CREW RESOURCE MANAGEMENT
Recurrent for Flight Crew

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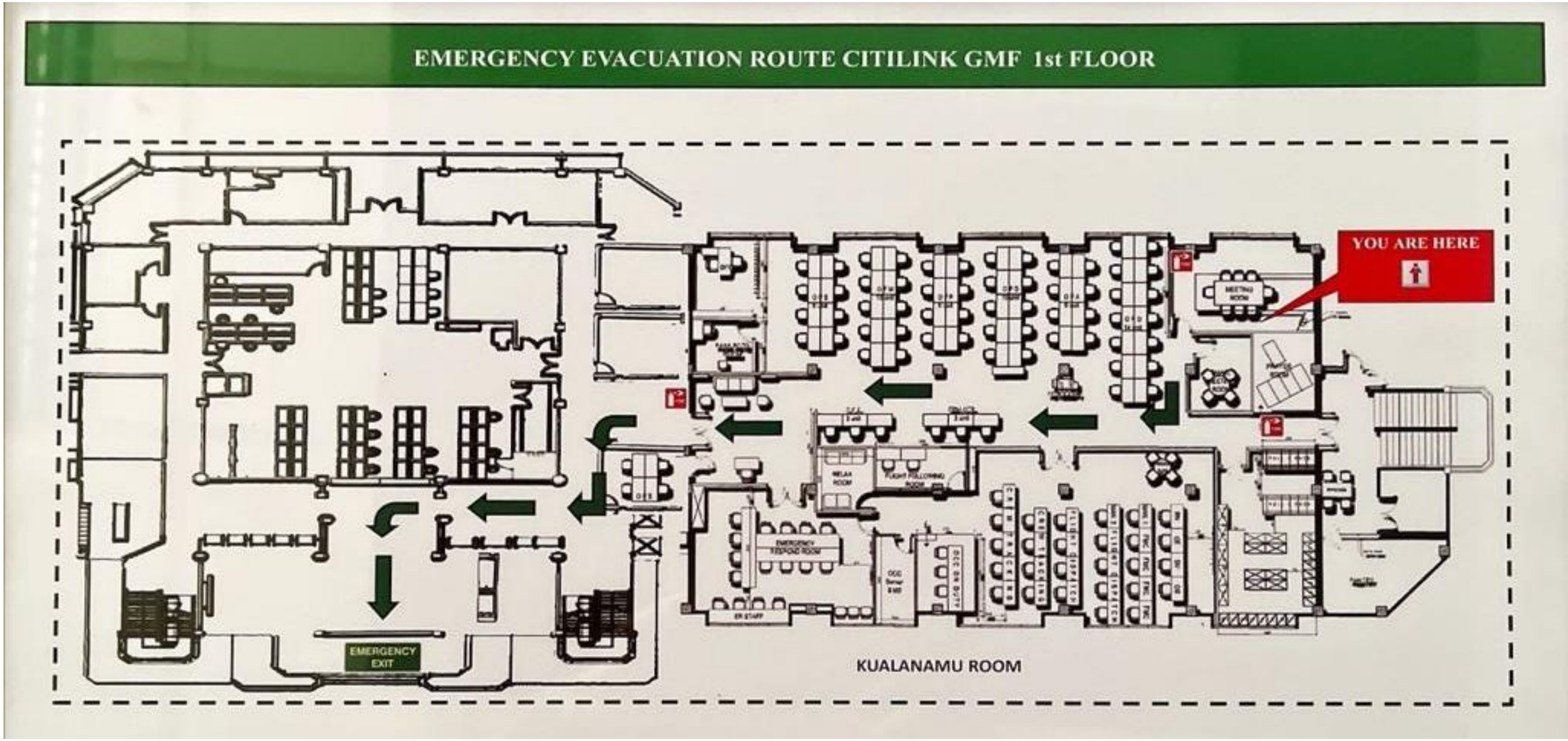
EMERGENCY ROUTE IN GMF

KUALANAMU ROOM

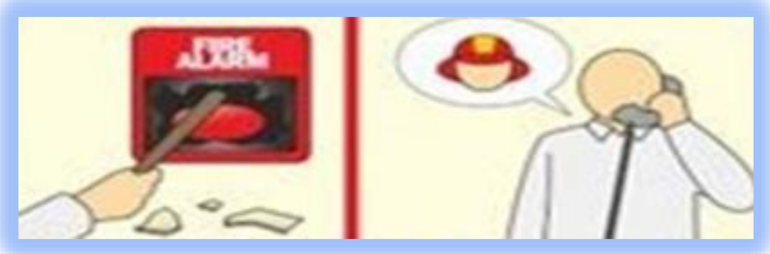


SAFETY BRIEFING
IN CASE OF FIRE

FIRE PROCEDURE

1. When you see smoke or fire : Keep calm, yell for help (fire, fire, fire)

2. If the fir can potentially be extinguished, and you are trained :
   Extinguish the fire using the nearest fire extinguisher



3. If the fire is uncontrolled, press the fire alarm and call security
   on duty

SAFETY BRIEFING
IN CASE OF FIRE

4. The fire alarm and the announcement from the building management may take place in case evacuation is required

5. Do not attempt to use the elevators. Use stairway only

6. Do not panic and do not run

7. If caught heavy smoke take short breaths; cover your nose and mouth with a handkerchief or cloth and stoop or crawl to escape. Air is usually better close to the floor

