

An introduction to

# HUMAN FACTORS IN AVIATION OPERATIONS



Produced by the JIG HSSE Committee with kind contributions of IATA/IFQP

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# Introduction

Human error is both universal and unavoidable.

- This means that everyone will make a mistake one day.
- When you hear of an incident or accident caused by human error you often think the person involved has poor skills or character.

People who have accidents are mostly well-meaning, motivated and experienced.

- Good people may make mistakes because they are influenced by their organization, workplace, tools, environment or personal situation.



# Introduction

There are twelve common causes, or *Human Factors*, that contribute to human error:

1. Lack of Communication
2. Complacency
3. Lack of knowledge
4. Distraction
5. Lack of teamwork
6. Being tired (Fatigue)
7. Lack of resources
8. Pressure
9. Lack of assertiveness
10. Stress
11. Lack of awareness
12. Norms (Convention, Standards)

For each of these causes, we can simple work practices known as *Safety Nets* to understand common errors and prevent them from having tragic consequences.

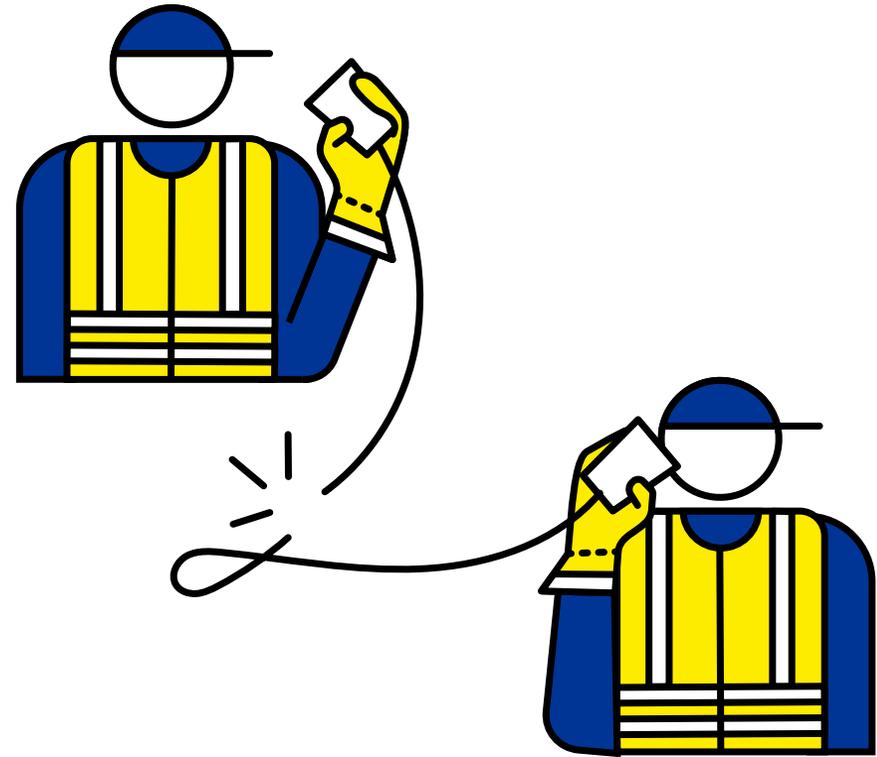
Following are some examples of *Safety Nets* for each of the twelve common Human Factors.



# 1. Lack of Communication

## Contributing Factors

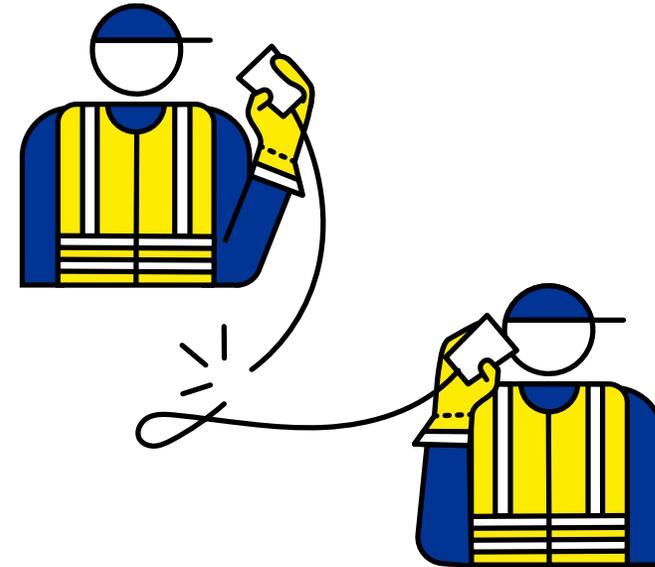
- Information was not passed on properly or was not well received or understood
- Lack of dialogue or discussion between people
- People made assumptions about the information or the task to be done



