

# [EN-I-087] What will air traffic controllers (ATCOs) be doing in the future, in a more automated ATM environment?

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<sup>†</sup>Keiko Moebus

Head of Safety Human Factors  
skyguide – swiss air navigation services, ltd.  
Wangen bei Dübendorf, Switzerland  
keiko.moebus@skyguide.ch

**Abstract:** Regardless it is SESAR or NextGEN or Carats, the world-wide trend in the future Air Traffic Management (ATM) initiatives often call for more modernized ATM, where its vision is enabled by a progressive increase of the level of automation support, the implementation of virtualization technologies as well as the use of standardized and interoperable systems. But are we all aware of what it really means to the ATM, procedural, safety and Human Factors experts and engineers who need to guarantee the 24-hour safe and efficient operations and at the same time, have to start designing, developing and implementing from today's own ATM infrastructure and the systems to such high level objectives? Are we really clear about what job or tasks future ATCOs should be doing vs. what should be delegated to automated supporting tools in such future working environment at the operations floor to achieve the envisioned future modernized ATM? This presentation explores the typical challenges and struggles that various experts encounters at ANSP today – with emphasis on safety, organization culture and HF and Human Performance (HP) points of view.

**Keywords:** Automation, Human Factors, Human Performance, Safety, Organizational culture.

## 1. INTRODUCTION

1.1 How far should we progress in our future Air Traffic Management (ATM)? What will be human's role in the future ATM?

It is impressive how much we have progressed in soon 100 years of air traffic control systems. For example, the night flight experiment with a series of bon fires to imitate the guided airways was successful so that later it paved the way to build imaginary airways using DMEs, VORs and way points. Archie. Imagine, W. League – the first U.S. air traffic controller, had to use flags and air gun to signal aircraft for Go or Land but now Instrument Landing System (ILS) or GPS could guide pilots automatically.

Today, some lucky air traffic controllers (ATCOs) are equipped with many advanced air traffic control assisting tools such as electronic flight progress strips to replace paper strips, sending and receiving simple communication via Controller-Pilot Data Link Communication (CPDLC), downlinked cockpit inputs data via Mode S downlink so that the ATCOs can check whether the pilots are adhering to the assigned flight level by monitoring pilot's inputted flight level or Conflict Detection Tool (CDT) to warn

ATCOs within the set of parameters to monitor potential conflicts of selected aircraft pairs, etc.

According to SESAR - Single European Sky ATM Research Joint undertaking, the European commission set following four high-level goals: 1) Enable a 3-fold increase in capacity which will also reduce delays both on the ground and in the air, 2) Improve safety by a factor of 10, 3) Enable a 10% reduction in the effects flights have on the environment, and 4) provide ATM services to the airspace users at a cost of at least 50% less. European ATM Master Plan (2015) calls for "increase of the level of automation as a key to success in SESAR.

While ensuring safe and efficient air traffic service provisioning at 24-hour basis, we the sharp-ends and supporting staff are working hard to transforming our ATM systems steps closer to reach SESAR high level goals every day. Implementing a piece of technology is always easy, however, making such technology work for ATCOs to increase their safety and efficiency level as well as raising bar of operational improvements are extremely difficult – because we are dealing with human who are unpredictable and each individual is unique and different. This presentation will guide participants to learn the insights of daily struggles and success that HF experts

encounters during the design and development of new ATM tools and Human Machine Interfaces (HMI).

## **2. ABUNDANT TOOLS AND INFORMATION ARE GREAT, BUT NOW TOO MANY CHOICES**

This should sound familiar to many of us in today's smart phone environment – where we receive several different notifications simultaneously or constantly ranging from text messages, update notification, battery low warnings etc. Additionally, Apple reports that there are now over 2 million APPs available in 2017 in which their iPhone customers can choose from. Well, ATCOs are often feeling similar like that and being overwhelmed by the number of tool and information choices they have – when their ultimate job is to separate numbers of aircraft safely and efficiently.

The presenter will explore how the design was derived to such state with hope to support ATCOs job but in contrary, some good intention have gone wrong in the reality once ATCOs start using them.

## **3. MORE TOOLS WE INSTALL, MORE SKILLS WE LOSE**

Similar to flight deck automation, the ATCO will assume more and more a supervisor or monitorer function to oversee the future air traffic. While anticipating such to happen, we also expect ATCOs who will be doing passive monitoring to jump up and start solving problems when things go wrong. The flight deck automation or cruise and distance control as examples, the more we take away the jobs and actions from ATCOs, we are also reducing some attention capabilities in the brain and some of the learned skills. As a result, is it correct to assume that we still need human in degraded mode. Flight deck automation as lessons-learned, are there better way how we could utilize human?

Using today's typical Conflict Detection Tool (CDT) capabilities and foreseen evolution of CDT as examples, the presenter will explore how ATCOs use such tools today, what kind of skills are already or will be lost in the future if we do not react properly and what we can do about to keep human attentive for good decision makings in the future.

## **4. DISCUSSIONS AND CONCLUSION**

While we fancy at the same time worry about full automation coming ahead in the future ATM system, it is safe to say that we will still need human ATCOs to assume the core part of the ATM system by making rational and optimal decision makings when required in the next 20 years. And we should not forget that many ATCOs do enjoy and welcome new technologies in their daily operations.

What we HF experts, system designers and developers and operational experts can do to bring new technologies a success is that: always think in the shoes of ATCOs and visualize how best they could achieve one task by providing what minimum information and using what tool(s). Or we must consider how to treat system fallback situation: if we expect humans to take over the job from system, we must design the system in user friendly for better informing and finding the right information. Alternatively, ANSPs could invest in training ATCOs more to retain certain skills that they do not use lately.

## **ABOUT PRESENTER**

Keiko works at skyguide – swiss air navigation services ltd and heads the team of Human Factors (HF) experts who work for company's strategic projects and future concepts, conduct HF analysis to solve issues or improve daily operations, and dedicate towards guiding and educating skyguide employees in increasing Human Factors and Human Performance (HF/HP) awareness and technique. She has accumulated various work experiences related to strategic safety implementation, process improvement and HF/HP applications and research though serving the aviation and aerospace industries for over 20 years. Prior to joining skyguide in 2011, she has involved in international projects such as EUROCONTROL European Aeronautical Database (EAD), Swiss Air Force new Defense system and EASA HF research contracts. She is Japanese but spent her academic years in the USA and since 1999 she has been living in Zurich, Switzerland. She holds a Bachelor of Science in Aerospace Studies and a Master of Aeronautical Science with Human Factors specialization from Embry-Riddle Aeronautical University in Florida USA.

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