevant case study, analyzing the SRM (CRM) factors that involved in the accident.
- ▶ Listed below are three TSB Accident reports. Pick one to analyze and complete the provided test for this course.
- ▶ **Keystone Navajo:** [\\_http://www.bst-tsb.gc.ca/eng/rapports-reports/aviation/2012/a12c0005/a12c0005.asp](http://www.bst-tsb.gc.ca/eng/rapports-reports/aviation/2012/a12c0005/a12c0005.asp)
- ▶ **Gladstone AT401/ PLZ M18:** [http://publications.gc.ca/collections/collection\\_2013/bst-tsb/TU3-5-09-15-eng.pdf](http://publications.gc.ca/collections/collection_2013/bst-tsb/TU3-5-09-15-eng.pdf)
- ▶ **Trek C185:** <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2011/a11w0180/a11w0180.asp>

# Questions and Qualifications

- ▶ My Background in CRM began during my enrollment at an two year Aviation Diploma program at Selkirk College from 2009-2010. Besides taking several stand alone CRM courses, CRM principles were integrated in every flight and simulator session during the program. This was to prepare us for a seamless transition to the airline environment post graduation. I brought this training into the aerial application industry, where for the past eight years I have utilized and observed other operators and pilots use these same techniques.
- ▶ In preparation of creating this course I completed a separate CRM program in 2018. I also utilized AC 700-042, TC-1000314/ 10000316 Human Factors for Aviation Basic and Advanced handbooks, along with hours of research on various articles and information sessions about CRM elements and techniques.

If you have any questions feel free to contact me:

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