Focused Work

Practical tools for managing distraction in a dynamic aviation environment.

Table of Contents

Authors

James Stottlemyer   Bristow Group
Duncan Moore   Omni Helicopters
David Leithner   Shell Aircraft
Andreas Eleftheriou   PHI Group
Liam Tutin   CHC Helicopters
Chris Cooper   NHV Group
Francois Lassale   HeliOffshore
Steve Hazlehurst   HeliOffshore

Contributors

Duncan Trapp   CHC Helicopters
Rob Saunders   Shell
Marcin Nazaruk, Ph.D.   Baker Hughes
Will Jacobs   Cougar Helicopters

Introduction

Executive Summary

The modern work environment has transformed over recent years with enhancements in digital communication and technology. Employees see less separation between their personal and professional lives as they are easily reachable 24/7 by both the employer as well as their family. The new "connected environment" presents an opportunity, and a need, for leaders to review existing practices to ensure that employees across the organisation are best equipped to focus on their respective tasks.

Within offshore operations, safety-critical responsibilities are not confined to flight operations, ground operations, or maintenance/engineering. Support services such as flight following, IT, safety, and HR perform safety-critical actions throughout their day. The intent of this study is to define a framework to aid in the identification and management of internal and external sources of distraction to help individuals recognise 1) where they are most vulnerable to distraction prior to starting work, 2) how to recover from distraction during work, and 3) how to capture errors made as a result of distraction before finalising a task.

Background

The American Psychological Association (APA) simply defines distraction as, "the process of interrupting attention (focus)." Within the transportation industry research into distraction has primarily worked to identify specific actions that interrupt one's focus. Road safety, as an example, commonly references talking on a cell phone or texting while driving as primary actions that can cause distraction whilst driving a motor vehicle. The Flight Safety Foundation (FSF) similarly completed a study (Flight Safety Foundation, 1999)[1] to identify actions that can result in distraction for pilots. Within this study, communication, head-down time, and dealing with abnormalities were the primary actions that resulted in pilot distraction.

Current State

In collaboration with HeliOffshore members, a working group was developed to explore these opportunities.

Within our industry, the term distraction is traditionally associated with a negative outcome and is trended as a causal / contributing factor during event investigation. One could assume that to classify as a distraction an invisible threshold has been crossed resulting in a negative event. Distraction is only the transition of attention from one area of focus to another regardless of duration. Our goal is always to ensure that employees remain focused on their specific task throughout the entire process. For this reason, we have chosen the term 'Focused Work' to define the area of study.

The Challenge

While programs do exist in offshore aviation to manage distraction within certain areas of our operations, it was recognised that overall awareness and application could be enhanced. Our self-imposed challenge was to accept that distraction occurs on a frequent basis within the workplace, and it is not enough to train employees on actions that can cause distraction with an expectation that they will be able to consistently distinguish when these actions have, or have not, impacted their performance.

As a working group, we believe we can build something practical for individuals, teams, and organisations to use that will raise individual and collective awareness of distraction that may impact our performance, and reduce the negative outcome associated with distraction events when they do occur. This paper will outline a new model, developed by HeliOffshore members, to address this challenge. Over the next 12-18 months our hope is that the information provided by the working group will be adopted in whole or through modifications to existing processes and systems such as HFACS or Threat and Error Management (TEM). Throughout this time the working group will remain active to assess the methods of adoption and implementation by various organisations. Following this period of innovation, the workstream will publish an implementation guide to share throughout the industry.

Note: In organisations that use the HFACS model the 'Focused Work' principles will assist in the pro-active understanding of failure pathways for the latent factors of the organisation, leading to errors and violations.

Objective

The fundamental objective of this study is to enhance the individual and collective awareness around focused work and provide guidance to recognise:

- The impact that sources of distraction have on human performance within aviation operations,
- Actions that can be taken to manage distractions before, during, and after the completion of a task,
- Triggers that can help one individually recognise when they have been distracted, and observable behaviours to recognise when someone else may be distracted, and
- To propose a meaningful framework to address possible sources of distraction prior to beginning work, capture human errors after one has been distracted, and safely return to normal work.

These pillars serve as the foundation to allow organisations to implement a proactive focused work program and reduce the likelihood of a possible negative outcome from a distraction event. A supportive and committed leadership team must accompany a 'Focused Work' program to benefit from open employee reporting.

Tools

In order to support the defined objectives listed above, the group is committed to the establishment of:

- A white paper outlining potential next steps and considerations for management for the training, development, and implementation of a Focused Work program along with provisional guidance on how one can recover from non-focused work.
- A reference tool for frontline personnel to assess themselves and their surroundings to minimise the impact of distraction before, during or after work is performed.
- A Focused Work training video made available to all operators to support the training and awareness of employees at all levels within the organisation and will outline the elements of the TEAMS model.

