

# INTERNATIONAL FEDERATION OF AIR TRAFFIC CONTROLLERS' ASSOCIATIONS

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Agenda Item: C.6.3

IFATCA 16  
WP No. 304

## Educational Issues on Distraction (Guidance Material)

Presented by PLC

### Executive Summary

Air Traffic Control Officers (ATCOs) are exposed to different kinds of distractions in their daily operations. These distractions may have a disruptive effect on ATCOs performance and result in errors or omissions which compromise aviation safety. In order to reduce distractions in the air traffic environment and enhance safety, it is essential to educate ATCOs on understanding distractions, their sources and affects on ATCOs performance, and develop prevention strategies to minimise their effects. Management support and behavioural change in fostering professionalism and safety culture are inevitable for creating a distraction-free operating environment. Collaborative efforts among controllers, supervisors, and management staff are required in addressing the problems of distractions and advocating the awareness on distractions through educational programmes and campaigns.

### 1. Introduction

- 1.1 This paper continues the work on 'Distractions at Workplace' presented at the IFATCA 54<sup>th</sup> Annual Conference in Sofia, Bulgaria, 2015. The objectives of this working paper are to provide Member Associations (MA) with guidance to educate their members and increase awareness on the affects and impacts of distractions and develop practical prevention and mitigation strategies to eliminate and minimise the risk of distractions in order to enhance aviation safety.
- 1.2 ATCOs are exposed to all sorts of distractions in their daily operations. From self-induced to third party distractions, as well as from the operating environment, procedures and equipment. How often do they consider the detrimental affects of these distractions on their working performance? Are they aware that these distractions may adversely affect their cognitive abilities and situational awareness, and pose a risk to aviation safety?
- 1.3 As highly trained professionals, ATCOs have an obligation to ensure that they are capable of performing their duties to the best of their abilities. The aviation authority and employers have an obligation to ensure proper procedures, tools, operating environment and adequate training are available to their staff and implement necessary precautionary measures to achieve a high level of aviation safety.
- 1.4 Preventing distractions will require efforts and measures from management and/or supervisory personnel. However, collaborative and cooperative efforts are also required from individual ATCOs in fostering a distraction-free working

environment from a bottom-up approach. Responsible ATCOs, being role models for other colleagues, could cultivate an atmosphere of responsible behaviour and strengthen the awareness of distraction through peer education.

- 1.5 While some distractions are obvious, momentary and easily identified, the subtle aspects of cognitive distraction are not apparent. ATCOs are facing different kinds of distraction in their daily operation and managing distractions effectively can only be made possible through education and prevention. Information on the sources and different types of distractions must be conveyed to all staff, including managers and supervisors. ATCOs need to be fully aware of the affects distractions may have on their task performing abilities.

## 2. Discussion

### 2.1 **Management Initiatives - Proactive Safety Management**

- 2.1.1 'Distraction' has been an important aspect in human factors, contributing to a number of accidents and/or incidents in aviation history. Distractions have been widely studied in military and civilian aviation industries, focusing on pilot distraction and workload management. Apart from that, last year's working paper on 'Distractions at Workplace' revealed that air traffic controllers distractions can have disastrous consequences too. Distraction is considered one of the most serious threats to aviation safety by the National Transportation Safety Board (NTSB) in the United States. According to the Flight Safety Foundation, distraction is the most frequent causal factor in incidents and accidents<sup>1</sup>.
- 2.1.2 The FAA Air Traffic Organization (ATO) 2014 Safety Report identified 'Distraction' as one of the Top 5 Safety Hazards in the National Airspace System (NAS). According to the ATO, distractions are activities in the work area and/or other job-related functions affecting focus on priority tasks. The ATO established a workgroup to assess and improve the policy, procedures, systems, and training associated with occurrences of distraction.. Some of the mitigation examples were; identify administrative tasks not acceptable to be performed in the operational environment, update facility Standard Operating Procedures and deploy a recurrent training workshop to address causal factors of distraction hazards. Also, in communicating and promoting safety among the workforce, the ATO adopts ongoing education and awareness initiatives to proactively address safety issues like the 'Turn Off Tune In' campaign, which is jointly organised with National Air Traffic Control Association (NATCA) to increase awareness and education about the safety impact of distractions, particularly those related to the use of personal electronic devices (PEDs), to controllers and managers in the operational environment. Recurring publications, in both print and electronic media, are also made available to operational personnel through safety bulletins, websites, and videos that are easily accessible by mobile devices to ensure employees safety practices are current and thoroughly informed.
- 2.1.3 The Australian Transport Safety Bureau (ATSB) conducted a study on distraction issues contributing to aviation occurrences in 2005. The study revealed that distractions, consisting mostly of pilot distractions, contributed to a substantial