SAFETY BRIEFING
IN CASE OF EARTHQUAKE

EARTHQUAKE PROCEDURE

DON`T PANIC

COVER AND HOLD

FIND A WAY OUT

GET A TABLE OR FURNITURE

DO NOT USE LIFT

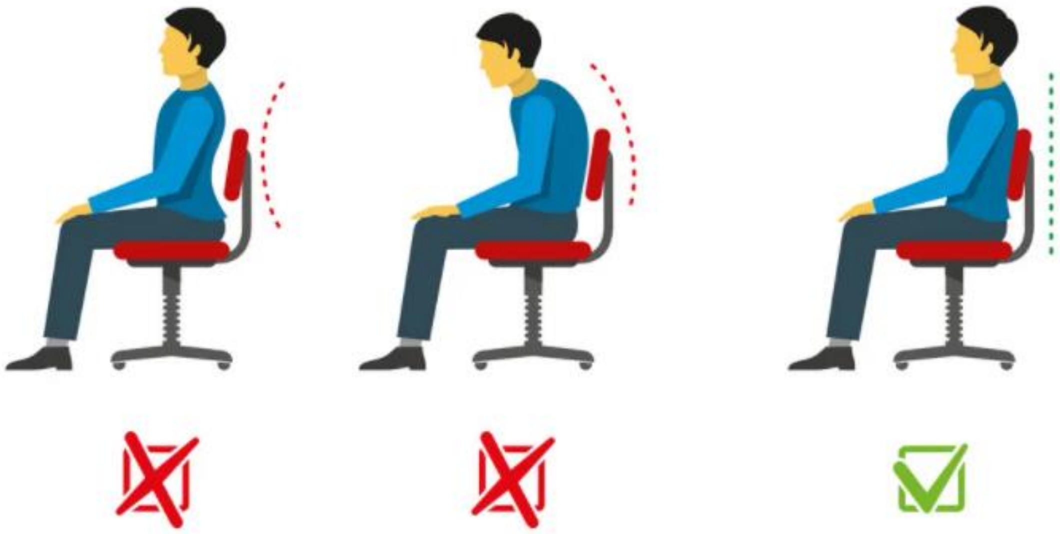
KEEP DISTANCE FROM BUILDINGS

ASSEMBLY POINT BUILDING MANAGEMENT

CLASSROOM REGULATION

1. Enter the classroom on time for class

2. Dress properly (office attire)



3. Sit properly

CLASSROOM REGULATION

4. While in class, do not :

Do not Sleep

Do not Smoke

Use Electronic Device which is not related to the study

Do not Chum Gum

Do not Eat & Drink

CLASSROOM REGULATION

5. Request permission before leaving or entering in the middle of the class.

6. Raise hand to talk or ask anything

4-STAR LOW-COST AIRLINE

Session	Time
CRM Overview, Shell Concept	08.00 – 09.00
Relationship of Crewmembers	09.00 – 10.00
- Break -	**10.00 – 10.15**
Review Incidents, Accidents	10.15 – 10.30
Human Factors	10.30 – 12.00
- Break -	**12.00 – 13.00**
Human Factors	13.00 – 14.30
Selected Coordinated Emergency Procedure	14.30 – 15.00
- Break -	**15.00 – 15.15**
Threat and Error Management (TEM)	15.15 – 16.00

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BACKGROUND of CRM

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WHY DO WE HAVE TO DO CRM?..

1. Implementation of CASR 121 Amdt. 12, appendix c.
2. Aircrew shall be given 12 months and cover safety and emergency procedures and where possible, include joint participation of Pilot and Flight attendant.
3. Based on investigation, 80% of airplane accidents caused by HUMAN ERROR.
4. 25% - 80% caused by non effectiveness of implying CRM program on duty.

Crew Resources Management is the effective use of available resources (e.g. crewmembers, aircraft systems and supporting facilities), to achieve safe and efficient operations” (JAR-OPS and ICAO)

ICAO

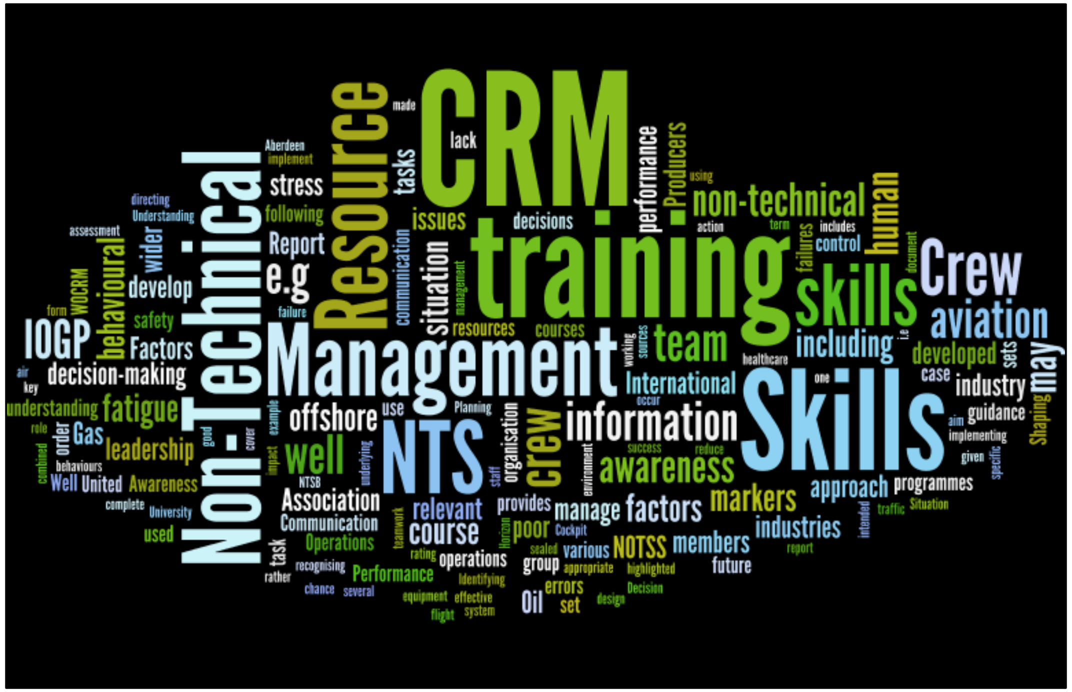
CREW RESOURCE MANAGEMENT

Aviation has reached a very high level of safety with very low accident rates in recent years.

This can be attributed to the efforts of the many people involved in the design, manufacture, and training, and the aviation authorities who take time and effort to ensure the highest possible levels of flight safety.

The ultimate goal is to obtain zero accidents. However, accidents **DO STILL HAPPEN**!!

Therefore, to improve performances and help crewmembers communicate, make decisions, manage stress and increase situational awareness skills; “Crew Resources Management” (CRM) was born.