# 1. Lack of Communication

## Safety Nets:

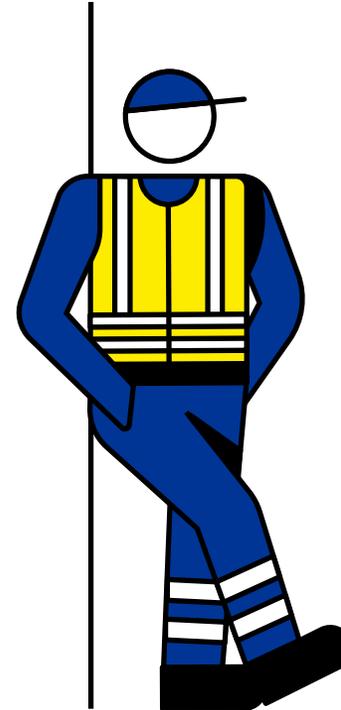
- Use logbooks, worksheets or other written methods to communicate and remove doubt
- Shift turn-over should not only to be written down, but also descriptive words should be used such as “left”, “right”, “top”, “bottom”, “upper” and “lower”
- Discuss the work to be done and what has been completed
- Discuss the work with the people who need to know. Make sure the person responsible for the sign-off knows the status of the equipment/component
- Never assume anything
- Never assume your teammates know what is going on. Take responsibility, and inform them yourself
- Always check (e.g. climb up the work stand, ask teammates to explain)



## 2. Complacency

### Contributing Factors

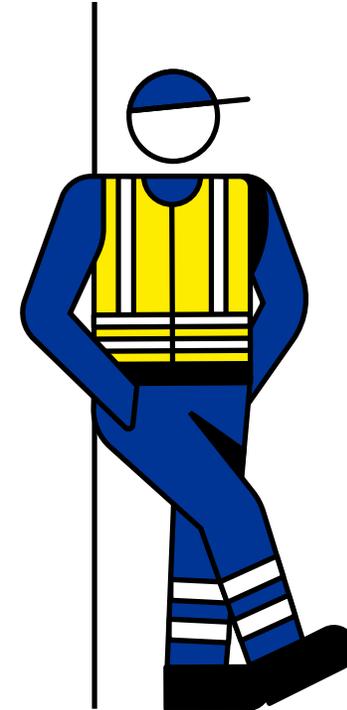
- Complacency is caused by a lack of sufficient stress. We know that stress is bad for our health, and too much unresolved stress certainly is. However, we need a moderate amount of stress for optimum performance. While too much stress causes confusion and poor decision-making, too little stress can cause a person to be bored and complacent.
- Feeling of self satisfaction
- Laxness (tendency to take short cuts instead of following procedure and not pay proper attention in routine tasks)



## 2. Complacency

### Safety Nets:

- **Face reality.** The reality we face in our field is that mistakes, even small ones, could kill someone
- **Physical fitness.** Physically fit people are more alert. People who are unhealthy have a built-in distraction. They tend to feel bad, making it difficult to take the initiative to “go the extra mile” or in some cases, to complete their work effectively.
- **Create challenges for yourself** – challenge yourself to find at least one fault per day
- **Never sign for something you didn’t do.** This is falsification and is a crime. You may feel pressured by Human Factors to falsify, but when you make the decision to sign for something you didn’t do, it is no longer a human factor issue, it is an ethical and possibly a legal decision to do so.



## 3. Lack of knowledge

### Contributing Factors

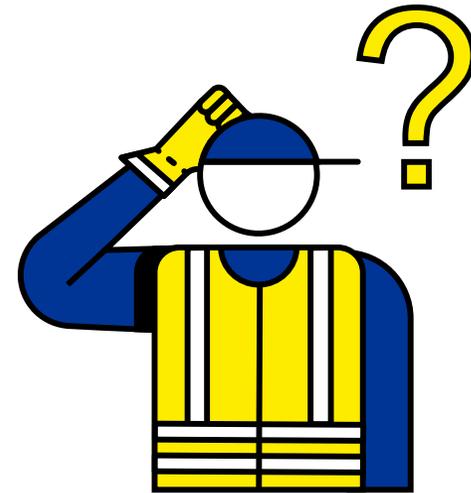
- Lack of basic knowledge
- Lack of skills (proficiency)
- Lack of proper training
- Not up to date with technological evolution in the job



