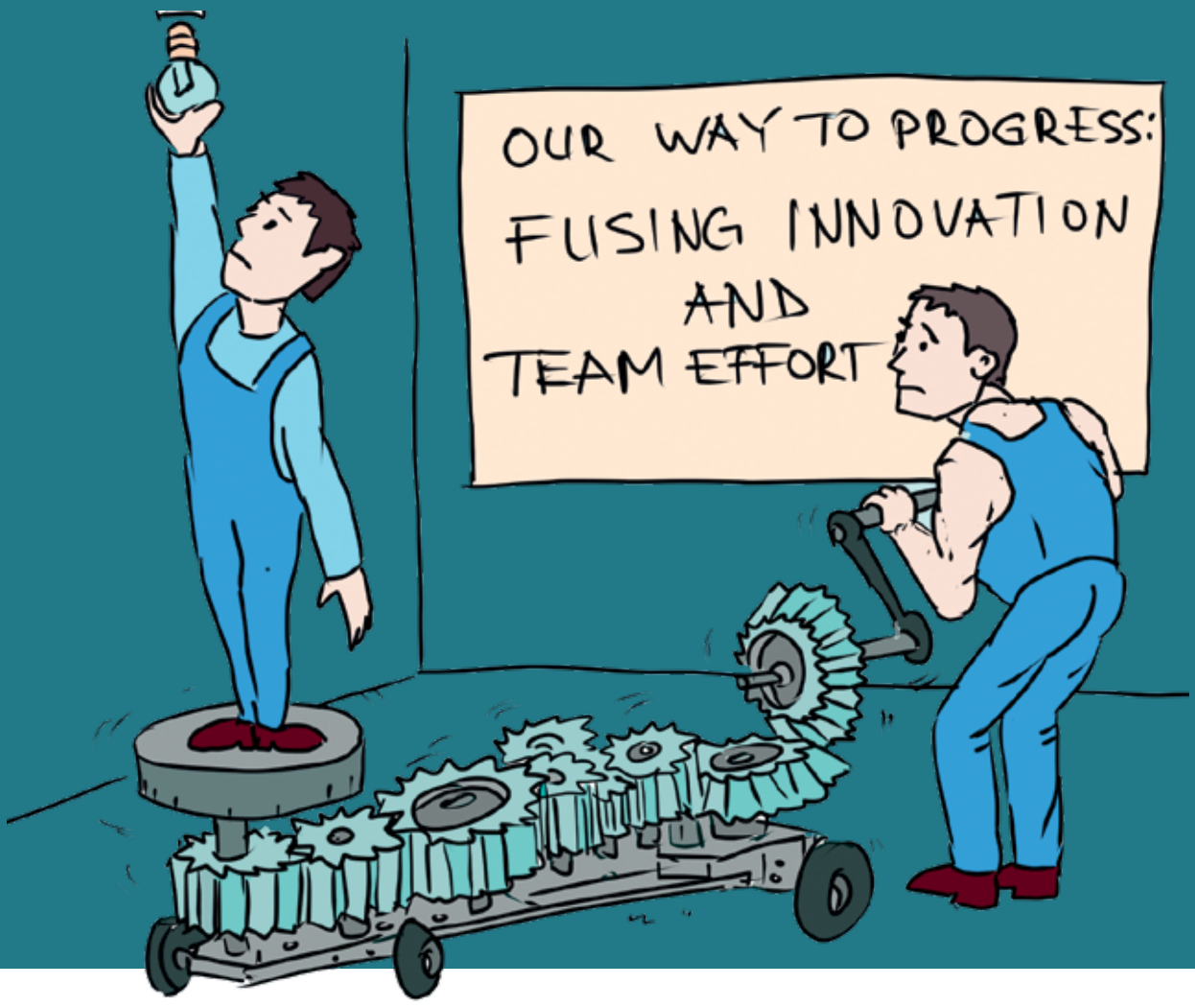
COMPETENCY AND EXPERTISE FOR THE FUTURE OF ATM

As we move into the future of aviation, changes in society and technology will affect the competency and expertise required of front-line and other staff. In this article, **Linda Napoletano** outlines some of the future trends and the changing nature of work, along with some of the implications for competency.

KEY POINTS

- **Trends and innovation will change the nature of ATM. The challenge is ensuring that today's workers have the competencies, expertise and support needed.**
- **New technologies and innovations require thinking in terms of human-machine partnerships.**
- **Future competencies needed in ATM may include abilities to work with data, knowledge of ICT and robotics, and new non-technical skills relating to problem solving and decision-making.**
- **ATM is starting to discuss how to define future competencies. We need to compare current competencies with future needs to prepare for the changes in the ATM work.**



Mobility4EU is a Horizon 2020 project aiming to deliver a vision for the European transport system in 2030 and an Action Plan that aims to implement that vision. This vision and action plan will focus on user-centeredness and cross-modality anad include the transport of passengers and freight (see https://www.mobility4eu.eu/).

STRESS is a Horizon 2020 project in the frame of SESAR Research and Innovation action to support the transition to higher automation levels in aviation, by addressing, analysing and mitigating its impact on the Human Performance aspects associated to the future role of Air Traffic Controllers (see http://www.stressproject.eu/).

MOTO is a Horizon 2020 project in the frame of SESAR Research and Innovation to identify the key multimodal stimuli required on remote tower platforms to enhance the sense of presence experienced by air traffic controllers (see http://www.moto-project.eu/).