The everyday operation of an aircraft requires very complex planning and coordination.

Think for a moment of how many teams of people are involved in just getting one aircraft off the ground, and when cabin crewmembers boards the aircraft and the number of tasks to be accomplished before take off. The flight crew is also bombarded with tasks.

Sometimes it can be overwhelming. The “Human Factor” is a big part of the equation.

“Flight Safety Factors”

SHELL CONCEPT

by FRANK H. HAWKINS-1975

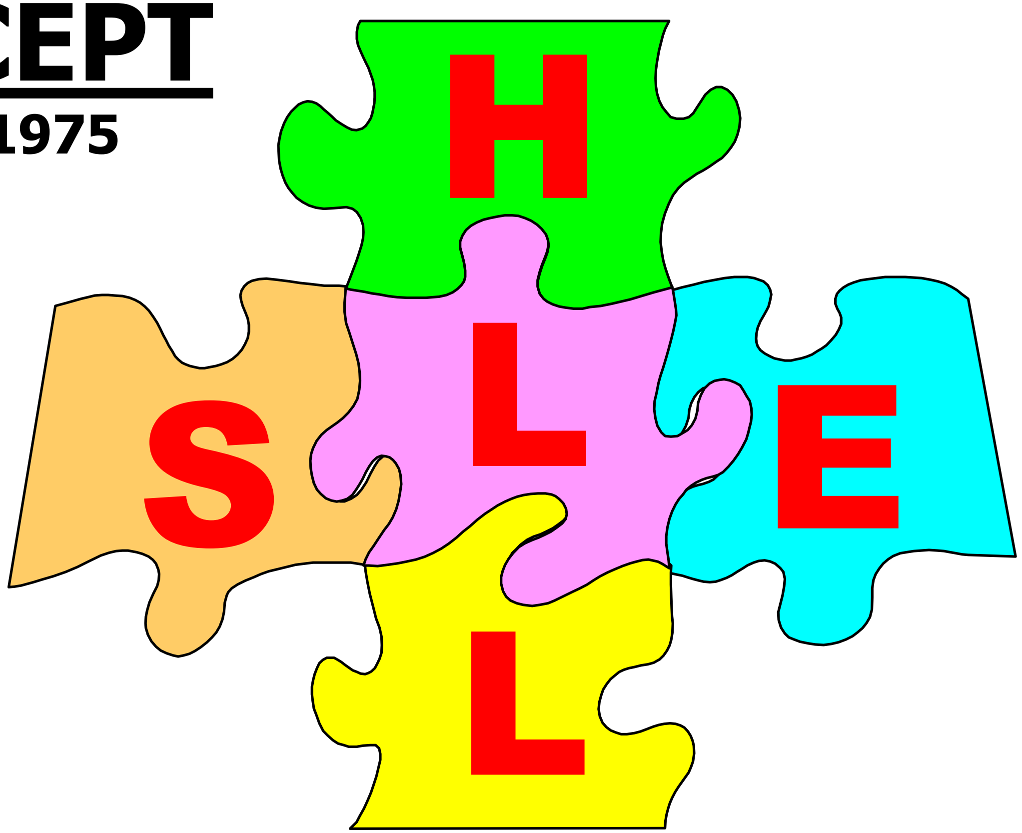
S = Software

H = Hardware

E = Environment

L = Lifeware

L = Lifeware



SHELL Model

The SHELL Model provides a conceptual framework to help us to understand Human Factors. It illustrates the various constituents and the interface, or points of interaction, which comprise the subject. The study of Human Factors can be broken down into four conceptual categories:

- **Software** : Documentation, procedures, etc.
- **Hardware** : Machinery, equipment.
- **Environment** : Both internal and external to the workplace.
- **Liveware** : The human element.

Interaction between human beings and the other elements of the SHELL model are at the heart of Human Factors!

SHELL Model

Software

- Maps (difficult to read, colour contrast, too much information, etc.)
- Flight manuals (graphs, charts, etc.)
- Let-down plates (open to interpretation)
- Checklist layout

Hardware

- Instruments (hard to read, poorly located, inaccurate)
- Control knobs (difficult to reach, distinguish, operate)
- Seats (adjustment,, harness nonstandard)
- Crashworthiness (40 G body, 9 G aircraft)
- Glass cockpit (people not good monitors)

Liveware - Pilot

- The clash between the trained pilot and their personality

Environment

- Weather limits (marginal)
- Runways (wires, trees, birds, vehicles, etc.)
- Helipads (debris, wires, trees, etc.)
- Departure (noise-abatement procedures)
- ATC (intimidate, too fast, nonstandard R/T etc.)

Liveware - Other People

- Passengers' expectations - a safe unexciting trip
- Customers, in commercial operations - maximum value
- Employers attitude (staff/management) - production
- Group influence - do as we do
- Instructor/student - complex relationship, role model

Relationship of crew members (Teamwork)

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Team Building (Teamwork) and Maintenance

MAJOR CAUSES OF HUMAN ERROR IN AIRCRAFT ACCIDENTS

- Lack of Situational Awareness
- Poor of Decision Making
- Lack of Communications
- Lack of teamwork
- Lack of Resources
- Lack of knowledge
- Lack of assertiveness
- Pressure and Stress
- Crew Fatigue

What is Teamwork?

What is Teamwork?

- Team is a cooperative unit
- Teamwork: the process of working together with a group of people order to achieve a GOAL

ELEMENTS IN THE TEAM

Leader

+

Follower

=

Teamwork

TEAMWORK SKILL

Leadership

Followership

Communication

Decision making

Crew coordination

Cooperation

LEADER

Who am I?

A person whose ideas and actions influence the thought and the behavior of others

I’m a leader

LEADER

How to influence others?

1. Use examples and persuasions.
2. Understanding the goals and desires of the team.

LEADERSHIP

The ability to direct and coordinate the activities of other crewmembers and to motivate the crew to work together as a team in order to ensure a safe, efficient and successful outcome.