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<sup>1</sup> Skybrary. (2012) Managing Interruptions and Distractions.

number of aviation safety occurrences between 1997 and 2004. The majority of these occurrences were classified as incidents instead of accidents, however, the results clearly indicated that distractions can contribute to casualties and cause substantial damage to aircraft.

- 2.1.4 From the safety management perspectives in Air Traffic Services (ATS), 'distractions to ATCOs' has been identified as one of the hazards within the ATM system that warrant necessary actions to proactively reduce its safety risks before incidents or accidents occur. Senior management, in both service providers and regulatory authorities, cannot be absolved from addressing distraction issues that have significant implications on the overall ATM safety performance. An unambiguous and strong commitment from the management consistent with both verbal and written policies is essential. Allocation of resources can be more effective in supporting training, education or awareness campaigns associated with distractions if management support and endorsement are obtained.

## 2.2 **Educate the Workforce – Distraction Training Programme**

### 2.2.1 **What is 'Distraction'?**

- 2.2.1.1 According to the dictionary, distraction is defined as “a thing that takes your attention away from what you are doing or thinking about”; or “a thing that prevents someone from giving full attention to something else”; or “a thing that prevents someone from concentrating on something else”<sup>2</sup>. Transport Canada defines distraction as anything that draws your attention away from the task at hand.
- 2.2.1.2 The Federal Aviation Administration (FAA) defines distraction as: “One’s attention is drawn away; mental or emotional confusion or disturbance occurs. When working among many people, with frequent work interruptions, or when coping with stress, it is easy to become distracted”.

### 2.2.2 **Identify Sources of Distractions**

- 2.2.2.1 Distractions, as a human factor, can adversely affect human performance. Human contribution to safety and the interaction between human and other components in the complex aviation system are often analysed by the ICAO SHELL Model developed by Edwards in 1972 and modified by Hawkins in 1975<sup>3</sup>. The relationship is represented by the diagram in Figure 1 where interfaces between **S**oftware and **L**iveware; **H**ardware and **L**iveware; **E**nvironment and **L**iveware; and **L**iveware with **L**iveware are not simple and straight, meaning humans do not interact perfectly with the various components in the workplace. Hence, distractions can occur at any point between these interfaces as well as at the centre of the model, which represents the human in frontline operations and is most critical, as they can influence human performance and create mismatch or breakdown in the system leading to human error.

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<sup>2</sup> Oxford Advanced Learner's Dictionary; US English Dictionary; and British and World English Dictionary.