## 3. Lack of knowledge

### Safety Nets:

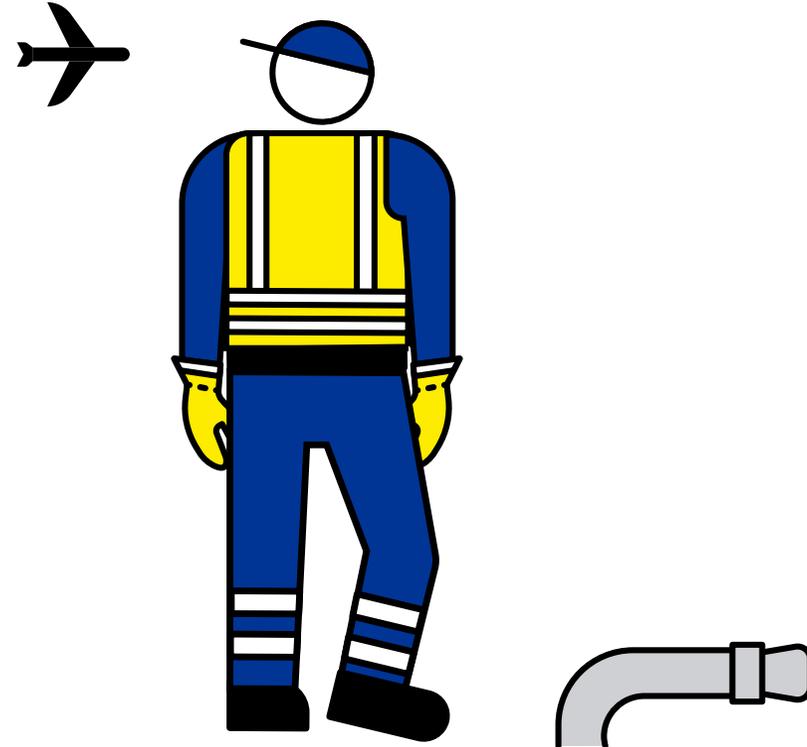
- **Get training on aircraft types** - Bad things happen to untrained people.
- **Understand your activity-** As well as reading up-to-date manuals, you should also read trade magazines, web sites, and human factors information. It may be up to you to find the information.
- **Use up-to-date manuals** - The aviation fuel industry values continuous improvement. One of the main constants in aviation fuel is constant change. “I’ve been doing it this way for years” is therefore not a valid attitude.
- **Ask a supervisor** - The quickest way to lose your status as the “go to expert” (recognized expert) in a team is to go ahead when you don’t know what you are doing. When you break something due to your lack of knowledge you are no longer the “go to” guy.
- **Communicate** - Let someone know when you need help. You will be respected for your humility.



## 4. Distraction

### Contributing Factors

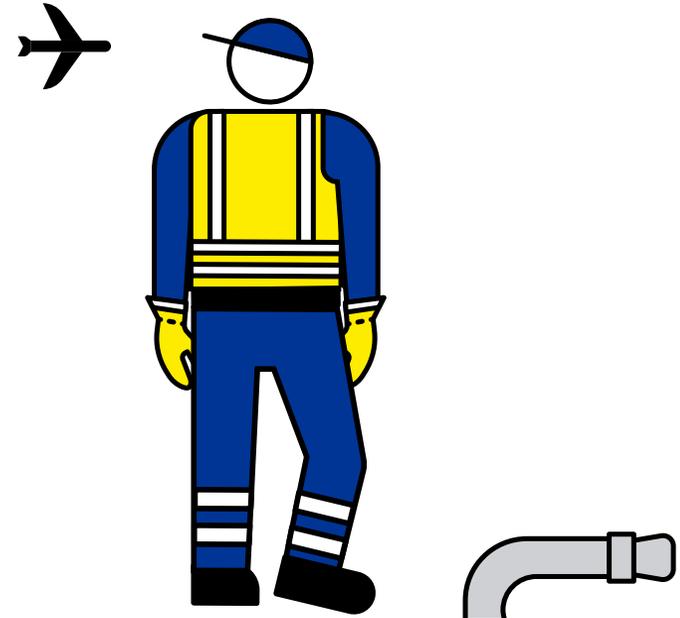
- Our jobs and our lives are full of distractions. It has become a feature of our culture. A distraction diverts your focus from the job you are doing and increases the chances that you will forget what stage of a task you are at and make an error. Distractions can come in many forms such as noise, bright lights, people, radio messages, telephone calls and problems at home.