Foundational and Organisational Elements impacting Focused Work

A healthy safety culture is required if employee self-assessment tools are to be effective. ICAO states, *"A safety culture encompasses the commonly held perceptions and beliefs of an organisation's members pertaining to the public's safety and can be a determinant of the behaviour of the members. A healthy safety culture relies on a high degree of trust, [learning, accountability] and respect between personnel and management and must therefore be created and supported at the senior management level." "An effective way to promote safe operations is to ensure that an organisation has developed an environment where all staff feel responsible for safety. This becomes evident when staff consider the impact on safety in everything they do, report all hazards, errors, and threats, and support the identification and management of all their associated risks. In addition, management must create an environment in which personnel are aware of safety risks, are given sufficient systems to protect themselves, and are assured protection when they divulge safety information through the safety reporting system."* (ICAO, 2018)[2]

The openness or willingness of employees to share information (reporting culture), and the desire and ability of the management team to support appropriate mitigations or interventions as a result of the reported information, are critical cornerstones to supporting a focused work program. When designing and implementing such a program, it is important to give due consideration to potential barriers stemming from not just an organisation's culture (institutional factors), but equally the broader social behaviours and norms. These behaviours and norms may prevail in the staff-employer-client relationships that vary based on regions, countries, the maturity of the organisations involved, open and hidden hierarchies, and service provider's interactions with its customers. For example, the value of a focused work program that is actively promoted to employees will quickly be undermined if reported events were downplayed, outright discarded by the organisation, or if company management were not enabled by its clients to take necessary safety action when distraction events require services to be delayed or even cancelled. Ultimately, effective implementation requires a strong commitment and participation by those parties based on a common understanding, collaborative rollout, and mutual support for each other.

Training the workforce to identify distraction will only provide a limited self-correcting impact if employees are unwilling to report sources of distraction that they encounter within the workplace. Open communication, specifically concerning areas where employees are observing the potential for distraction, will allow an organisation to proactively manage each of the sources of distraction that are within their control. Open reporting is also essential to allow the organisation to identify, and individually manage, sources of distraction that relate to non-workplace-related events such as individual family hardships, health or financial concerns. Prior to implementing the TEAMS model (described hereunder), organisations should have confidence that their workforce is willing and able to report safety hazards, threats, and occurrences, and management at all levels support the open reporting culture with transparency, with meaningful action for areas of safety improvement when appropriate, and with a consistently applied just culture.

The T.E.A.M.S model

Elements of the TEAMS Model

The TEAMS model is designed to identify sources of internal and external distraction. The TEAMS model contains five areas of consideration, **Task, Environment, Anatomy, Mind, and Stress**. The model highlights that the cognitive process of focusing attention does not stand alone in isolation and consideration must include the task and environment in which we operate. We have assessed each element of the TEAMS model to identify the impact that it could have on one's ability to focus during a task. The development of a standardised model is challenging as it cannot account for every individual mental model or consider how every individual sees the world and the relationship between its parts. The considerations of this document are not definitive and appropriate context is required to ensure that the intent behind each element is understood within each organisation's various departments.

It is recognised the susceptibility to distraction arising from the performance of a particular task, or group of tasks, will vary from operator to operator based upon a wide spectrum of factors. Our guidance in this regard is that each organisation considering the use of the TEAMS model should evaluate their own business and operational circumstances, applying particular focus to the factors identified as "medium" and "high impact" in the following sections of this white paper, when developing the scope of their implementation.

Task

Many elements of the performed task can affect one's performance. Clarity of the instructions, ones understanding of the task, our individual mental model or expectations on how the elements specific to the performed task, or interest in the task, can affect ability to retain focus on their actions or environment and can lead to distraction.

Interest – It is imperative that we understand the relationship between highly routinised activities and the required attention necessary to ensure a successful outcome.

New and exciting tasks tend to capture one's attention naturally and without effort. Conversely, tasks that are routine and do not provide a natural interest require a deliberate, or voluntary, effort to focus one's attention. During this deliberate mode of attention, the mind will occasionally misdirect attention to areas of interest for several seconds or minutes. These routine and familiar tasks serve as the greatest threat to focused work. (Reason, 1984)[3]

A study focused on mental fatigue and control of attention similarly found that when the motivation to engage in the task becomes low, fatigue serves as a stop emotion that protects individuals from overspending energy and conserve it for the moment that a more rewarding activity presents itself (van der Linden, 2011)[4].

The following correlations between one's interest in a task and attention should be understood to minimise one's potential for non-focused work.

a) **Low Impact** – New and exciting tasks naturally capture one's attention without effort.
b) **Medium Impact** – Complex tasks require a deliberate mode of attention that a human being cannot sustain indefinitely.
c) **Medium Impact** – Sustained tasks -The longer one performs a task the more susceptible they are to mind wandering or shifting attention to areas of interest.
d) **High Impact** – Routine or non-interesting tasks require deliberate attention and will result in the mind occasionally drifting attention to other areas of interest.

Cognitive Load – Cognitive load refers to the demand placed on working memory, or memory that can be manipulated. Working memory is a finite resource of the human brain. Unlike short- and long-term memory used to recall information, we use working memory when completing tasks or learning. Working memory is critical for tasks such as planning, problem solving and reasoning.

A high cognitive load increases the demand on working memory and can negatively affect one's ability to process information and learn. Two primary factors affect cognitive load:

(1) **The complexity or number of the task being performed** – tasks that are complex, require problem solving and/or reasoning have a higher demand on working memory. Task loading can also affect the amount of working memory required. In aviation, secondary tasks completed during the course of a primary task can use necessary working memory resulting in a shift in one's focus or attention. Additionally, human beings have a tendency to "multi-task" or work on multiple tasks for short periods, requiring the shifting of attention and increased demand on cognitive load.

(2) **The medium used to communicate instruction(s)** – carefully consider the appropriate method to communicate the true understanding of a task, therefore decreasing the demand placed on working memory. For example, a checklist or picture is sometimes easier to understand than the same instructions or orientation presented in written or spoken format.

Consider the following general principles when assessing the impact that a given task(s) can have on one's cognitive load:

a) **Low Impact** – Simple/basic tasks that are well understood prior to execution and are completed without significant cognitive loading.
b) **Medium Impact** – Tasks that require following a checklist or step-by-step process, those that instil confusion/doubt when attempting to understand the instructions, or when completing more than one simple/basic task at a time.
c) **High Impact** – Complex tasks, tasks that are not understood, when completing multiple checklist tasks at one time, or a safety critical task along with another secondary tasks.

