Controllers’ Views on the (European) ATM System of the Future
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Everywhere you look, you cannot help but notice the “doom and gloom” about the recent performance of the European ATM system and its prospects for the next few years. While 2018 saw Europe’s air traffic increase by 3.8%, making it the busiest year on record with more than 11 million flights, the overall delay in the network increased by 105% compared to 2017 [1]. More than 60% of that delay was generated by capacity and staffing issues and the situation is not likely to improve in the near future. As you can imagine, that has prompted our industry to discuss measures to increase capacity and improve staff efficiency, which was very noticeable during the recent 2019 World ATM Congress in Madrid. Unfortunately, nobody was willing to discuss the real reason why we got into this situation in the first place and learn from it, namely the focus on cost reduction in Reference Periods 1 and 2 (RP1 and RP2), something which is also present in RP3 [2]. The reference periods set air navigation objectives in terms of safety, capacity, environmental impact and cost efficiency for Member States, with RP3 referring to the period 2020-2024.

Despite this unfavourable situation, the hands-on and pragmatic nature of air traffic controllers has meant professional organisations like the Guild of Air Traffic Control Officers (GATCO) in the UK, the International Federation of Air Traffic Controllers’ Associations (IFATCA) and others have been calling for a different approach avoiding past mistakes and have been actively promoting concrete measures to improve the European ATM system. This article describes the views of those professionals at the coal face, who battle the inefficiencies and shortcomings of the system day in and day out. It details the changes that will help the daily operation of the system in the medium term and, in turn, pave the way for the capacity, flexibility, efficiency and resilience the European ATM system needs if it is to deal successfully with the forecasted traffic growth in the next 20 to 30 years [3]. As an additional advantage, and leaving aside the particularities of the European airspace, some of the measures below could equally be applied worldwide.

Airspace

The focus of any talk about capacity in the context of the European ATM system is, yet again, the optimisation of the European airspace. However, that is far from a new or revolutionary concept. In 2001, the European Commission drafted a Single European Sky (SES) legislative package. That package was adopted in 2004 by the European Parliament and Council, setting up the legal framework for the implementation of a truly SES. However, progress has been very slow, as shown in Figure 1, depicting the differences between the areas of responsibility of European Area Control Centres (ACCs) in 2004 and 2017. That slow progress has also been highlighted in a recent report from the European Court of Auditors [4].

In Summer and Autumn of 2018, GATCO and IFATCA took active part in two Airspace Architecture Study Workshops organised by the SES ATM Research Joint Undertaking (SESAR-JU) with the support of EUROCONTROL, where ATM stakeholders were asked to provide input on how to deal with the shortcomings of Europe’s airspace architecture. While the document resulting from the workshops makes some very valid points [5], the focus on upper airspace, with the aim to create a European Upper Flight Information Region, ignores some of the more pressing problems of the European airspace, which would require a holistic approach.
In particular, whether we are talking about upper or lower airspace, the biggest elephant in the room in this discussion is of political nature. European airspace is suboptimal because it is based on national needs and preferences, under the “umbrella claim” of national sovereignty. Functional Airspace Blocks (FABs) could not overcome that, resulting in a very limited implementation of that concept. SESAR JU has shifted the focus towards virtual centres, even though national sovereignty is still very present in every ATM fragmentation discussion. If virtual centres, where the delivery of an ATM service is independent of the physical location of staff and equipment, are to succeed where FABs failed, a legal mandate might be required so political interests are left aside and European airspace and sectorisation can be structured based on traffic flows and controller workload, not conditioned by Member States’ national borders. Research has been carried out to find the optimum airspace sectorisation and the evidence against the current structure is overwhelming [5], so when are we going to break free from those constraints?

Figure 2 shows another of the main problems of European airspace, the suboptimal allocation of special use (military) airspace, guess what - due to national boundaries [6]. In particular, when comparing the USA and the European case, we can see how the airspace with the highest density of traffic in the USA is free from restricted airspace, something that does not happen in the European case. The message is clear, the cooperation between civil and military aviation authorities in Europe needs to become much more effective. Dynamic flexible use of airspace needs to become a reality, so restricted airspace can be released on a tactical basis to cope with varying traffic conditions and capacity demands. Only then can we get that little bit closer to the promise of Free Route Airspace (FRA).

