

A REGULATOR'S PERSPECTIVE ON DIGITALISATION AND HUMAN PERFORMANCE

When it comes to digitalisation, it can be hard to know what regulators expect. In this article, **Kathryn Jones** and **Anna Vereker** give a regulatory perspective on digitalisation to support human operators.

It is tempting to think that regulators should have an advanced understanding of the impact of the various technological advances in aviation. The reality is that we share this knowledge journey *with* the industry. As ICAO's *Human Performance Manual for Regulators* (Doc.10151) states, our role is "to make it easy for people in the aviation system to do the right thing and avoid negative consequences". We need to develop our regulatory approach with support for the person in mind. This is at all levels of regulatory influence, from State Safety Programmes and options for regulatory intervention, to the changes in oversight driven by the demands of technological advancement.

This rapid change in the use of technology is not restricted to aviation; we are all impacted at a societal level by digital transformation. For many of us, digital assistants on smartphones have much reduced the need to make difficult mental calculations, remember phone numbers, or even use a map. It – in theory at least – frees up brain functionality for other more interesting or more useful things. This process of handing off less interesting tasks to a digital assistant is a common theme in aviation too. Most commercial aircraft now have a digital suite which augments the capabilities of the human pilots, as well as air traffic control

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systems, flight operations scheduling, and many other functions.

How technology changes the nature of work

One of the five core human performance principles recently published in ICAO's Doc.10151 is that "people's performance is influenced by working with other people, technology and the environment" (see *HindSight* 32). There is recognition that the way we work *with* technology has changed the way our work looks and feels, and the tasks we undertake. As an aviation regulator, we want to understand how organisations have understood this change, and how they are supporting their people to do their best in their operational context. We want to know that technological tools help people to make the best decisions on the day, and support them with the tasks that we know people are not as good at achieving – for instance remembering to do things in advance (prospective memory) and monitoring tasks.

For digital assistance to be successful, it must be able to provide options within the boundaries of its functionality *and* be easy to understand and use by the people involved. It must cater for changes to peripheral tasks in addition to the 'main' users. It must be able to support people on the day and within the context it will be used. This is an often-forgotten element; just because something can be *designed*, doesn't mean it can be applied *usefully* on the day.

Understanding complexity

We want to ensure that organisations understand how digitalisation affects a complex system. Digitalising one task can have a big impact elsewhere in the system. It may change how an operator understands the system is working, or make the job harder for someone else in another part of the system. Traditional safety analysis methodologies such as barrier and bow-tie models may not be well suited to understanding these sorts of changes in a complex system.

As a regulator, we want to see new methodologies emerge that are better able to deal with systems and complexity. Take the map navigation function on your smartphone: it is not simply a digital version of a paper map. Instead, there is recognition that a person driving a car will have difficulty trying to read a map at the same time

as driving – so the map application provides audible directions to help the driver, and is often mounted on the dashboard of a car so that the driver can easily see the map without having to hold the smartphone. However, by not looking at the map before we start our journey, we often lose sight of the bigger picture and can end up driving down unsuitable roads or not knowing how to avoid a closed road. We now have regulations preventing car drivers from holding and using smartphones while driving, recognising that this is unsafe, but we do not require them to have a 'big picture' view so that they manage the different conditions on the day. As aviation regulators we are looking for digitalisation to support human operators to do their best both in using the equipment and understanding the context.

Beyond prescription

As regulators we need to avoid 'solutionising' digital applications. There may be new applications that would be helpful but might be precluded by prescriptive regulations. Instead, we want operators to understand their own systems better, and understand how digitalisation may help their people do their best. As a society, our appetite for increased digitalisation (and automation, including autonomous operations) will change over time, and with increased technological development. We do not want to hamper this development, but we do want to ensure that safety is at the forefront of progress.

In air traffic control, a new type of 'digital' tower is being introduced; this might be an augmented physical

tower located at the airport or might be a remote application from another location. Careful consideration has been given to how best to support the human controllers involved in this work, and what sorts of technology will assist them to do their best. It is possible for some cameras to provide more information than a controller would gain from using their eyes in a physical tower, but at the same time there could be several limitations (for example, poor weather occluding a camera). Some of these differences are more obvious than others, and there is an agreement for ongoing monitoring of the effects of digital towers on the human controllers so that any long-term impacts are captured and understood.

For now, the system still relies on a human controller, but in the future, there may be a different interaction

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of digitalisation and automation that changes this role. We need to ensure that we are mindful of safety impacts, and make best use of human operators, and all their positive capabilities in this situation.

Collecting safety data

Collecting safety data is a core activity in supporting our understanding of the system and in aviation. It has been subject to both digitalisation and in some cases automation. We have air and ground systems that collect data, and help the human operators translate this into meaningful trends. Digitalising mandatory occurrence reporting (MOR) forms has also improved the user experience of submitting these reports and may improve reporting as people find it easier to log them. However,

data itself always has limitations in the insights it can provide, and we need to be wary that in making the collection process easier, we must listen out for 'noise' between data points that can provide vital contextual information about safety. Once again, we need the technology to support the people, valuing qualitative information as much as we easily accept quantitative data.

The road ahead

This is a shared road that we are all travelling on, and it will call on all of us to use our experience and knowledge in different ways. Through collaboration and curiosity, we can work together to ensure that we make the best use of the resources available to us and continue to explore ways to prioritise system safety with human factors at the fore. **S**



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References

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