LEADERSHIP SKILL
AUTHORITY AND ASSERTIVENESS

AUTHORITY

The power or Right to give others of make decision. This skills infers the ability to create a proper challenge and response atmosphere

Be a LEADER NOT a boss

FOLLOWER

A person who accepts the leadership of another.

FOLLOWERSHIP

The capacity or capability or willingness to follow the leader.

Follower skill is to follow the leader..

FOLLOWERSHIP SKILLS

To be effective follower, the crew must

1. Respect the authority (leader)
2. Balance Assertiveness
3. Accept others
4. Admit Errors
5. Provide feedback

CO-OPERATION SKILLS

Co-operation is the ability to work effectively between the crew / team members

BEING ASSERTIVE

ASSERTIVENESS

Ability to express your opinion without ignoring or hurting the opinion, needs and feeling others.

SYNERGY

If each crewmembers of the team was able to facilitate the work of other members, meaning they have been working in Synergy

When 1 + 1 is more of 2

We have a good Synergy..!

SYNERGY

When Output or product of TEAMWORK

Greater then

Sum the effort of the INDIVIDUAL CREWMEMBERS acting in ISOLATION (alone)

SYNERGY

Prerequisite for synergy:

1. Good Communication
2. High degree of Situational Awareness
3. Good Decision Making

SYNERGY

GUIDELINES FOR A TEAM

No one among from us who is better

than togetherness

CONCLUSION

Consequently, **Good communications** within the group, a **high degree of situational awareness** and a full **understanding of the decision-making** process by all members of the group are fundamentals for **create the effective performance of the team** as a whole.


Individually
We are one drop, but
Together
We are an OCEAN

Briefings are the ideal moment for flight crew to set the tone, and the expectations for a flight. It is also the opportunity to advocate open two-way communication between the cabin and the flight crew. Joint crew briefings assist in creating a working environment that is more conducive to a safe operation.

Barriers to communication

- **Uncommunicative attitudes :** It is not easy to communicate with someone who does not want to communicate.
- **Hierarchy :** It is more difficult to be assertive with a senior colleague, than with a colleague of the same job level.
- **Non-verbal components can 'betray' you :** such as breathing, voice, hesitations, and accent contribute to the message.
- **Workload can impair, or even prevent communication :** When there is a high workload, there is less time to communicate. If communication is forced during a high workload, it is possible that crewmembers will forget about the task in hand, and return to their original activity to early or too late in the sequence, consequently committing errors of commission (i.e. repeating actions already done), or errors of omission (i.e. forgetting steps in the sequence).

Cont'd…

- **Cultural differences :** Cultural differences and language can seriously confuse communication. Cultural differences are not just limited to different countries of origin, but education, upbringing, and values.
- **Difficulties due to the medium of transmission :** Distortion of the information due to background noise, excessive feedback (and volume level) on the PA system, or poor volume of interphone.
- **Assumptions :** When Assumptions can be based on expectation and context. Problems associated with assumptions can be minimized, if the message is not ambiguous, and accurate feedback is given.
- **Lack of confidence :** A lack of confidence in the abilities of other members of the crew.

Cont'd…

To improve flight safety and promote efficient team work:

- Use briefings to encourage communication and teamwork, and to build a rapport with the crew. A good briefing will result in a high performing team!
- Following Standard Operating Procedures ensures that all crewmembers are familiar with the flight standards and expectations.
- Communicate and cooperate with, other crewmembers, maintenance personnel, catering staff, and boarding staff.
- Communicate with passengers, and make them feel comfortable and able to communicate with the crew.

Review Accidents, Incidents

Human Factor

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Emirates Boeing B777-300 (A6-EMW) flight EK521

Accident date: 03/08/2016

Description

- Emirates flight EK521 crashed on 3 August 2016 while operating a scheduled passenger flight UAE521, departed Trivandrum International Airport India, at 0506 UTC for a 3 hour 30 minute flight to Dubai International Airport (OMDB), the United Arab Emirates, with 282 passengers, 2 flight crew and 16 cabin crewmembers on board.

- The Commander attempted to perform a tailwind manual landing during an automatic terminal information service (ATIS) forecasted moderate wind shear warning affecting all runways at OMDB. The tailwind was within the operational limitations of the Aircraft.

- During the landing on runway 12L at OMDB the Commander of Emirates flight EK521 , who was the pilot flying, decided to fly a go-around, as he was unable to land the Aircraft within the runway touchdown zone.

- The go-around decision was based on the perception that the Aircraft would not land due to thermals and not due to a wind shear encounter.

- For this reason, the Commander elected to fly a normal go-around and not the windshear escape maneuver.

- The flight crew initiated the flight crew operations manual (FCOM) Go-around and Missed Approach Procedure and the Commander pushed the TOGA switch.

- As designed, because the Aircraft had touched down, the TOGA switches became inhibited and had no effect on the autothrottle (A/T). The flight crew stated that they were not aware of the touch down that lasted for six seconds.

- After becoming airborne during the go-around attempt, the Emirates flight EK521 climbed to a height of 85 ft radio altitude above the runway surface.

The flight crew did not observe that both thrust levers had remained at the idle position and that the engine thrust remained at idle.

- The Aircraft quickly sank towards the runway as the airspeed was insufficient to support the As the Aircraft lost height and speed, the Commander initiated the windshear escape maneuver procedure and rapidly advanced both thrust levers.

- This action was too late to avoid the impact with runway 12L.

- Eighteen seconds after the initiation of the go-around the Aircraft impacted the runway at 0837138 UTC and slid on its lower fuselage along the runway surface for approximately 32 seconds covering a distance of approximately 800 meters before coming to rest adjacent to taxiway Mike 13.

- The Aircraft remained intact during its movement along the runway protecting the occupants however, several fuselage mounted components and the engine/pylon assembly separated from the Aircraft.