## 4. Distraction

### Safety Nets:

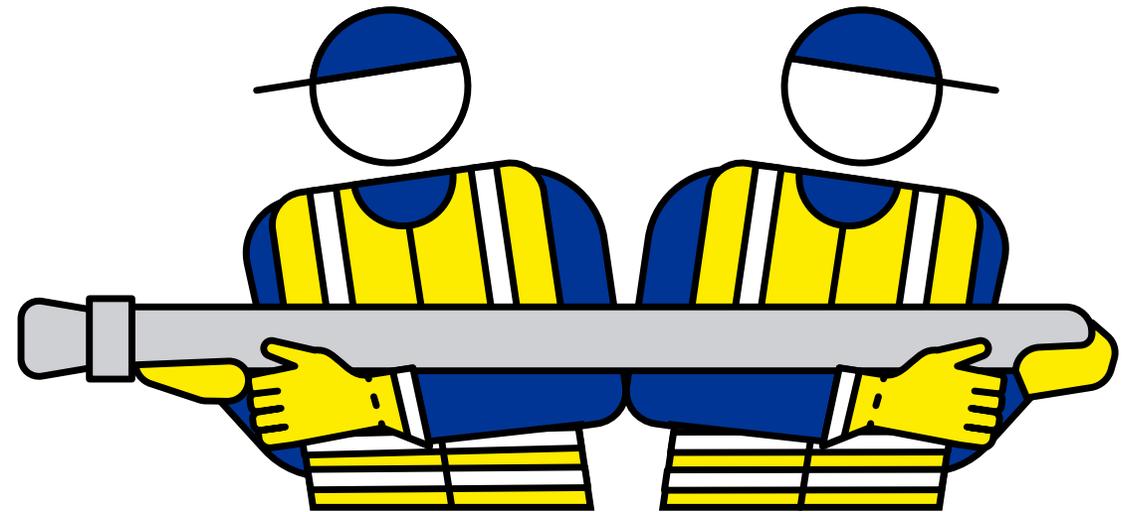
- **Always finish the job or lock-out / tag-out**
- **Mark any uncompleted work**
- **Double inspect**, with another or by yourself. Inspections of tasks can uncover a multitude of mistakes. It is always helpful to ask for another person's perspective. When you return to the job always go back three steps. When possible, this is very helpful.
- **Use a detailed procedure.** A detailed procedure helps when we become distracted.



## 5. Lack of teamwork

### Contributing Factors

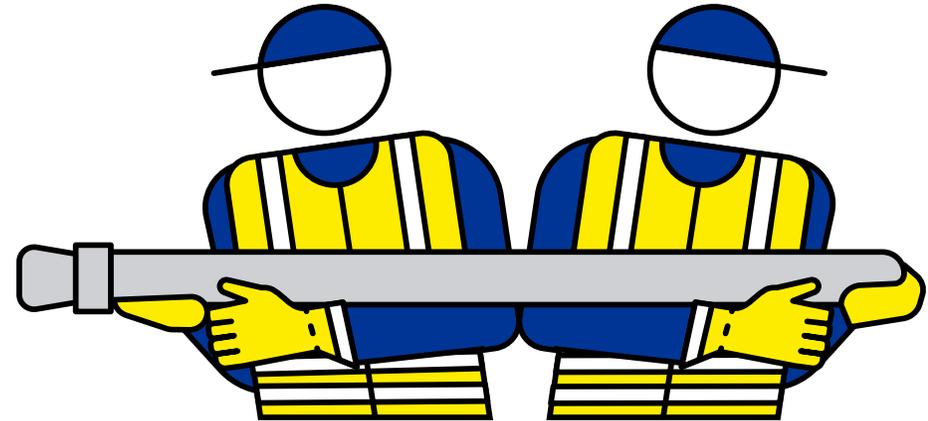
- Lack of Leadership
- No contribution to the team effort.



## 5. Lack of teamwork

### Safety Nets:

- **Communicate.** The team needs a clear purpose or mission. Never assume someone else knows exactly what is going on.
- **Reconfirm duties among team members.** During the short meeting clarify the exact role of each of the team members. Each person in the team needs to know how they fit within the team.
- **Follow the correct procedures.** It is very important to follow procedures when working as team. Your team-mates expect you to follow the rules. When you don't it makes a bad surprise for your teammates. It is especially dangerous to violate procedures when working in a team because combining a violation with an error can create a disaster.



## 6. Fatigue

### Contributing Factors

- Work under conditions of extreme temperature, loud noise, poor light...
- Very long work hours
- Few hours of rest



## 6. Fatigue

### *Fatigue: an explanation*

The effects of tiredness (fatigue) are common among Aviation operators, as many of them work eight to twelve hours a day.

Fatigue reduces a person's ability to work effectively.