Environment

The environment in which we operate can act as a significant source of distraction or can help minimise one's exposure to sources of distraction. Due to the dynamic nature of helicopter operations, it is unreliable to make assumptions about a "standard work environment". Instead, a more reliable method of accounting for environmental sources of distraction is to assess dynamically an individual working environment before each task.

We can broadly categorised environmental sources of distraction into the following buckets:

Visual – The eye delivers around 80% of the information we need to perceive the world. This makes vision our primary sense. A study completed by Beck Johnson[5] explored the relationship between visual distractions in direct line of sight (while seated during bench tasks) for high focus work and found that the presence of visual distraction resulted, on average, in a 16% increase in errors. Additionally, the presence of visual distractions during high focus work resulted, on average, in a 13% increase in perceived difficulty in focusing during a given task.

Consider the following general principles when assessing the need to remove sources of distraction within a working area:

a) **Low Impact** – Work completed in an area that has been selected or prepared to remove the likelihood of visual distractions from the activities of others, such as single-bay maintenance hangars, or sterile cockpit.
b) **Medium Impact** – Work completed in an area that has minimal visual distraction opportunities, such as an area set aside from a busy operating environment or when flying coupled to the autopilot.
c) **High Impact** – Work performed in an environment with other ongoing operations, within dense airspace or other ongoing sources of visual distraction.

Auditory – Multiple factors play into what sounds actually capture one's attention or focus. Noises that are predictable and agree with the body's expectations show little effect in capturing one's attention (Lutfi-Proctor, 2016)[6]. This is why "white noise" can help one recall information as it is predictable with little modulation and blocks out other sound that could be more distracting. The best way to minimise the potential for distraction is to eliminate the sources.

Consider the following general principles when assessing the need to remove sources of distraction within a working area:

a) **Low Impact** – Constant or repetitive sounds that do not alternate frequency and are predictable.
b) **Medium Impact** – Human voices or saying one's name tend to capture one's attention more than environmental sounds.
c) **High Impact** – Modulating sounds or loud sounds that have a stark contrast to the ambient sound in the workplace.

Temperature – The temperature of the working environment can serve as a source of distraction. Many times, maintenance, flight and ramp/ground operations occur in less-than-ideal temperature conditions and range anywhere from freezing temperatures with bitter wind chill to very hot or humid environments. Temperature control and appropriate clothing can help minimise the potential for the temperature to serve as a distraction.

Consider the following general principles related to unmitigated temperature conditions when assessing the need to remove or minimise the source of temperature distraction.

a) **Low Impact** – Comfortable or Slightly warm/cool temperature conditions.
b) **Medium Impact** – Conditions that result in skin cooling effects (Cheung, Westwood, Knox, 2007[7])
c) **High Impact** – Extreme temperature conditions (hot or cold)

Lighting – Workplace lighting can affect human health as well as work performance. Natural lighting is better than supplemental lighting as long as appropriate UV protection is in place for direct skin and eye exposure. From a workplace perspective, natural lighting has the greatest impact on the body's circadian rhythm. The colour temperature of the light also plays an important factor in visual acuity. White lights (higher colour temperature) provide significantly better visual acuity compared to yellow lights (lower colour temperature). A study examining colour temperature impact on visual acuity found that yellow lights required 400% more task luminance (brightness) compared to white lights to obtain the same visual acuity (Navvab, 2002)[8]. When natural lighting is not available, use supplemental lighting in a manner that supports appropriate visual recognition by providing the appropriate intensity (lumens) and at a temperature range that minimises eye fatigue and promotes visual acuity.

Consider the following general principles related to workplace lighting conditions when assessing the need to remove or minimise the source of colour temperature distraction.

a) **Low Impact** – Natural lighting or natural colour facility lighting that meets OSHA or similar specifications,
b) **Medium Impact** – Non-natural colour facility lighting that meets OSHA or similar specifications,
c) **High Impact** – Supplemental lighting such as flashlights, headlamps, or light stands.

Anatomy

Anatomy is a reflection of one's physical and physiological condition that may affect their performance within the work environment.

Physical Condition – Many aspects of one's physical condition can influence work performance. Ideally, design of tasks and equipment support proper ergonomics and protection to minimise or eliminate the possibility of pain or discomfort. An assumption will not be made that all equipment or tasks meet this intent, therefor one's height, weight, flexibility, strength are a few areas of consideration when considering if a task can safely be completed by an individual. One's physical condition can prevent the completion of a task if the body is not capable of the movement or strength required. Traditionally it is easier to recognise if a task is outside of one's physical capabilities. More challenging is recognising when the completion of a task that one is capable of, could cause discomfort or lead to injury. Both discomfort and injury can serve as sources of distraction affecting one's ability to focus. Task-based risk assessments or ergonomic assessments for routine tasks can help identify when individual restrictions, fitness requirements, or other mitigation efforts are required.

Consider the following general principles related to one's physical condition prior to executing a task.

a) **Low Impact** – No physical limitation in strength, flexibility, or endurance
b) **Medium Impact** – Tasks that result in modifications to the work process to account for minor physical limitations or those tasks that are known to cause the individual discomfort.
c) **High Impact** – Multi-person tasks completed independently or those tasks that cause the individual physical pain.