Causes of the accident

The Air Accident Investigation Sector determines that the causes of the Accident of Emirates flight EK521 are:

- During the attempted go-around, except for the last three seconds prior to impact, both engine thrust levers, and therefore engine thrust, remained at idle. Consequently, the Aircraft's energy state was insufficient to sustain flight.
- The flight crew did not effectively scan and monitor the primary flight instrumentation parameters during the landing and the attempted go-around.
- The flight crew were unaware that the autothrottle (A/T) had not responded to move the engine thrust levers to the TOGA position after the Commander pushed the TOGA switch at the initiation of the FCOM- Go-around and Missed Approach Procedure.
- The flight crew did not take corrective action to increase engine thrust because they omitted the engine thrust verification steps of the FCOM- Go-around and Missed Approach Procedure.

Korean Air Airbus A330-322 plane crash Cebu City, Philippine

Accident date: 23/10/2022

Description

- The Airbus A330-300 operated by Korean Airlines took off from Seoul, South Korea, for a passenger flight to Cebu City, Philippines. 162 passengers and 11 crewmembers were onboard. The plane had gone around at low height twice following approaches to Cebu's airport. The Airbus A330 then landed but overran the runway end at high speed and came to rest about 360 meters (1200 feet) past the runway end close to the airport perimeter fence. The aircraft received substantial damage. All the occupants escaped uninjured.
- Weather conditions reported at the time of the accident were 8km visibility, light to moderate winds, ceiling at 9000 ft, and thunderstorms and rain in airport vicinity.

Cause of Incident

- The captain of the flight explained that they suffered a hard touchdown on their second approach due to wind shear. After this hard touch down, a warning light indicating low wheel brakes pressure was triggered. The crew declared emergency, provided instructions to the cabin crew and passenger for an emergency landing including the brace position.
- They performed the third approach in gusting winds and turbulence. The touchdown was smooth, but the wheel brakes failed. The aircraft was slowed down aerodynamically and through thrust reversers only. The aircraft overran the runway end at about 80 knots and struck the localizer antenna. The nose landing gear collapsed resulting in substantial damage in the nose underbelly.

SITUATIONAL AWARENESS

Human Factor

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Situational awareness

DEFINITION

Researcher speaks:

“The perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future”

DEFINITION

Pilot speaks:

- Perceiving the features of the environment
- Knowing what they mean to relative to the flight
- Projecting their status into the future

SOME FACTS...

Investigation into recent accident data shows :

- 80% of airline accidents are caused by human performance failures (Endsley 1998, NTSB 1994)
- 75% of those accidents can be attributed to poor or inaccurate situational awareness

THEN...

Increasingly, human factors researchers view situational awareness as the key to good aeronautical decision making.

- All decision models for our profession have SA as a key component
- Good data = Good decision
- Bad data = Bad decision

ASEANTA
ASEAN TOURISM ASSOCIATION

LEVELS of Situational Awareness (SA)

Level 1 : Perception

Simply noticing features in the environment

Level 2 : Meaning

The assignment of meaning to those features

Level 3 : Projection

Mentally stimulating the status of those features in the future

SA ERRORS

Level 1 : Perception

- Failure to detect relevant information
- Information is there but not perceived
- Lack of knowledge
- Education/ignored
- lack of information
- Resource utilization, lack of communication, poor team processes

Level 2 : Meaning

- Lack of deep knowledge
- Failure to determine cause and effect relationship
- Failure to understand “why” behind the information
- Failure to utilize resources effectively
- Fellow team members, other crew, technical resources

Level 3 : Projection

- Failure to mentally simulate
- Failure to determine cause and effect relationship
- Failure to conduct threat management

QUALITY of Situational Awareness

BEST

- All relevant cues noticed and assigned meaning
- Crew is confident all relevant cues

BETTER

- All relevant cues noticed—some are assigned meaning
- Crew is not sure they have correctly accounted for all cues

QUALITY of Situational Awareness

NOT SO GOOD

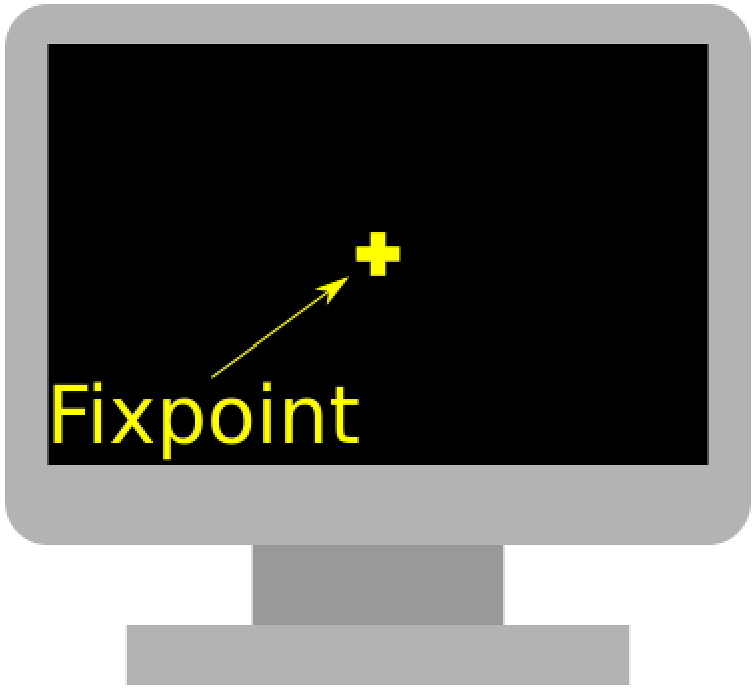
- Some relevant cues are missing
- Crew is uncertain all relevant cues have been accounted for

BAD

- Some relevant cues have been missed
- Crew thinks they have accounted for all relevant cues

LOSS of Situational Awareness

- Lack of alertness
- Loss of recognition of warning signals
- Reduced ability to respond quickly & correctly
- Information overload
- Ambiguity
- Unclear information
- Fixation
- Improper procedures
- Deviation from SOP
- Failure to meet planned targets
- Gut feeling



MAINTAINING Situational Awareness

- Experience
- Training
- Spatial orientation
- Physical flying skills
- Ability to process information
- Cockpit management skills
- Personal attitude
- Emotional/physical conditions

Selected Coordinated Emergency Procedure

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Let's simulate this scenario..