Fatigue affects the way you think, and can cause memory loss, complacency, loss of coordination, lack of judgment, increased tolerance of risk, and reduced decision-making skills.

Studies have discovered that sleep loss has similar effects as high blood alcohol levels. Would those who ask us to work tired, tolerate us working drunk?

#### Types of fatigue

There are three types of fatigue. The first two, ACUTE and OPERATIONAL fatigue, are the same thing. They are caused by hard work and long hours. The difference is only a matter of duration. CHRONIC fatigue, however, requires medical intervention. It is another term for Depression and needs at least counselling and possibly medicine.

**ACUTE:** produced by hard physical activity or sleep loss. Alleviated by a single rest period

**OPERATIONAL:** most commonly experienced after 3-4 days of heavy duties. It cannot be relieved by a single sleep period.

**CHRONIC:** medical or psychological problem. Depression or "chronic fatigue syndrome".



## 6. Fatigue

### Symptoms of fatigue

There are the symptoms of fatigue. These symptoms are true of fatigued people whatever category of fatigue they are experiencing. Chronic fatigue shows some of the same symptoms. The symptoms can be identified more easily by colleagues working with the person than by the person who is actually suffering from fatigue.

The symptoms are:

- attention reduced
- poor memory
- no or poor communication
- low awareness of surroundings
- long hours of labour (any type)
- high intensity stress



# 6. Fatigue

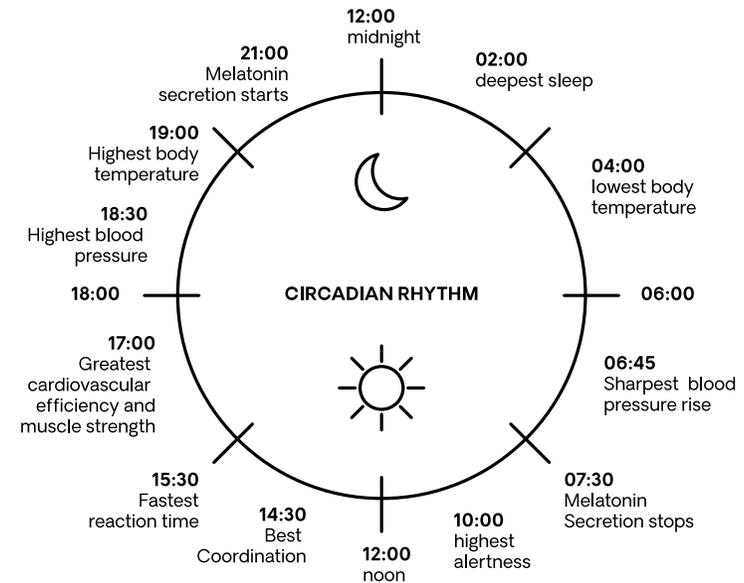
## *Fatigue: an explanation*

### **CIRCADIAN RHYTHM**

We have an internal biological clock with a cycle of roughly 24 hours. Many bodily functions cycle about these daily circadian rhythms, such as blood pressure, heart rate, core body temperature and others.

Perhaps most important to us is performance also cycles about normal circadian rhythms. The typical circadian cycle causes performance to peak between noon and nine o'clock in the evening and then fall to a minimum between three and six o'clock in the morning.

The point is: safety nets for fatigue are important no matter how long you have been on shift work. You will just not be at your peak performance between midnight and 4 a.m. even if you regularly work those hours.



## 6. Fatigue

### Safety Nets:

- **Be aware of the symptoms and look for them in yourself and others.** Remember the symptoms: reduced attention, diminished memory, withdrawn mood, low situational awareness brought about by long hours of labour, high intensity stress.
- **Plan to avoid complex tasks at the bottom of your circadian rhythm.** Nice idea isn't it? In a perfect world this might happen. Perhaps the pragmatic point of view would be to understand you will not be at your peak performance in the night time and compensate with any resource you can find. Resources like colleagues who can support you with help thinking through difficult situations (perhaps they will also be willing to help with extra tasks). Another resource may be a slower operating tempo allowing you to slow down and think through complex tasks.
- **Sleep and exercise regularly.** Practice good sleep patterns. Try to sleep where it is quiet, cool and dark. It is difficult to get a sound sleep when your circadian rhythm is at its peak. Exercise will generally make you feel better, and more prepared to relax.
- **Ask others to check your work.** It is very difficult to avoid an action you did not intend to do. This makes mistakes somewhat invisible to those who make them. Someone else's point of view may uncover what you cannot see.