Physiological Condition – How our body functions is a state of our physiological condition. A number of chronic physiological diseases can affect one's ability to focus at work. Similarly, acute conditions such as one's current hydration level, blood sugar, and level of fatigue can also affect one's mental acuity and concentration. Discussed chronic physiological diseases with a medical professional to understand how they might affect one's ability to work safely. Consider the following general principles related to acute physiological conditions when assessing the need to resolve an acute condition prior to starting work.

Hydration – Roughly, 60% of the human body is water. Water is responsible for temperature regulation and maintaining other bodily functions. Multiple factors in combination can influence dehydration including water deprivation, physical exertion, and environmental conditions such as heat and humidity. Many studies have been completed to look at the effects of mild to moderate dehydration (reduction in 1-6% body mass loss) on cognitive performance. A meta-analysis comparing multiple studies found that dehydration impairs cognitive performance, particularly for tasks involving attention, executive function, and motor coordination when water deficits exceed **2% body mass fluid loss** (Wittbrodt, Mizelle, Wheaton, Sawka, Millard-Stafford, 2016)[9].

Additionally, a 2% reduction in body mass fluid loss results in a 20% decline in physical performance. (Adan, 2012)[10].

Every individual body responds differently to the effects of dehydration, consider the following principles when assessing the impact that dehydration might have on an individual employee.

a) **Low Impact** – water intake around 1 glass per hour, comfortable temperature condition, and no excessive physical exertion or perspiration.
b) **Medium Impact** – moderate water deprivation or environmental or task conditions that result in physical exertion or perspiration.
c) **High Impact** – Significant water deprivation or environmental or task conditions that result in prolonged physical exertion or perspiration.

Blood Sugar – Good nutrition is an important chronic determinant factor in one's ability to focus. Hunger traditionally has an acute effect that is seen more often in the workplace and can vary throughout the working day. The brain represents about 2% of the mass of the body, however it accounts for 20% of the energy used. (Raichle & Gusnard, 2002)[11]. The only source of energy used by the brain is glucose (sugar) and a deficit in glucose can have a significant impact on one's ability to focus. Individuals with pre-existing medical conditions, such as diabetes, are aware of their need to manage blood sugar throughout the day. Prolonged periods of hunger will result in a decrease in blood sugar. In contrast, spikes in blood sugar because of foods high in sugar will cause a sharp increase in insulin and subsequent "crash" effect as the insulin overcorrects the blood sugar level.

Consider the following general principles related to blood sugar for healthy individuals when assessing the need to correct one's blood sugar level prior to executing a task.

a) **Low Impact** – primary diet of non-processed foods eaten evenly over 3 to 5 meals a day.
b) **Medium Impact** – processed diet and/or greater than 8 hours between meals.
c) **High Impact** – eating a meal/snack high in sugar.

Mind

The brain is the most complex organ in the body and is responsible for one's intelligence, interpretation of the senses, the initiator of voluntary body movements, and control of behaviour. Since focused work is a reflection of one's attention controlled by the brain, one's mental state plays a significant role in the allocation of attention during the completion of tasks. The following elements affect one's mental state and can influence focus during the completion of a task.

Fatigue – Fatigue defined as the state of feeling tired, weary, or sleepy because of insufficient sleep, prolonged mental or physical work, or extended periods of stress or anxiety. The effects of fatigue can be acute or chronic and can affect someone both mentally as well as physically. The primary impact of fatigue is on mental acuity and therefore is classified in this study under "mind".

Generally speaking, Fatigue Risk Management Systems (FRMS) that exist within aviation traditionally focus on elements of employee rest periods and working periods. While short-term sleep deprivation of 24 hours was found to negatively impact decision-making and memory, simple attention was found to be most impacted (Lim & Dinges, 2010)[12]. An individual can recover from acute fatigue over the course of 1 or 2 rest periods.

During prolonged exposure to high levels of stress or fatigue, an individual can face "burnout" that negatively affects mental and physical fitness, job satisfaction, and perceived performance (Maslach & Schaufeli, 2000; Schaufeli & Enzmann, 1998)[13]. Both stress or fatigue exposure can occur in one's personal or professional lives and can compound on each other. Individuals who exhibit severe burnout symptoms were found to have had more self-reported cognitive failures, poor performance, and did not adequately allocate attention to action. These individuals were most impacted in their ability to exercise attention control, ability to tune out stimuli not relevant to the given task, impulse control, working memory (reasoning skills), and ability to switch between tasks (van der Linden & Eling 2005)[14].

Consider the following general principles related to fatigue when assessing its potential impact on focus prior to executing a task.

a) **Low Impact** – Healthy sleep periods (6-8 hours), working during the day.
b) **Medium Impact** – Shortened sleep period (4-5 hours) or recently transitioned shifts (day/night).
c) **High Impact** – Prolonged time with shortened sleep periods, multiple shift transitions without stabilisation.

Mind wandering – Mind-wandering can simply be defined as off-task thought. It can be voluntary or involuntary. The TEAMS model captures mind wandering as a mental break in flow and covered as part of the implementation of the TEAMS model. One's personal thoughts concerning relationships, finances, job security, or hobbies/interests can all serve as catalysts for voluntary or involuntary mind wandering and serve as a mental break in flow.

Some elements of "Task" and "Environment" affect mind wandering. However, consider the following additional principles related to mind wandering when assessing its potential impact on focus prior to executing a task.

a) **Low Impact** – Healthy personal relationships, and no immediate financial concerns, stable job security.
b) **Medium Impact** – Interpersonal conflict with a personal relationship or immediate financial concerns or concerns over job security.
c) **High Impact** – A combination of the medium impact items.