Unruly Passengers

THREAT and ERROR Management

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SOME STATISTIC

- 70% of jet airliner accidents have been found to involve crew errors

- Errors are frequent: 3 to 5 per hour in the cockpit


nwa
NORTHWEST AIRLINES

Introduction

Threat and error management (TEM) is a safety management approach which has been described as ‘simply an extension of the concept of airmanship.

It is the process of detecting and responding to threats (such as adverse weather) and errors (such as unclear communication between crew members) before they compromise safety. TEM aims to maintain safety margins by training pilots and fight crews to detect and respond to threats and errors that are part of everyday operations.

If not properly managed, these threats and errors have the potential to generate *undesired aircraft states* (UAS). The management of undesired aircraft states represents the last opportunity to avoid an unsafe outcome and thus to maintain safety margins in fight operations.

What is TEM?

TEM provides a way for pilots to look for potential threats to fight operations in a structured way. They actively manage these threats and any errors that may lead to undesired aircraft states and therefore to the safety of the fight. TEM encompasses training, briefings, checklists, standard operating procedures, and human factors principles for single-pilot and multi-crew operations.

Threat and error management:

- Recognise and manage errors
- Recognise and manage threats
- Recognise and manage undesired aircraft states

Threat

A threat as a situation or event that has the potential to have a negative effect on fight safety, or any infuence that promotes an opportunity for pilot error/s.

Threats are generally external (such as bad weather) or internal (such as physiological and psychological state).

Threats such as fatigue increase the likelihood of errors, leading to degraded situational awareness and poor decision making. Pilots need good situational awareness to anticipate, recognise and manage threats as they occur.

External threats include:

- adverse weather
- weight and balance
- passenger distraction
- early starts and late finishes
- night operations
- reduced runway length
- other traffic, high terrain or obstacles
- the condition of the aircraft.

Internal threats include:

- fatigue
- inexperience
- over-or under-confidence
- isolation
- impulsiveness
- lack of recency and proficiency
- press-on-itis.

Managing Threats

The TEM model includes three threat categories: *anticipated*, *unanticipated* and *latent*. All three can reduce safety margins.

Latent threats may not be clear and may need to be uncovered by formal safety analysis and specifically addressed in your organisation's training and procedures.

ANTICIPATED

Some threats can be anticipated such as:

- thunderstorms, icing, wind shear and other forecast bad weather
- congested airports and landing areas
- wires and other obstacles
- complex ATC clearances
- cross and/or downwind approaches and landings
- outside air temperature/density altitude extremes
- aircraft mass and balance
- forecast or known bird/wildlife activity

UNANTICIPATED

These are other threats that can occur unexpectedly, suddenly and without warning. Pilots must apply the skills and knowledge they have acquired through training and operational experience to deal with issues such as:

- in-fight aircraft malfunctions
- automation—anomalies and over-reliance
- unforecast weather, turbulence, icing
- ATC re-routing, unexpected congestion, non-standard phraseology, navigation aid unserviceability, confusion over similar call-signs
- ground handling
- wires and other obstacles
- unmanned aircraft systems (drones)
- unforecast bird/wildlife activity
- laser attacks
- contaminated or sloping landing areas.

LATENT

Some threats may not be directly obvious to, or observable by, pilots and may need to be discovered through formal safety analysis. These are considered latent threats and may include organisational weaknesses and the psychological and physiological state of the pilot. They include:

- organisational culture
- organisational change
- incorrect or incomplete documentation, such as poor manuals
- equipment design issues such as landing gear and fap levers located too close to each other, or inaccurate fuel gauges
- operational pressures and delays, such as undue pressure to get a job done
- perceptual illusions such as approaches to sloping runways
- fatigue and rostering
- lack of recent experience and proficiency
- Stress
- over-confidence or under-confidence.

Error

As humans we all make errors. In TEM, errors are defned as fight crew actions or inactions which lead to:

- A deviation from crew or organisational intentions or expectations
- Reduced safety margins
- Increased probability of adverse operational events on the ground and during fight.

Adverse operational events can be handling errors, procedural errors or communications errors.

Errors can be the result of momentary diversion of attention (slip), or memory failure (lapse) induced by an expected or unexpected threat. There are also more deliberate, *intentional non-compliance* errors. These are often shortcuts used to increase operational efficiency, but in violation of standard operating procedures. Slips and lapses are failures in the execution of an intended action. Slips are actions that do not go as planned, while lapses are memory failures.

Mistakes are failures in the plan of action; even if execution of the plan was correct, it would not have been possible to achieve the intended outcome.

While errors may be inevitable, we need to identify and manage them before safety margins are compromised. Typical errors in charter operations include:

- Incorrect performance calculations (mistakes)
- Inaccurate fight and fuel planning (slips, lapses)
- Non-standard communication (mistakes, violations)
- Aircraft mishandling (slips)
- Incorrect systems operation or management (slips, lapses, mistakes)
- Checklist errors (slips, lapses)
- Failure to meet fight standards, such as poor airspeed control (slips)

