



## HUMAN PERFORMANCE & LIMITATIONS

### Human Performance as part of maintenance engineering system.

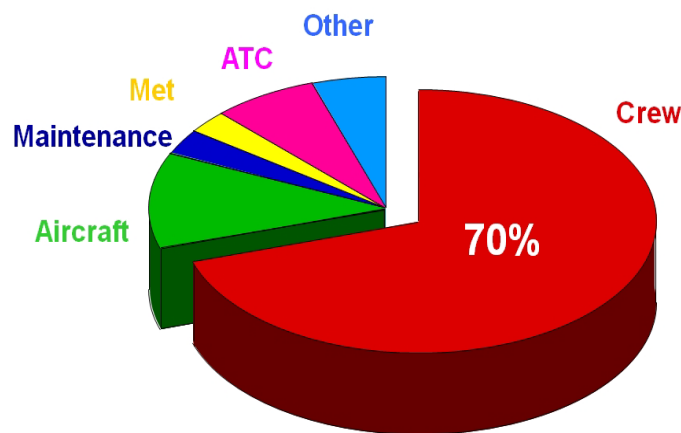
Mechanical components used in aircraft maintenance engineering have limitation. Maintenance personnel themselves have certain capabilities and limitation. While the precise range of human capabilities and limitation might not be as well defined as the performance range of mechanical or electrical component. Same principle apply in that human performance is likely to degrade and eventually 'Fail' under certain condition eg. 'Stress'. Mechanical components in aircraft can on occasion suffer catastrophic failure, however human can also fail to function properly in certain situation:

- **Physically**  
Human become fatigue are affected by the cold, wound, break bones in workplace accidents.
- **Mentally**  
Human can make error have limited perceptual powers, can exhibit poor judgment due to lack of skill and knowledge.

Unlike mechanical or electrical component, human performance is also affected by social and emotional factors. Therefore failure by aircraft maintenance engineer can also be to detriment of aircraft safety. As an aircraft maintenance personnel is the central part of the aircraft maintenance systems. Hence, it is very useful to have an understanding of how various part of human body and mental process function and how performance limitation can influence the effectiveness at work.

### Why is it important?

The aircraft accident that happened over the last 10 years has been classified into six categories according to their main contributing factors. That result would have been the same if the figures represented the last 30 years or just the last year. The Crew category is the largest one. It represents 70% of the accident. This figure represents all the accidents where the crew could really have done things differently and prevented the accident from happening.



**Medical Incapacitation:**

Incapacitation is the loss of strength or the ability to perform normally.

(a) **Sudden Incapacitation:**

The pilot collapses or slumps over the aircraft controls. Heart attack and stroke are common causes.

(b) **Subtle Incapacitation:**

Subtle incapacitation can go unnoticed by the crew-members, which makes this a potentially dangerous situation. The pilot might be dazed, semiconscious, or unable to move as with a stroke.

(c) **Total Incapacitation:**

Means you are totally out of it, up to and including dead. There is no doubt that there is a problem that needs immediate attention. Common causes are heart attack and food poisoning.

(d) **Partial Incapacitation:**

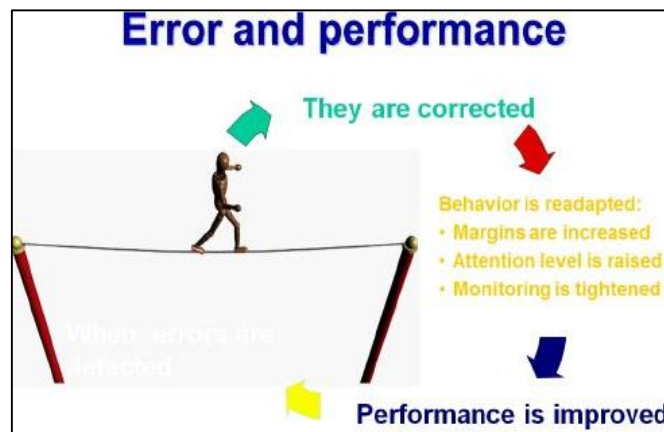
You are only partly incapacitated; you can still fly but not properly. You may be unaware of your problem.

Common causes:

- Fatigue Hypoglycemia (low blood sugar)
- Stress Medication
- Dehydration
- Jetlag.

**Error Prevention:**

- Errors are inevitable: we make errors because we make an intelligent use of our limited resources.
- The objective is to detect and correct errors before any negative impact on safety occur.
- Error detection governs our behaviour and is a key condition for good performance and flight safety.
- Error Detection is both an individual and a crew responsibility.