<sup>3</sup> ICAO Circular 216-AN/131



**Figure 1 – ICAO SHELL Model as modified by Hawkins**

- 2.2.2.2 This SHELL Model can be adopted to provide a framework for service providers in identifying sources of distraction within the ATM system. ATCOs physical states like hunger, thirst, cold/hot (body temperature), fatigue, sickness; emotional states like stress, depression, family burden; and personal conduct like playing with personal electronic devices (PEDs), text messaging, making phone calls, reading newspapers, are possible distractions that can be generated from the **Liveware** itself in the centre of the model. Surveillance system alerts and warnings, flashing labels on radar displays, or system malfunction are the more obvious examples of distraction that may occur at the **Liveware-Software** interface. Uncomfortable or inconvenient controller working positions (CWPs) including console design, controllers chair positioning, monitor displays, headset or speaker etc... are possible sources of distraction at the **Liveware-Hardware** interface. Extraneous noise from the surrounding environment, temperature and lighting of the control room, glare or reflection of light on radar displays or monitors are subtle distractions at the **Liveware-Environment** interface. Coordination or messages from other colleagues, loud conversation or non-essential conversation between colleagues in the control room are possible distractions at the **Liveware-Liveware** interface.
- 2.2.2.3 Four main types of distraction were identified in last years working paper; self-induced distractions, third party distractions, distractions from the operating environment and distractions from equipment (both hardware and software). However, the listed examples are not exhaustive and each organization should be aware of the possibility of new and undetected distractions pertinent to their workplace.
- 2.2.2.4 According to the study conducted by the ATSB, the sources of most pilot distractions are not unique and are also applicable to ATCOs, such as distractions associated with radio communication problems (e.g. poor transmission, malfunction, congestion), weather (e.g. diverting, deviating), workload (e.g. high workload, increasing traffic volume, abnormal or unexpected situations, equipment malfunction) and people-related distraction (e.g. conversation from colleagues or coordination from other working positions). Another interesting finding in the report, which applies to the ATC environment as well, stated that in addition to high workload situations, people also became distracted during periods of low workload. Events that require little or no mental workload can be distracting, as such events may involve a sudden recollection or mental image or an unexpected thought irrelevant to the task being performed. This theory explains why some people became distracted by their concerns about previous performance, whereby a transient mental recall may have diverted one's attention away from controlling the aircraft.

### 2.2.3 **Effect of Distractions on ATCO Performance**

2.2.3.1 The primary affect of distractions is the breakdown of the normal flow of ongoing activities or tasks. Once the thread of complex and lengthy procedures handled by an ATCO is broken, lapses may occur. Lapses are skill-based errors that occurred when a person unintentionally failed to complete a task or action. If a distraction occurred during the work process, the ATCO may return to a different point of the task, with a different stage of mental process where a critical task or action may be missed out.

2.2.3.2 It is a wrong concept that air traffic controllers are well-trained for multitasking. *“Human brains do not perform two tasks at the same time. The brain handles tasks sequentially, switching attention between one, then another. The more you multitask, the worse you are at it. Multitasking leads to as much as a 40% drop in productivity, increased stress, and a 10% drop in IQ<sup>4</sup>”*. An ATCO dealing with distractions is actually ‘task switching’ rather than ‘multitasking’. It has been proven that distraction causes an increase in perceived workload even if the actual task load is steady. ATCOs may feel swamped and rushed with concurrent task demands, which may result in stress, frustration, and a decrease in focus. All these intensify poor work practice and exacerbate issues that lead to poor performance. A negative spiral effect is created where poor performance leads to more stress which then leads to more poor performance, and so on, and thus further compromising safety issues. Hence, distractions can have disruptive effects on one’s emotional state and mental ability to focus on tasks, and adversely affect an ATCOs performance.

### 2.2.4 **Building Line of Defense**

2.2.4.1 If distractions are not managed well, they can seriously erode one’s ability to focus on tasks and any intended actions may be omitted leading to lapses, poor performance or judgment error, and may consequently cause serious or critical mistakes. Reducing or eliminating distractions at their source is considered the most effective way to address distraction problems. However, distractions as a human factor cannot be completely eliminated; some of them are unavoidable and an ATCO has to deal with them.

2.2.4.2 Building lines of defense are essential to recover from unavoidable distractions and regain situational awareness:

- Recognize distractions
- Identify what was the primary task
- Remember where was the task being interrupted
- Decide what decisions or actions should be taken to return to the primary task
- Act and prioritize between tasks
- Plan the actions
- Review and verify

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<sup>4</sup> American Psychological Association, March 20, 2006. Multitasking: Switching Costs – Subtle “switching” costs cut efficiency, raise risk.

## 2.3 **Behavioural Change - Professionalism**

2.3.1 ATCOs self-discipline, code of conduct, and emotional stability while at work are vital to maintaining their professional behaviour and standards of performance. In fostering professionalism, many of the self-induced and third-party distractions can be avoided. There is no universal definition for professionalism but it is about how controllers value their work, inspire and motivate to practice introspection, self-management and ethical behaviour along with training to master tactical skills and procedures. Professionalism is an attitude and involves more than just what one does while on duty. It also means air traffic controllers must manage their time off and personal matters appropriately and be rested and ready for duty both physically and emotionally.