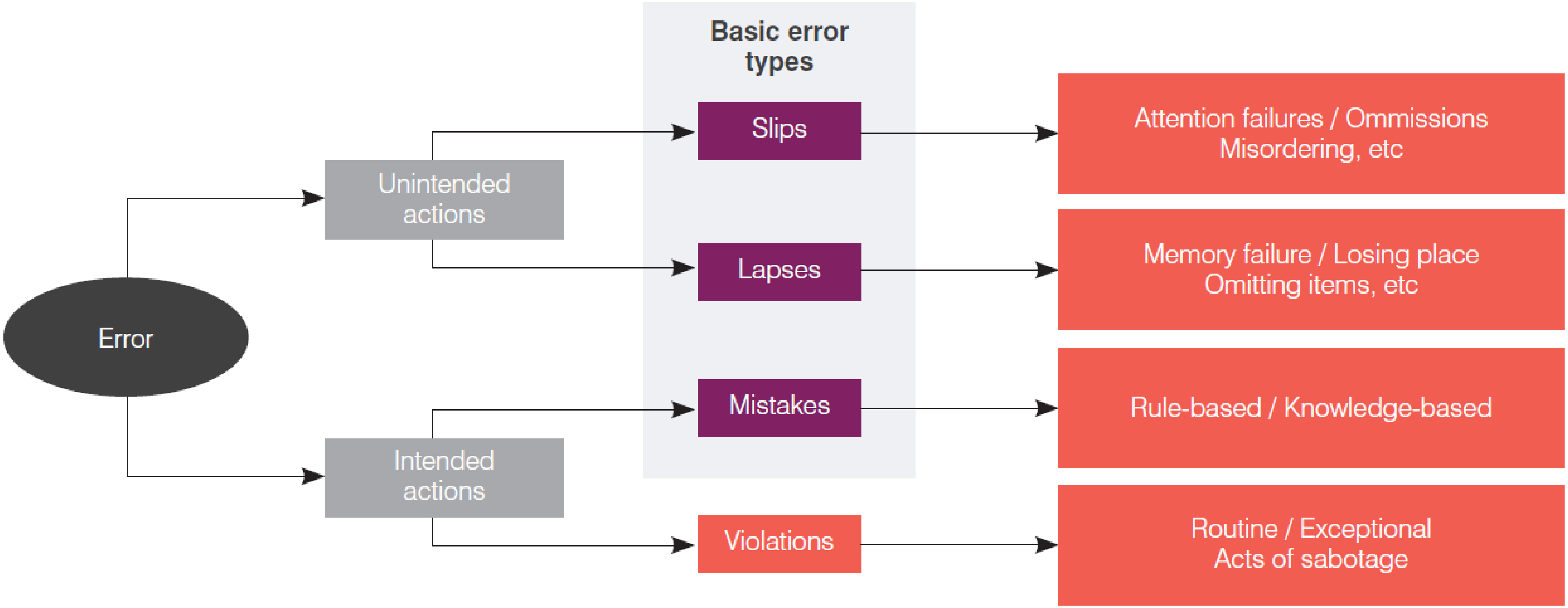


Figure 1 Basic error types

From Reason, 1991

See Video

Click this to play

Examples of Errors

Aircraft Handling Error

- **Flight control**

Incorrect faps or power settings.

- **Ground navigation**

Attempting to turn down wrong taxiway/runway, missed taxiway/runway/gate, failure to hold short.

- **Manual flying**

Hand flying vertical, lateral, or speed deviations.

- **Systems/radio/instruments**

Incorrect GPS, altimeter, fuel switch, transponder or radio requency settings.

Procedural Errors

- **Briefings**

Missed items in the brief, omitted departure, take-off, approach, or handover briefing.

- **Callouts**

Omitted take-off, descent, or approach callouts.

- **Checklist**

Performed checklist from memory or omitted checklist, missed items, performed late or at wrong time.

- **Documentation**

Wrong weight and balance, fuel information, ATIS, or clearance recorded, misinterpreted items on paperwork.

- **Other procedural**

Other deviations from regulations, fight manual requirements or standard operating procedures.

Communication Errors

- **Pilot to external**

Missed calls, misinterpretation of instructions, or incorrect read-backs to ATC, wrong clearance, taxiway, gate or runway communicated.

- **Pilot to pilot**

Internal crew miscommunication or misinterpretation.

Undesired Aircraft States (UAS)

Undesired aircraft states (UAS) are pilot-induced aircraft position or speed deviations, misapplications of fight controls, or incorrect systems configurations associated with a reduced margin of safety.

For safe fight we must quickly recognize and recover from an undesired aircraft state before it leads to a loss of control or uncontrolled fight into terrain.

Examples of errors and associated undesired aircraft states in charter operations include:

- Mismanagement of aircraft systems (error), resulting in aircraft anti-ice not turned-on during icing conditions (state).
- Inappropriate scan of aircraft instruments (error), resulting in an unusual aircraft attitude (state)
- Flying a final approach below appropriate threshold speed (error), resulting in excessive deviations from specified performance (state).

Examples of Undesired Aircraft States

Aircraft handling

- Vertical, lateral or speed deviations
- Unnecessary weather penetration
- Unstable approach
- Long, foated, frm or off-centreline landings.

Ground navigation

- Runway/taxiway incursions Wrong taxiway, ramp, gate, or hold spot Taxi above speed limit.

Incorrect aircraft confguration

- Automation, engine, fight control, systems, or weight/ balance events.

Applying TEM and Countermeasures

TEM involves anticipating and calling out potential threats and errors as well as planning countermeasures in the self-briefng process at each stage of fight to prevent threats and errors becoming an undesired aircraft state. This needs to be done in a structured and simple way, without becoming complacent about commonly-encountered threats such as weather, traffc, and terrain.

There are three kinds of countermeasures:

- **Planning** countermeasures including fight planning, briefng, and contingency planning.
- **Execution** countermeasures including monitoring, cross-checking, workload and systems management.
- **Review** countermeasures including evaluating and modifying plans as the fight proceeds, and enquiry and assertiveness to identify.

Once you recognize an undesired aircraft state, you must use the correct countermeasure rather than fixate on the error, and address issues in a timely way.