Mental Models – A mental model is one's individual understanding of 'how things work' in the world. There are thousands of stimuli within the environment, anyone of which can draw the attention and focus of the individual. For good or bad, mental models serve as a guide for where to direct one's focus at any given time and establish an individual assumptions or expectations about specific scenarios or events.

An individual builds their personal mental model largely off their experience and culture (organisational and societal). New ideas, norms and experiences can change an individual's mental models over time. Consider the following general principles related to mental models for the individual or supervisor prior to executing a task.

a) **Low Impact** – Individual is heavily experienced in the task performed *where* the organisational and peer cultures *support* following the rules, asking questions, and objective self-assessment.
b) **Medium Impact** – Individual is heavily experienced in the task performed *or* organisational and peer cultures *support* following the rules, asking questions, and objective self-assessment.
c) **High Impact** – Individual has similar or limited experience in the task performed *where* the organisational and peer cultures *do not* support following the rules, asking questions, and objective self-assessment.

Psychosocial – Workplace relationships exist within the social environment and can have a significant impact on employee job satisfaction as well as serve as a form of distraction.

Consider the following general principles related to workplace relationships when assessing the impact that personal relationships can have when completing a task.

a) **Low Impact** – Healthy workplace relationships based on mutual respect and trust. No ongoing performance issues. The employee has job satisfaction.
b) **Medium Impact** – Interpersonal conflict with one or more employees.
c) **High Impact** – Interpersonal conflict with one or more employees. The employee has ongoing performance issues. The employee states they lack job satisfaction.

Stress

Stress is the body's non-specific response to a demand placed upon it. In addition to affecting one's performance, the sources of distraction outlined in the TEAMS model can result in an individual feeling stressed.

Stress can manifest itself in a multitude of ways including changes in one's behaviour, emotion, mental state, and even physical changes. Although stress is discussed as an independent element of TEAMS, it encapsulates behavioural markers from the Task, Environment, Anatomy or Mind that can be observed by others. Use the chart below to identify signs of stress in the workforce.

Task	Environment	Anatomy	Mind
Performing **multiple tasks** at once which requires shifting attention.	**Breaks in focus** to look at items in the environment including other people, phones, simops, etc. not relevant to the given task.	Signs of **physical discomfort** or pain.	**Off-topic conversations** ongoing throughout a task.
Performing **complex tasks** or **complex safety critical tasks**.	**Sweating** or shivering.	**Abnormal productivity/** energy (high or low).	There is a **difficulty** to retain or **recall** information.
	Squinting one's vision.	Not **hydrating** or loss of appetite.	**Changes** from one's normal **behaviour** or disposition.
	Making comments concerning **workplace relationships**.	Experiencing **headaches**.	**Complaining** about personal or work-related items.
			Lacking confidence or **experience** in the task.

Table 1: Observable signs of stress

Implementation of the TEAMS Model

The TEAMS model is designed to be used by employees at all levels within an organisation. Human performance factors significantly affect safety within front-line positions. The proactive engagement of supervisors and managers is critical in establishing and supporting the organisational safety culture. The TEAMS model will be most effective when managers are seen actively participating and supporting the use of the TEAMS model to accomplish the following:

Prepare for work – by conducting a pre-task assessment to minimise the sources of distraction prior to starting a task. Conducting a pre-task assessment by answering a series of questions or "triggers" helps the individual recognise sources of distraction and eliminate or mitigate them prior to starting a task.

The implementation of a pre-task assessment allows time for an individual to dedicate focus to internally examine the elements of TEAMS before, and after a task. The assessment has a specific purpose for each of the four elements.

Task (reflection) – When examining the Task an employee is examining their personal interest in the task they perform, the complexity and how often they complete this task, and their workload. The self-reflection is to aid in the awareness of the potential of losing focus during the task, as the employee cannot change the complexity, frequency nor interest in the task. It also helps one reflect on one's current workload.

Environment (action) – When examining the Environment section, the intent is to take action to prepare for the completion of the task by minimising sources of distraction prior to starting work. Environmental factors remaining after mitigation require additional supervisory oversight and monitoring throughout the task and discussed as a team pre-start planning.

Anatomy (reflection/action) – Similar to Environment, Anatomy allows one to prepare the body to focus prior to beginning a task. The workplace worker interface cannot address all elements of anatomy. Anatomy factors remaining after mitigation require additional monitoring and potentially supervisory oversight throughout the task and discussed as a team pre-start planning.

Mind (reflection/action) – The self-assessment of one's mental state is the hardest and least reliable amongst the elements of TEAMS. It is understood that the observable behaviours from others captured under 'Stress' will be more impactful when recognising when one is not focused, or when our thoughts or concerns are actually impacting our mood or performance.

One could benefit from pausing to reflect on their current level of fatigue and underlying assumptions they have concerning the task they are about to complete or their operating environment. Consider the following visualisation questions to assess the assumptions of one's mental model on a given task:
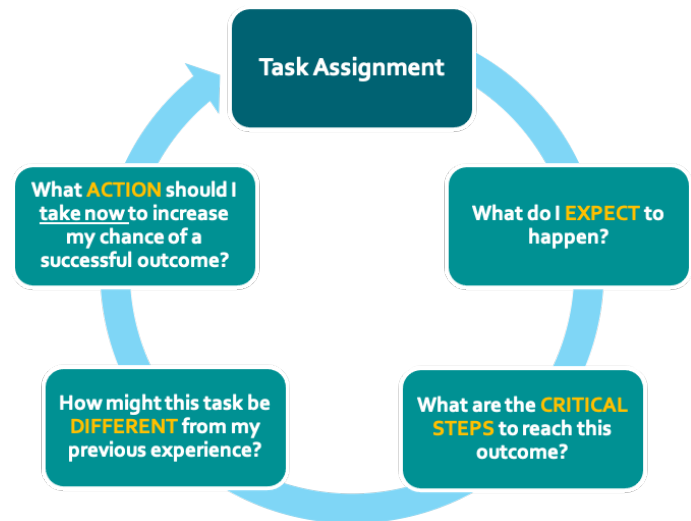