2.3.2 Enhanced professionalism among controllers and an emphasis on good practices at work are important to minimising distractions. Any adversities, like momentary lapse due to impulsive decision, distraction induced by personal convenience, drifting away from procedures and best practices, or slack, casual and unfocused atmosphere, may lead to safety margins being eroded and inadvertent errors go uncorrected which may have significant safety consequences. To cultivate a sense of pride and commitment for safety, specific attributes of professionalism and behavioural traits can be developed through workshops, discussion, experience sharing and lessons learnt. Consensus should be reached amongst controllers, employers and the industry to recognise professionalism as the intangible personal qualities of ATCOs that should be instilled at screening and selection of students, initial training in ATC and in subsequent recurrent training.

## 2.4 **Software Engineering**

2.4.1 Software engineering, like the design of airspace, ATS routes, handling procedures, human-machine interface (HMI), etc... should allow ATCOs to achieve a safe, orderly and efficient air traffic flow without any distractive attention or being driven away from the primary task as far as practicable. However, during the design of new systems or procedures, gaps often appear between engineers, technical experts and air traffic controllers. Human factors are taken into account too late in the development process. This results in a reverse engineering with ATCOs adjusting their skills and techniques to adapt to the system or procedures. The cognitive complexity in handling such situations may exceed the processing capacity of ATCOs which may lead to reduced situational awareness, longer response times, or increased workload, and hence, increased risk of errors<sup>5</sup>. Nuisance alerts/warnings, colour code and scheme for screen displays, for instance, can cause misunderstanding, are extremely distractive and interrupt the normal flow of a proposed task. ATCOs need to spend time to determine whether these alerts/warnings are genuine or try to understand and interpret the colour representations before they return to the task. This time lag may cause lapses of attention, pressure of dealing with a concurrent task or rushed with task completion, resulting in a perceived increase in workload. If nuisance alerts and false warnings occur too frequently, the problem of complacency and neglect may result even though alerts are genuine.

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<sup>5</sup> Cognitive Processes in Air Traffic Control – Presented by PLC. Agenda item C.6.2. IFATCA Annual Conference 2016, Las Vegas, USA.

2.4.2 It is important to involve air traffic controllers and take human factors into account in the early stages of design and development process of any new/change in systems or establishment of new procedures. ATCOs are also encouraged to adhere to standard operating procedures (SOPs) and try to keep coordination with others relating to non-standard issues at a minimum. This can greatly reduce unnecessary distractions.

## 2.5 **Ergonomics and Environment**

2.5.1 Distractions can also be minimised through careful design and arrangement of equipment so that people and hardware can interact most efficiently and safely. The provisions of reliable, consistent, and user-friendly infrastructure are vital to eliminate distractions in the operating environment. The failure of equipment may turn a routine procedure into a challenging event, and service providers have an obligation to ensure proper maintenance of the equipment and establish proper backup or contingency procedures in case of any unforeseen situation.

2.5.2 The following items can also induce distractions in the workplace: CWPs' design, console positioning and location; consistent and comfortable settings of equipment like headset, handset, speaker, monitor displays, chairs; operation room seating arrangement; ambient temperature; noise level, lighting etc... Careful design considerations and collaborative efforts through thorough communication between engineers, technicians and frontline air traffic controllers are crucial in striving for a distraction-free operating environment.

## 2.6 **Culture Change - Peer Effort**

2.6.1 Since there is a wide spectrum of distractions within the ATM system, it is important to generate a culture change in the ATC domain where every employee, being part of the aviation profession, has a role to play in enhancing safety in the system as a whole. Instead of prohibiting staff to do something (like the use of PEDs) or setting strict rules in the control room (like no food or drink at consoles or no private conversation in the operational areas) to tackle distraction problems, the cultivation of a sense of responsibility and appreciation by others are much more valuable. Managers, supervisors, or experienced controllers setting good examples and being role models can influence other colleagues through persuasion or open discussions.

2.6.2 An open culture involving work team members getting together, exchanging values and developing soft skills of disciplines and best practices is important in fostering "good controllership" amongst controllers from peer effort. Attitude change and intrinsic motivation to act professionally are long-term approaches in addressing distraction problems at the workplace.

## 2.7 **Awareness Campaign**

2.7.1 Advocate the awareness of distractions through thorough communication and promotion within the organisation like the publication of posters, videos, notices or articles on bulletin board or website, or creating a slogan for anti-distraction campaigns and print it on t-shirts, jackets, caps, badges or stickers for staff.