KAAT (Knowledge Alliance in Air Transport) is an Erasmus+ project developing competency frameworks in ATM (see http://www.kaat.upb.ro/).

Introduction

For the past 10 years, the unemployment of the European labour force aged 15 to 24 years has been between 18%-20%. Beside the recent economic crisis, an important reason for young people being held back from the labour market is a lack of skills relevant to the workplace. The skills shortage sends alarming signals to both the European aerospace industry and to educational institutions. The European aerospace sector has always required a highly qualified and innovative workforce, and it is estimated that in Europe in 2014, 2.5 million jobs belonged to the aerospace sector (Air Transport Action Group, 2018). There is a need to identify the new skills, knowledge and attitudes to maintain competitiveness and to keep attracting and retaining highly skilled staff.

Future trends

In the next 20 years, mobility will dramatically change (Mobility4EU, 2018). Digitalisation, the Internet of Things and Big Data will allow different transportation modes to communicate with each other and with the environment. This will pave the way to integrated and inter-modal transport solutions.

Automation will increase for all tasks, changing the nature and the role of the humans in the system. Digital analytics, for airline and airport operations, will improve the strategic planning of traffic flows in both optimisation and deconflicting (NATS, 2017). Travelling will be more seamless. Unmanned aerial systems (UAS) will be populating our urban areas, performing many more applications.

"Automation will increase for all tasks, changing the nature and the role of the humans in the system."

Additionally, growing awareness of environmental concerns will require sustainable flying for policy makers, industry and end users.

The changing nature of work

Currently, there are two extreme perspectives on the implications of these trends. On the one hand, the impact of technology on the employment rates would be catastrophic. On the other hand, technological innovations are seen as the solution for all social and environmental problems.

A recent report (IFDT, 2017), suggests a third way, which is to frame the human-machines interaction in terms of partnership. This begins to build capacity in machines to improve their understanding of humans, and in people and organisations to engage meaningfully with robotics and new technologies. The versatility, creativity and ability of humans to solve problems would combine with the precision and repeatability of robots.

When applying a human-machine partnership framework to ATM, we can still see the future air traffic controller as an "active decision-maker" (as Andrew Beadle, IFATCA Executive Vice President, said in 2010), delegating to automation the execution of repetitive tasks. Once relieved from routine tasks, the pilots and controllers could dedicate more time to other activities such as training, collaborating with colleagues, complex planning and problem solving.

A number of technological innovations will change the way operators currently interact with machines in ATM. Some occupations will be modified, others will disappear, and new ones will be created. We can expect the following:

1. Airspace will be dynamic, with airspace boundaries changing to suit traffic flows, even in the terminal area, and in response to the ATM services needed. Operational differences between areas, like terminal and en-route, will become more blurred. More than one service provider could work in a given airspace block and controllers may be responsible for a set of aircraft (CANSO & IFATCA, 2010). In such a vision, **augmented reality** offers inline instructions to operators that can be quickly reassigned to new working positions with training being focused mainly on problem solving and decision making.

2. Higher levels of automation will be required. **Big data** will be collected at all levels of the system, including from operators. This will allow for performance-based operations, more accurate predictions, and on-time adaptation to unexpected changes. In the SESAR exploratory research project 'STRESS', air traffic controllers wear devices to monitor their levels of stress, workload and fatigue. 'Adaptive automation' is used to help both controller wellbeing and system performance.

3. New concepts for ATM will appear, such as remote towers, which centralise services for multiple airports. What will happen to situational awareness and decision-making of tower controllers, once they are no

longer physically there? Remote towers can be equipped with **augmented and virtual reality** to recreate a sense of presence, and haptic wearable devices to enhance the controlling experience and overall safety (see MOTO project).

4 In the coming years, the commercial use of drones is expected to grow across industries and for many applications.

Extensive **drone operations** will call for new competencies and jobs, from unmanned aircraft designs, to trained drone pilots, to the technology and regulations required to ensure that such aircraft are operated safely in the commercial airspace (SESAR, 2016).

Competencies

By looking at the few examples of the changing nature of the work in ATM, we can see that the skills and knowledge required for working in the ATM sector will change.

- Increasingly, the future controller (supported by automation) will manage traffic flows and trajectories. Active tactical intervention will be the exception, and the human will remain in the loop to make sure that the system meets performance targets.
- Using big data to diagnose future problems will require a new level of teamwork. To detect deviations and promptly intervene, machines will analyse and build patterns among large sets of data, and humans will interpret the results and understand how they connect to the actual operational scenarios. Future controllers will need competencies in strategic decision making and problem solving, as well as skills and abilities to read big data analytics and thus be able to manage the system, even when less directly involved in the operations.
- New 'natural interfaces' (e.g., gestural, voice/conversational) will enter ATM. Operators will need new technical and operational competencies.
- Where old tasks are fully delegated to automation, it may not be possible for the controller to understand how automation is offering a specific outcome, but operators may need competencies to take back control in some situations.

Additional technical and non-technical competencies will be required at all levels: operational, technical, support, specialist, and management.

An additional challenge for ATM will be to facilitate the adoption of a new 'mindset' concerning change. ATM has to plan for this now, by involving staff in the development of future ATM (Zizi, 2010).

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Challenges

The current competency framework must be compared with short- and mid-term needs. The current workforce must be trained to meet these needs. To contribute constructively to changes and adoptions to the surrounding world, ATM needs a new competency framework (see KAAT project). We need to understand how new technology, new procedures and new concepts will change competency requirements. We also need to assess what part of future employment demand can be met by retraining existing workers versus hiring new ones.

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