Figure 1: Prepare for work visualisation questions

Stress (reflection/action) – The observable behaviours outlined in the element of 'Stress' are effective in helping to recognise if someone else could be experiencing stress. Similar to 'Mind', self-assessments of 'Stress' could prove beneficial if viewed objectively. When self-assessing 'Stress' the intent is to take action to prepare for the completion of the task by minimising sources of distraction prior to starting work. Stress factors remaining after mitigation require additional monitoring and potentially supervisory oversight throughout the task and discussed as a team pre-start planning.

While a self-assessment acts as an important step in order to trigger an individual to exercise increased caution prior to performing work, it is subject to limitations and bias of the individual.

The American Journal of Pharmaceutical Education published an article titled, "The Social Psychology of Biased Self-Assessment", highlights that people misestimate their abilities and finds a weak correlation between one's self-assessment and demonstrated performance. (Karpen, 2018)[15]. Additional research, however, demonstrates that this misestimate is often an overestimate.

To date, researchers have uncovered two promising strategies to minimise the impact of bias during self-assessments: requiring students to evaluate themselves on specific, measurable, and externally generated outcomes (triggers), and providing non-threatening feedback that guides students toward improvement (Dunning, Meyerowitz, Holzberg, 1989)[16] (observable behaviours / post-task review). The TEAMS Self-Assessment tool incorporates both strategies with defined triggers and observable behaviours incorporated into the model.

During work – Traditional training provided to employees highlights the sources of distraction and sets an expectation that employees attempt to recognise when they are distracted and safely return to work. As explained previously, distraction is a shift in attention that can occur on a subconscious level. Under these scenarios, it is an unrealistic expectation to expect one to recognise when they are distracted.

A more reliable method to capture when one has been working without focus is to capture when one has experienced a break in flow during work.

A break in flow – is experienced any time an individual pauses a task, categorised as physical or mental in nature.

a) **A physical break in flow (P-BIF)** is an occurrence when one physically stops the intended performance of work for any reason. Cell phones, other employees, higher priority/emergent tasks, radio calls, and failure to get the appropriate equipment for the task are all common causes for P-BIF. The P-BIF event can serve as a trigger to the individual that attention has been shifted from the work performed onto a secondary task. Many companies have "sterile work environment" practices for maintenance and "sterile cockpit" practices for flight operations to prevent P-BIF events. However, they can occur in all work environments.

b) **A mental break in flow (M-BIF)** is an occurrence when one shifts attention off the work performed for any reason. In essence, an M-BIF is the quintessential distraction event. While this shift in attention can occur subconsciously, it is possible at times to recognise when one has recovered from an M-BIF. If this is recognised, it is important to review the work performed when not focused to ensure individual made no errors while distracted.

A break in flow not only serves as an internal trigger that can be used by the impacted employee, but it is also a powerful observable event that can be used by others to help recognise if one of our co-workers is not focused. An individual that observes a break in flow must communicate the event to the potentially impacted employee, so that they can review their completed work for errors. The peer communication itself can serve as a break in flow for both parties so it is important the individuals involved follow a deliberate review and return to work process. A sample return to work flowchart is outlined in section.

Identify observable behavioural markers – which we can look for in others to help us recognise unfocused behaviour before, during or after a task. The aviation industry recognises that Peer Support Programs ensure confidential access to care and ease of conversation related to mental wellness. Recent regulations have made Peer Support Programs mandatory for Pilots, but much more work is required in the wider aviation workforce if the programs are to be fully effective. While Peer support programs focus on ease of access, confidentiality, intervention, the TEAMS model aligns as the first stage of recognition of sources of distraction that might not immediately affect the safety of flight but could result in human errors. The TEAMS model does allow for the identification of behavioural markers that are observable by others. Many behavioural markers link to signs of stress, fatigue, or other more chronic sources of distraction. On an acute basis, these can lead to human error. Similar to a break in flow, an individual that observes a break in flow must communicate the event to the potentially impacted employee to allow for a review of work performed and the execution of a safe return to work.

Facilitate a post-task review – of the work performed to assess if any loss of focus occurred as part of the task completed. Consider the type and length of the task performed when identifying the appropriate point for conducting a post-task review. We complete most tasks within flight or ground operations within one working period, engineering conducts maintenance tasks that can span multiple days and over multiple shifts.

An initial review of the 'Task' performed and the operating 'Environment' can help identify points for a post-task review. It may be appropriate to consider an interim review for specific task(s) or part of a task, identified as an increased risk due to the impact rating, during an ongoing task vs waiting until the entire task is completed. Identify, plan and/or agree post-task review periods prior to executing a task, or at a defined period, to ensure the review process does not become a distraction is its own right. The pre-task visualisation questions outlined in Figure 2 can aid in the identification of critical steps or times when a post-task review can be beneficial. Additionally, each organisation should ensure that an appropriate mechanism is in place to capture performance metrics and sources of distraction identified during the post task review. Consider the need to complete a post-task review if 'Environmental' elements previously reviewed during the pre-task change during the task such as significant changes in lighting, sound, or visual distractions within the working environment.