## 7. Lack of resources

### Contributing Factors

- Completing tasks using old, or inappropriate spare parts
- Lack of personnel, time, data, tools, skill, experience and knowledge etc.
- Resources available, including support, are of a low quality or inadequate for the task.



## 7. Lack of resources

### Safety Nets:

- **Check the procedure and ensure the required parts are available.** Lack of proper planning leads to making wrong decision. It is one of the main reasons people violate procedures.
- Jobs tend to be completed despite the lack of the parts. The idea is to use good planning to reduce pressure on operators to be creative.
- **Order and stock anticipated parts before they are required.** In this world of, “just in time delivery” it is tempting to let the distributors handle the stocking of the parts.
- **Maintain a standard and if in doubt put out of the service the fueller/hydrant servicer/filter vessel/pump.** Procedures require proper tools, equipment, special equipment and material.



## 8. Pressure

### Contributing Factors

- Commercial / operational deadlines
- Putting pressure on ourselves by taking on more work than we can handle
- By lack of resources, especially time; and also from our own inability to cope with a situation



## 8. Pressure

### *Pressure: an explanation*

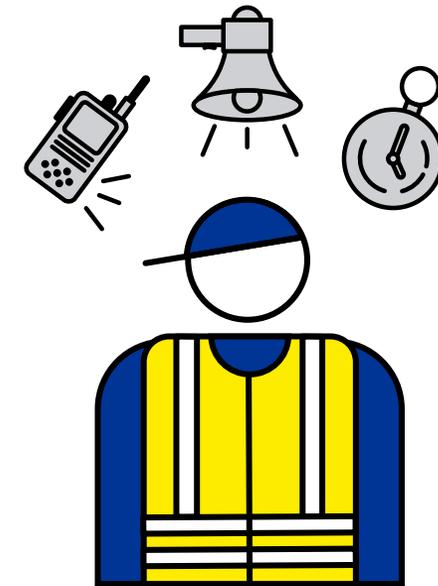
A certain amount of pressure is normal, but too much pressure can cause an operator to make a mistake. The most common danger is pressure to produce or deliver work. Pressure to produce causes people to drift towards dangerous methods in order to get the job done.

#### **Features of pressure to produce to are:**

- Completion of work despite lack of resources
- Supervisors accepting or ignoring unapproved actions to get the vehicle back into service
- Releasing a vehicle with repairs not completed

#### **Signs of excessive pressure to produce are:**

- Being asked many times, “how long is this going to take”?
- Getting frustrated and angry during the job
- Wanting to go home



## 8. Pressure

### Safety Nets:

- **Be sure the pressure is not self-induced.** You can reduce the pressure you put on yourself. The picture of the Coast Guard saving capsized boaters is a good example of when pressure is not self-induced. Anything short of life and death can be put into perspective and dealt with in a rational way.
- **Communicate your concerns.** One way to reduce pressure is to communicate your worry to someone who is in a position to make a difference by changing things.
- **Ask for extra help.** Extra help and other vital resources are generally available if you ask for them. Your supervisor wants you to be successful, because when you are successful, he/she is too.
- **Just say NO.** Saying no is a last resort. The idea is to be assertive (having or showing a confident and forceful personality), not aggressive when you tell someone NO.



## 9. Lack of assertiveness

### Contributing Factors

- Unable to express our concerns and not allowing others to express their concerns
- Lack of self-confidence



## 9. Lack of assertiveness

### Safety Nets:

- Communicate directly, but honestly and appropriately
- Give respect to the opinions and needs of others
- Never compromise on safety and quality standards.
- Follow a training course on assertiveness techniques