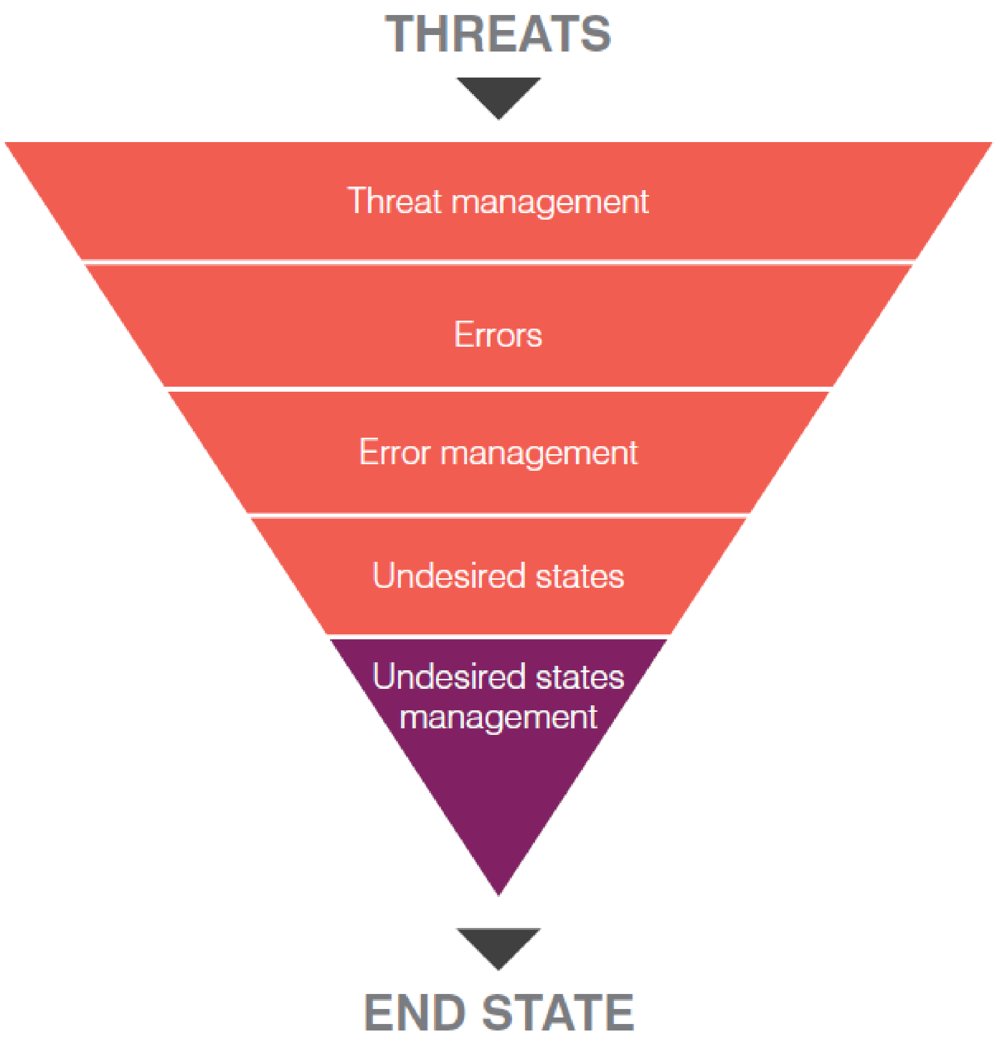


Figure 2 TEM triangle

Error Management

By acknowledging that errors will occur, we change our focus from error *prevention* to error *recognition* and *management*. Because unmanaged or mismanaged errors may result in an undesired aircraft state we need to be constantly alert to recognise and fix them early.

Once you recognise an error, it is important you focus on managing any resulting undesired aircraft state. In trying to manage an error, we can become fixated on its cause and forget firstly to *'aviate, navigate and communicate'*.

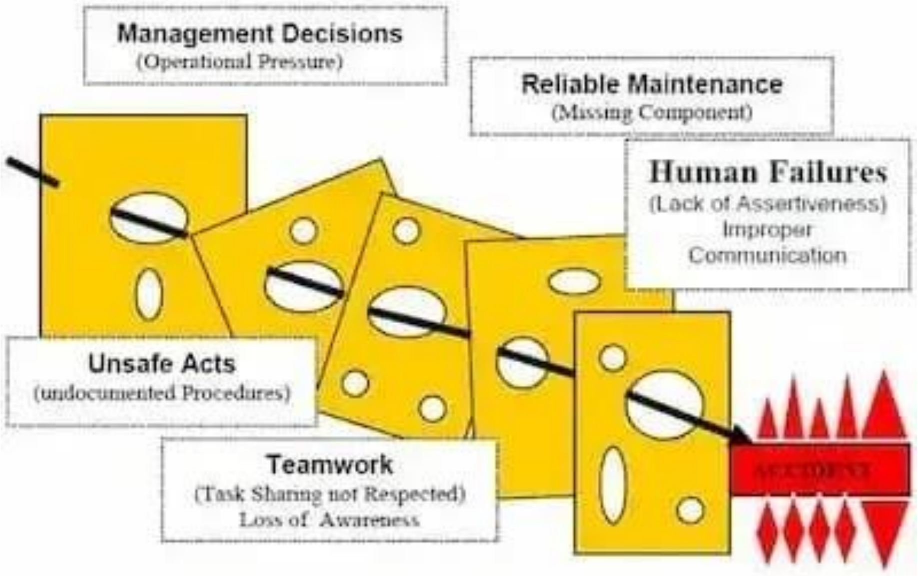
For example, if you become uncertain of your position, you need to make a timely decision to perform a 'lost procedure'. You may be tempted to ascertain why you became lost and blunder on regardless (undesired aircraft state), rather than initiating a logical procedure to re-establish your position, seek assistance from other aircraft or ATC or plan a precautionary landing.

While the basic concept of TEM is simple, including it into your standard practices is more challenging. But if you do, you will see the benefit of a planned and structured approach to staying ahead of the aircraft—and staying safe.

So, how do you prevent errors from multiplying and putting you in an undesired aircraft state? In this case, a go-around would have provided time to get everything together and sort things out.

Consider how you could have anticipated and briefed yourself for the threats and errors on this day and the countermeasures that you could have put in place to manage the situation and avoid an undesired aircraft state you couldn't control.

Assessing the application of TEM



- Maintains effective lookout
- Maintains situational awareness
- Assesses situations and make decisions
- Assesses solutions and risks
- Sets priorities and manages tasks
- Maintains effective communications and interpersonal relationships
- Recognises and manages threats
- Recognises and manages errors
- Recognises and manages UAS

KEY POINTS

- The threat and error management (TEM) approach recognises that making errors is a normal part of human behavior that can and should be managed. It promotes a philosophy of anticipation or ‘thinking ahead’.

- The three basic components of the TEM model are ***threats, errors and undesired aircraft states (UAS).*** It is important that crews know when to switch from error management to undesired aircraft state management.

- Pilots who develop strategies or countermeasures such as planning, and review or modification of plans, tend to have fewer mismanaged threats, commit fewer errors, and have fewer undesired aircraft states.


Thank You!