The following scenarios help explain the appropriate use of the post-task review within primary roles within aviation operations:

a) **Aircrew:** For aircrew, the structure of the checklist can serve as a great trigger for when a post-task review should be complete during flight. A moment to pause and reflect on the task performed with special consideration to one's focus throughout can easily supplement the use of the checklist. Additional intervals for consideration could be during the pre-flight briefing as a step to review all pre-flight planning completed by all crewmembers. Additionally, an aircrew post-flight debrief can serve as an appropriate peer review interval where all phases of the flight are assessed and discussed to highlight what went well and opportunities for improvement.

b) **Maintenance / Engineering:** We recommend that a post-task assessment following the completion of frequent or routine inspections that take place multiple times a week. These could include daily pre-flight / post-flight inspections, aircraft movement operations, or general servicing. If a maintenance task takes place over a longer period of time (half-day +), it is recommended that a post-task review be completed prior to all scheduled breaks and prior to stopping work to complete other tasks or at the end of a working day.

c) **Ground Handling:** Ground-handling personnel keep flight operations moving and serve in a safety-critical capacity as they perform services such as baggage/passenger weighing, passenger movement on the flight line or helideck, and the loading of baggage and cargo. Generally, ground personnel do not use a checklist in aid of their responsibilities and procedures. Therefore, a post-task review can serve as a powerful safety barrier to minimise human error caused by a lack of focus. Post-task reviews can be adopted following defined actions such as the "closing of a flight" when dispatch paperwork is finalised and prepared for the flight crew. Additionally, conduct a review as a final step any time ground-support personnel have been in close proximity to a helicopter such as the loading of passengers or baggage.

d) **Flight Follower:** Flight following personnel serve in a safety-critical capacity as an extension of the flight crew monitoring. The tasks performed by flight following are more reoccurring and less defined as they are in operations or maintenance. Due to this nature of work, best practice places an emphasis on minimising sources of distraction within the environment. Additionally, flight following personnel should actively participate in observable behaviour conversations with peers. Organisation should define a frequency where the post-task review will be complete "TEAMS Check", and actively monitor the need for a TEAMS check with flight following personnel throughout the working day.

TEAMS Model – Recognition of Distraction and Intervention

The support given by organisations will vary the effectiveness of the TEAMS model through specific actions & targeted training designed to minimise occurrences of non-focused work and help individuals avoid unsafe conditions. When distraction does occur, a standardised methodology for recovery may also be beneficial. We discuss these approaches in this section.

The areas proposed for organisational consideration are:

a) Eliminating Institutional factors – organisation self-assessment to ensure they are not "setting themselves up for failure" with a work environment that is not predisposed to support focused work.
b) Supporting vigilant self-consciousness of common factors likely to cause distraction, enabling truthful self-appraisal and improved use of the distraction reference tool.
c) Self-recognition when distraction does occur, including guidance on recovery techniques.
d) Intervention by a 3rd party when observing someone who has become distracted to the detriment of his or her safety or obvious risk to the quality of work performed.

Eliminating institutional factors – Member organisations may wish to consider the institutional factors present in their businesses & workplaces and, by considering distraction risk specifically as part of their risk assessment process & workplace design, seek to identify and mitigate circumstances intrinsic to their specific operating conditions that might give rise to, or exacerbate, the likelihood of distraction.

Aspects for consideration might include:

a) **Work Environment** – the "Environmental" elements of the TEAMS model outlines sources of distraction that can be present in the working environment. Proper facility planning can minimise work environment sources of distraction. Consider if the workplace has appropriate lighting, is the climate stable, is work performed in locations where weather may affect an individuals' ability to concentrate? Does the organisation allow personal items, including telephones carried into the workplace?
b) **Workflows** – are tasks planned, logical in flow, and are the most challenging tasks scheduled when the team is at its at most alert? Consider action taken to prevent P-BIFs?
c) **Work Patterns** – shift patterns optimised such that the right skills are available in the right numbers with the closest possible correlation to the tasks planned. Do shift patterns introduce risk by combining late finishes and early starts?
d) **Workloads** – is the assigned workload appropriate to minimise perceived or actual organisational pressure or overloading any individual employees working memory (multiple complex task assignments, etc)?
e) **Team Composition** – does the team have the right quantity of skilled staff, the right skills mix, and is the general physical fitness profile of the team well balanced to ensure collaboration in completing the most demanding tasks? Actions required concerning psychosocial relationships (unresolved personal conflict, etc)?

Addressing such institutional factors may contribute significantly to mitigating circumstances that institutionalise distraction risk in the workplace.

Vigilant self-consciousness of distraction factors – Trained employees understand common factors that can trigger distraction, detailed in the previous section of this white paper. It is recommended that organisations include discussion concerning these factors in the initial training associated with this subject and that the factors be revisited as part of ongoing continuation training.

The desired training outcome is that the individual has a vigilant self-consciousness of the factors and the potential impact. How their specific personal circumstances may relate to those factors at any given time, such that they can identify risks and distraction to which they may be susceptible.

This awareness will lead to a more focused and truthful use of the distraction risk tool, delivering higher fidelity in the risk assessment exercise and preventative action outcomes.

Self-recognition when distraction does occur – Despite the previously described barriers to distraction that an organisation can set in place, distraction is clearly a frequent occurrence. However, we do not recognise the errors at the same frequency, as the individual is distracted in normal activities.

We recommend organisations undertake training with staff groups at high risk of distraction to generate awareness for the onset of distraction,and provide tools and strategies to recover from an event. In high-risk work environments, typically including our workplaces, the safety of the individual and those working with them is paramount and ensuring this is a desired instinctive reaction to a distraction event. Our industry has already taught us on many occasions that individuals should not merely dismiss distraction and try to work on it.