## 10. Stress

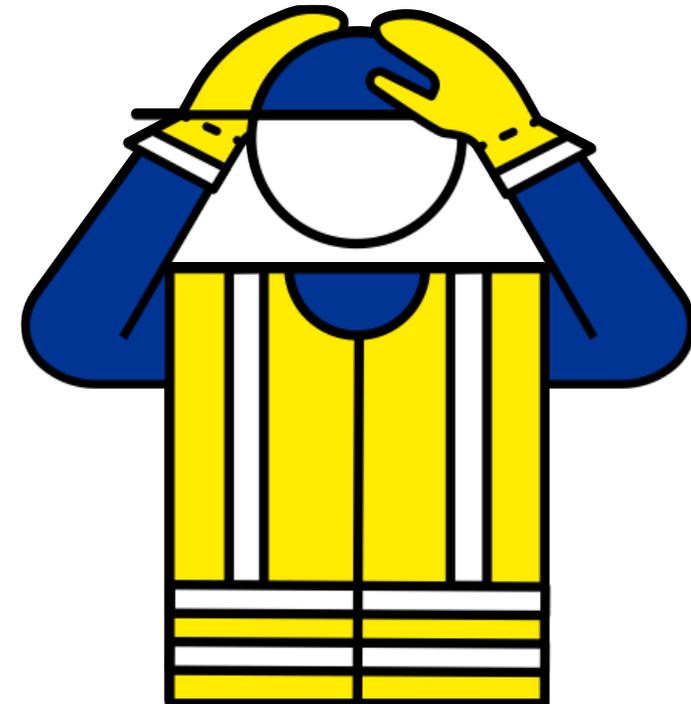
### Contributing Factors

- Real-time demands; such as dealing with an emergency or working under time pressure with inadequate resources (Acute stress).
- Long-term demands placed on the operator by life's demands, such as family relations, finances, illness, divorce, or even winning the lottery (Chronic stress)

#### *Stress: an explanation*

In order to work effectively a person needs a certain amount of stress. Sportspersons are a good example of this. However, not enough stress and too much stress can both cause problems at work.

The stress curve is an inverted “U” curve similar to the assertiveness chart. If stress is low it causes boredom and complacency. If stress is high then it causes fixation and confusion. Unresolved stress also tends to reduce our judgement skills leading to more risky behavior. However, a moderate level of stress is appropriate. It causes a person to be prepared and ready to perform. A moderate level of stress may be when a deadline is coming up or a person's supervisor is applying moderate pressure to produce or deliver work.



# 10. Stress

## Safety Nets:

- **Be aware of how stress can affect your work.** Understand that moderate stress is good. Too little or too much stress can be an influence to make mistakes.
- **Stop and look rationally at the problem.** You can affect the outcome of some things, but others are out of your control. It is a good idea to define to which category your stress factor belongs to.
- **Determine a rational course of action and follow it.** Develop a plan for the stress factors you can influence. Things may not get better overnight, but at some point you should be able to find an answer.
- **Take time off or at least have a short break.** For immediate stressors, taking a short break, eating or drinking can allow a solution to form.
- **Discuss it with someone.** People who are not directly involved sometimes have a point of view allowing them to see things you may miss. People generally have great ideas. Two heads are better than one.
- **Ask fellow workers to monitor your work.** When operators are severely stressed their teammates usually know why. Most people have a desire to help. If you ask your friends to back you up due to some life

issue they will be happy to do so.

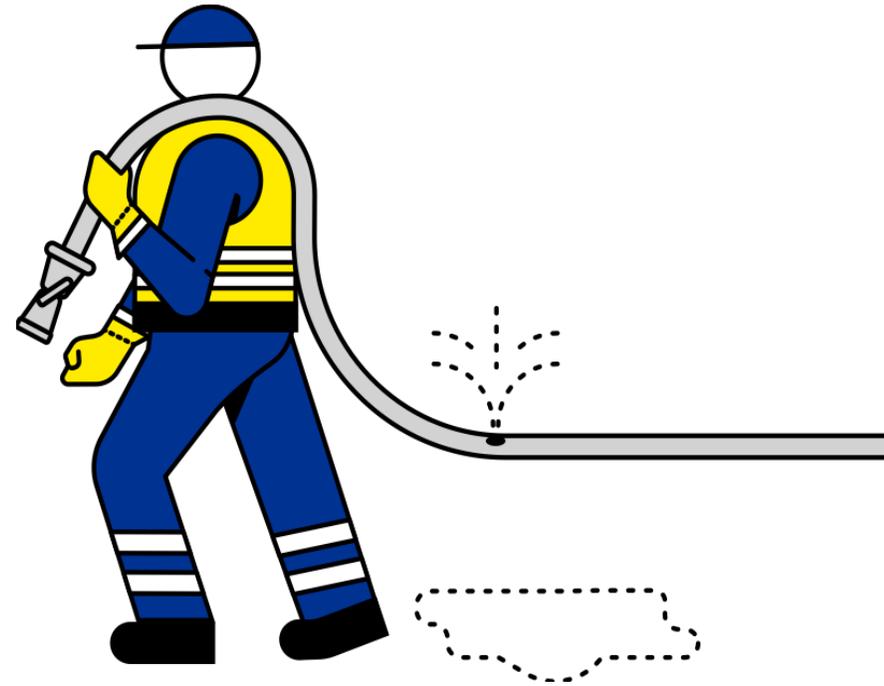
**Exercise your body.** What we feel due to excessive stress is our body's fight or flight reaction. Fighting is normally not very socially acceptable, but flight, as in exercise is. The idea would be to exercise as a natural method to reduce the fight or flight reaction. Exercise pumps up endorphins, your body's feel-good neurotransmitters. It is meditation in movement. After good hard exercise, you'll often find you've forgotten the day's dilemmas and irritations and concentrated only on your body's movements resulting in energy and optimism.