- 2.7.2 A comprehensive educational programme offering employees information on distractions, such as the sources and types of distractions, the affects of distractions on one's cognitive abilities and performance and the associated risks and impacts on safety. ATCOs should be trained in developing skills and techniques to identify, resist and counteract unavoidable distractions.
- 2.7.3 Peer education, persuasion, open discussion, and involvement of staff at all levels can help spread the message of good practices and controllership among co-workers effectively.
- 2.7.4 Incorporate 'Distraction' as a topic in ATC Human Factors and Threat and Error Management (TEM) initial training and recurrent training.

### **3. Conclusions**

- 3.1 ATCOs are exposed to all sorts of distractions in their daily operations. Understanding distractions by identifying their sources, types and information on the effects of distractions on ATCOs' performance must be conveyed to all staff, including supervisors and managers.
- 3.2 Distractions have been an important aspect in human factors and identified as one of the hazards within the ATM system contributing to a number of accidents/incidents in aviation industry. Proactive and effective management of distractions in an air traffic environment can only be made possible through education and prevention.
- 3.3 Senior management initiatives and commitment in proactively addressing distraction issues and safety risks associated with distractions can make allocation of resources more effective in supporting training, education, and awareness campaigns.
- 3.4 It is essential to educate ATCOs and increase their awareness on distractions through a comprehensive distraction training programme. The SHELL Model is useful in providing a framework for service providers in identifying the sources of distraction within the ATM system. Different types of distractions appeared in different interfaces within the SHELL Model, i.e. between Software and Liveware Hardware and Liveware, Environment and Liveware and Liveware with Liveware. Four main types of distractions were identified, namely self-induced distractions, third party distractions, distractions from the operating environment and distractions from equipment. These are not exhaustive and MAs should maintain awareness for new and undetected distractions pertinent to their workplace.
- 3.5 Distractions disrupt the normal flow of ongoing tasks leading to lapses and possibly errors. ATCOs may feel swamped and rushed with concurrent task demands, which may induce stress, frustration, and a decrease in focus. All these can have disruptive effects on ATCOs emotional state and mental ability and adversely affect their performance. Reducing or eliminating distractions at their source is considered the most effective way to address distraction problems. However, distractions as a human factor cannot be completely eliminated,



therefore, building lines of defense is important for ATCOs to recover from unavoidable distractions and regain situational awareness.

- 3.6 Many of the self-induced and third-party distractions can be avoided through behavioural changes to ATCOs conduct, discipline and emotional stability. In fostering professionalism and emphasizing good practices at work, ATCOs could cultivate a sense of pride and commitment to safety and ensure that they are performing their duties to the best of their abilities and would eliminate any possible distractions that may lead to lapses or errors which may have significant safety consequences.
- 3.7 Taking human factors into considerations in early stages of software engineering processes and the involvement of ATCOs in any new/change in systems or procedures can greatly reduce unnecessary distractions generated from the Liveware-Software interface. Careful design and arrangement of ergonomics, proper maintenance of equipment and the availability of backup or contingency systems and procedures should be utilised so that people (liveware) and hardware can interact more efficiently and safely. The provisions of reliable, consistent and user-friendly infrastructure are vital in striving for a distraction-free operating environment.
- 3.8 A culture change with more open discussion and peer effort, supported by an appropriate educational programme, training and campaigns can cultivate a sense of responsibility and develop intrinsic motivation. In addition setting good examples for others, encouraging sound practice and controllership amongst co-workers are long-term approaches in addressing distraction issues.

#### **4. Recommendation**

It is recommended that this working paper is accepted as Guidance Material.

#### **5. References**

- American Psychological Association, March 20, 2006. Multitasking: Switching Costs – Subtle “switching” costs cut efficiency, raise risk.
- Australian Transport Safety Bureau. (2005) Dangerous Distraction. An examination of accidents and incidents involving pilot distraction in Australia between 1997 and 2004. ATSB Transport Safety Investigation Report, Aviation Research Investigation B2004/0324.
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- Transport Canada. (2003) Human Performance Factors for Elementary Work and Servicing.

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