A simple mental checklist is one way to help the individual recover safely when distracted. This may include such factors as:

| DISTRACTION | I am safe | My team is safe | Work environment is safe | Recover to a safe place (mentally or physically) | Deal with the distraction | Reset to a known point in your work pre-distraction | Review work performed from the last known point |

Figure 2: Simple mental checklist to help an individual recover when distracted

Although not specifically covered within this white paper, organisations should identify a reporting process to capture when distraction events have taken place. It is recommended that any reporting process capture sources of distraction that are identified while preparing for work, during work, or when conducting a post-task review. Additionally, managers and supervisors should contribute to the positive reporting culture by submitting reports when they identify sources of distraction within their employee's working environment.

Intervention by a 3rd party – Recognising when a colleague is distracted is difficult; judging if an intervention is appropriate even more so, as it bears the obvious risk of contributing to the distraction event. However, certain distraction factors have a clear and obvious link to safety and where that link is obvious to the observer, an intervention is essential. Behaviours intervention may include:

a) **An individual is clearly not concentrating** – they may not be listening to an instruction, talking on a mobile phone, and working, they may not be looking at the work performed, or they may not have noticed an outright unsafe condition developing.

b) **An individual may be struggling against an environmental factor to complete a task**. Such factors may include excessive noise, heat, cold, inadequate light. An individual may also be "pressing on" against such a factor and clearly encountering difficulty, again giving rise to a safety issue, warranting an intervention.

c) **An individual has had a distinct change in mood or body language**. Under such circumstances, they may exhibit short temper, irritability, profanity, or be working excessively quickly to the detriment of the correct completion of the task. Another indication could be an individual who is traditionally happy and talkative, working silently and avoiding interaction with others.

d) **An individual could be verbally frequently detailing non-work-related concerns**, challenges, and hardships with personal relationships or money throughout the task. While an individual statement or single conversation might not trigger a concern when completing work, repetitive references could indicate that someone is clearly allocating a lot of thought to something other than the task.

A judgment as to when to intervene will depend entirely on the circumstances observed and the approach should follow closely the protocols, we now use daily for safety interventions. The resolution to the distraction event may follow the mental checklist outlined in the previous section.

In order to enhance the understanding of the organisation to eliminate sources of distraction, it is important that employees communicate when interventions take place. It is recommended that this is completed at two levels with direct communication to a supervisor as well as the submission of a safety report.

References

1   Flight Safety Foundation. "Killers in aviation: FSF Task Force Presents Facts About Approach-And-Landing and Controlled-Flight-Into-Terrain Accidents." Flight Safety Digest Volume 17 (November-December 1998) and Volume 18 (January-February 1999): 1-121.

2   International Civil Aviation Organisation (ICAO) Doc 9859 Safety Management Manual (SMM)

3   James Reason. Lapses of attention in everyday life. London: Academic Press. 1984

4   van der Linden, D. (2011). The urge to stop: The cognitive and biological nature of acute mental fatigue. In P. L. Ackerman (Ed.), Decade of Behavior/Science Conference. Cognitive fatigue: Multidisciplinary perspectives on current research and future applications (p. 149–164). American Psychological Association. https://doi.org/10.1037/12343-007

5   Beck Johnson. Visual Distraction Effects on Deliberate Focus Work. Hayworth Human Performance Lab. 2017.

6   Lutfi-Proctor, Danielle A., "The Mechanisms of Auditory Distraction: The Roles of Interference-by-Process and Attention Capture" (2016). LSU Doctoral Dissertations. 2438

7   Cheung SS, Westwood DA, Knox MK. Mild body cooling impairs attention via distraction from skin cooling. Ergonomics. 2007 Feb

8   Navvab, Mojtaba. (2002). Visual Acuity Depends on the Colour Temperature of the Surround Lighting. LEUKOS The Journal of the Illuminating Engineering Society of North America

9   Wittbrodt, Matthew & Mizelle, Chris & Wheaton, Lewis & Sawka, Michael & Millard-Stafford, Mindy. (2016). Impact of Hypohydration and Exercise-Heat Stress on Brain Structure in Men and Women.

10 Adan, Ana. (2012). Cognitive Performance and Dehydration. Journal of the American College of Nutrition.

11 Raichle, M. E., & Gusnard, D. A. (2002). Appraising the brain's energy budget. Proceedings of the National Academy of Sciences of the United States of America, 99(16), 10237–10239. https://doi.org/10.1073/pnas.172399499

12 Lim J, Dinges DF. A meta-analysis of the impact of short-term sleep deprivation on cognitive variables. Psychol Bull. 2010

13 Maslach, C., & Schaufeli, W. (2000). Job burnout. Annual Review of Psychology

14 van der Linden D, Eling P. Mental fatigue disturbs local processing more than global processing. Psychol Res. 2006 Sep;70(5):395-402. doi: 10.1007/s00426-005-0228-7. Epub 2005 Jun 21. PMID: 15968553.

15 Karpen S. C. (2018). The Social Psychology of Biased Self-Assessment. American journal of pharmaceutical education, 82(5), 6299. https://doi.org/10.5688/ajpe6299

16 Dunning, D., Meyerowitz, J. A., & Holzberg, A. D. (1989). Ambiguity and self-evaluation: The role of idiosyncratic trait definitions in self-serving assessments of ability. Journal of Personality and Social Psychology, 57(6), 1082–1090. https://doi.org/10.1037/0022-3514.57.6.1082