# 11. Lack of awareness

## Contributing Factors

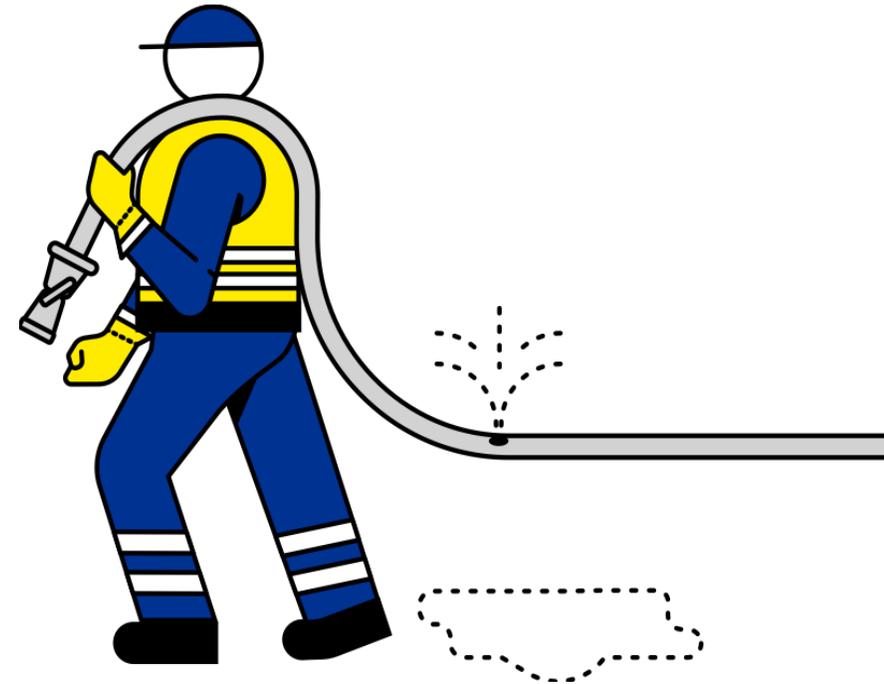
- Working in isolation and only considering one's own responsibilities > Tunnel vision.
- Lack of awareness what kind of effect our actions can have on others and the wider task



# 11. Lack of awareness

## Safety Nets:

- **Think of what may occur in the event of an accident.** It is not easy to anticipate events that have not yet happened. Brainstorm possibilities with colleagues. Identify hazards associated with the situation. Then modify the plan to reduce the risk of the hazard.
- **Check to see if your work will conflict with an existing modification or repair.** It is the installer's responsibility to check for conflict because the installer is firmly rooted in the reality of the installation.
- **Ask others if they can see any problem with the work done.** Listen to your teammates. They will have a different perspective.



## 12. “Norms”

### Contributing Factors

- “We have a better way to do this job than the published procedure”
- Company culture
- Own habits
- Procedures transmitted between generations without documental support



## 12. “Norms”

### Safety Nets:

- **Always work following the procedures.** We tend not to make an intervention when procedures cannot work as they are written down and a “work around” (alternative method) is required to get the job done. We are used to it. Maybe it is just easier to ignore it. But what happens to the next person that has to work with the same poor procedure?
- **Be aware that common practice doesn’t make it right.** It can take real courage to stand up to the group and point out their norm does not meet the rule, or the published procedure. However, a little pain and effort today can save much more pain in the future.



# Human Factors : a discussion

## Questions

Can you think of any other Human Factors? Such as:

- Illness
- Emotional issues (anger, pride, fear)
- Drug and alcohol use

**HUMAN FACTORS**

- 1 Lack of Communication**
- 2 Complacency**
- 3 Lack of knowledge**
- 4 Distraction**
- 5 Lack of teamwork**
- 6 Being tired (Fatigue)**
- 7 Lack of resources**
- 8 Pressure**
- 9 Lack of assertiveness**
- 10 Stress**
- 11 Lack of awareness**
- 12 Norms (Convention, Standards)**

All of these can affect your work

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Stop & start  
the machine

STOP → THINK → ACT  
**STAY SAFE**  
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# Human Factors : a discussion

## Closing statement – face reality

People make mistakes, the purpose of this Human Factors awareness document is to highlight **safety nets** which if used regularly can reduce the possibility of the mistakes happening.

- The reality we face is that if we make even a very slight mistake, the consequences for us, our colleagues, our families, our customer can be very severe.



# THANK YOU

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