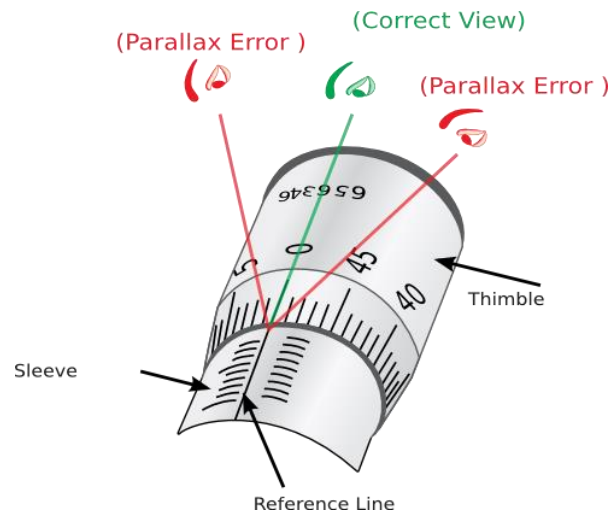
We are learning from our errors from a skill point of view and from a confidence point of view. Our level of confidence is set according to the number and type of error we make and also how we are able to correct them. That is what the tight ropewalker does when he walks quickly or slowly depending on his level of confidence.

### Physical Performance and Limitation Effect

#### a. Parallax Error

Parallax is a displacement or difference in the apparent position of an object viewed along two different lines of sight, and is measured by the angle or semi angle of inclination between those two lines. Due to foreshortening, nearby objects show a larger parallax than farther objects when observed from different positions, so parallax can be used to determine distances.

Parallax also affects optical instruments, fine measurement instrument, levelling glasses and gauges such as binoculars, microscopes, torque wrench, Vernier calliper and liquid glass level that view objects from slightly different angles. Many livings, including humans, have two eyes with overlapping visual fields that use parallax to gain depth perception; this process is known as stereopsis. In a philosophic/geometric sense an apparent change in the direction of an object, caused by a change in observational position that provides a new line of sight. The apparent displacement, or difference of position, of an object, as seen from two different stations, or points of view.



#### b. Vibration White Finger

Vibration white finger (VWF), also known as hand-arm vibration syndrome (HAVS) or dead finger, is a secondary form of Raynaud's syndrome, an industrial injury triggered by continuous use of vibrating hand-held machinery. Use of the term "vibration white finger" has generally been superseded in professional usage by broader concept of HAVS, although it is still used by the general public. The symptoms of vibrating white finger are the vascular component of HAVS.

HAVS is a widespread recognized industrial disease affecting tens of thousands of workers. It is a disorder that affects the blood vessels, nerves, muscles, and joints, of the hand, wrist, and arm. Its best known effect is vibration-induced white finger (VWF).

Workers who use hand-held or hand-guided power tools for more than a few hours each day are at risk of vibration white finger. The period of time between exposure to vibration and development of symptoms is variable, ranging from months to years. The risk of developing hand-arm vibration syndrome increases with the intensity and duration of exposure to vibration, and continued exposure results in worsening symptoms. It is recommended that individuals that suffer from certain vascular or neurological disorders affecting the hand or arm, e.g. Raynaud disease or carpal tunnel syndrome, are not exposed to vibration at work.

Vibration white finger may occur in those using handheld vibrating tools such as sanding tools, hammer drills, jackhammers and chain saws. It may also be caused by holding or working with machinery that vibrates. Vibration promotes vasoconstriction through arterial smooth muscle hypertrophy, and damage to the endothelial cell walls; there is an increase in the release of vasoconstriction chemicals such as serotonin and thromboxane. Nerve damage also occurs.

### **Mental Performance and Limitation Effect**

Stress isn't always bad. In small doses, it can help you perform under pressure and motivate you to do your best. But when you're constantly running in emergency mode, your mind and body pay the price. If you frequently find yourself feeling frazzled and overwhelmed, it's time to take action to bring your nervous system back into balance. You can protect yourself and improve how you think and feel by learning how to recognize the signs and symptoms of chronic stress and taking steps to reduce its harmful effects.

Stress is your body's way of responding to any kind of demand or threat. When you sense danger whether it's real or imagined the body's defences kick into high gear in a rapid, automatic process known as the "fight-or-flight" reaction or the "stress response."

The stress response is the body's way of protecting you. When working properly, it helps you stay focused, energetic, and alert. In emergency situations, stress can save your life, giving you extra strength to defend yourself, for example, or spurring you to slam on the brakes to avoid a car accident.

Stress can also help you rise to meet challenges. It's what keeps you on your toes during a presentation at work, sharpens your concentration when you're attempting the game-winning free throw, or drives you to study for an exam when you'd rather be watching TV. But beyond a certain point, stress stops being helpful and starts causing major damage to your health, mood, productivity, relationships, and your quality of life.