As mentioned above, tackling the inefficiencies of the European ATM system requires a holistic approach that looks not only at the upper airspace but also at lower airspace and at what happens on the ground (i.e. airports). One of the comments you could hear at the two airspace architecture workshops and at the 2019 World ATM Congress is that we need a more predictable system. However, we seem to forget that the biggest source of unpredictability is airport operations, once we get aircraft up in the air, things get considerably more predictable. Figure 3 shows the difference between departure and arrival punctuality in the European ATM system, comparing August 2017 and...
2018. In addition to seeing that delays are getting worse between 2017 and 2018 (nothing new there), we can see how the arrival punctuality is better than the departure one, which indicates that when aircraft are up in the air, the situation tends to improve. Any effort to optimise the European airspace without taking into account lower airspace and airports is bound to deliver, again, a suboptimal solution, a gate-to-gate approach is necessary. Granted, the problem of airport operations, with the number and heterogeneity of parties involved (airport operator, aircraft operator, ground handler and air traffic control amongst others), is extremely complex. However, we should not shy away from tackling that problem through Airport-Collaborative Decision Making (A-CDM). A-CDM is not just a technical change, it is also a mindset change based on the exchange of accurate information and the collaboration between stakeholders. Only by aiming to improve the predictability of what happens on the ground, can we improve the predictability of the overall system.

As in most industries and organisations, a lack of flexibility or resilience can be addressed through a process of simplification and optimisation, resulting in a leaner structure. Why don’t we apply the “simplify and optimise” motto to our airspace? One clear path to simplification would involve the reduction of the classes of airspace from the current seven ICAO categories (something which has already taking place in some countries). IFATCA has been proposing for some time to reduce the classes of airspace to three: a fully known environment; an environment of partial information where a differentiation is made between IFR and VFR flights and uncontrolled airspace. This idea, which might appear too extreme to some, is nothing new. EUROCONTROL already talked about the possibility in its ATM Strategy for 2000+ [7]. EUROCONTROL even went as far as proposing a further simplification to two classes of airspace. While only two classes may not be appropriate, it is clear that a simpler airspace classification would enable a more efficient operation through simpler rules and procedures.

One final point regarding airspace. Despite calls for sectorless and flight-centric operations, GATCO, IFATCA and other organisations still see ATC as a sector-based operation. That is very unlikely to change while technology, procedures and training cannot support those concepts effectively. Imagine
the job of a taxi driver in Paris. Take that taxi driver, with his/her car, to Frankfurt. Even though the same car is being driven, is the driver really going to be comfortable taking passengers around Frankfurt? Local knowledge about streets, routes, hotspots and places of interest is essential for the driver to provide a good safe service. The same applies to air traffic controllers. Flight-centric operations have been trialled in nominal conditions without a clear understanding of where the operational advantages lie (claims of increased productivity have not been substantiated). Even in those nominal simulation scenarios, a number of issues have arisen regarding coordination in the event of a conflict, dealing with an emergency or even the number of discrete frequencies needed. If we want to optimise the operation of our airspace, the solutions are elsewhere.

Supply and Demand

Despite European airspace capacity not meeting demand, only a relatively small percentage of sectors are congested, and even those are not congested 100% of the time [8]. It would seem obvious that, in a system where supply cannot match demand at specific locations and times, a flexible price structure should be set up that takes into account the law of supply and demand. That would result in a more balanced system where supply and demand can match each other more effectively. Just as an example, Figure 4 shows the forecasted additional number of flights in Europe in 2040 in the case of regulation and growth (darker colour means bigger increase) [3]. It can be observed how the currently congested areas will become even more congested, further exacerbating the supply and demand imbalance. The current system of unit rates, set to recover predetermined costs for a given period, would not deal with that scenario effectively. A more flexible system is required where other routes are made available at a lower cost or the most desirable routes become
more expensive based on demand. Airlines might be quick to claim that such an arrangement would result in aircraft flying less efficient routes with the associated negative environmental impact. However, given that the most congested routes are not so at all times, would airlines be willing to revisit their scheduling and compromise so they can continue to fly the preferred route but at other times of the day? Most likely not, but what if that meant not having to pay a premium when there is too much demand for that route? Again, this is not a novel idea, a number of initiatives have looked at flexible pricing mechanisms which can adapt to varying sector demands, like the Strategic Allocation of Traffic Using Redistribution in the Network (SATURN) [9] and the award-winning COordinated Capacity ordering and Trajectory pricing for better-performing ATM (COCTA) [10].

The ANSP Model

In recent years, we have seen a move by most Air Navigation Service Providers (ANSPs) in Europe from being a provider of air navigation services to becoming ATM solutions companies, where ATC is just one sector of the business (although normally the highest earner). It is understandable for ANSPs to look at other revenue streams, particularly if it is in the non-regulated part of the business. However, how can we get European ANSPs, which are competing around the world for projects/contracts, to truly work together on improving the European ATM system leaving aside business interests? Even non-European ANSPs are venturing out into the world of ATM solutions companies [11]. Most ANSPs in Europe are product-based monolithic systems, owning all the assets required to provide air navigation services [5]. That model is not sustainable if we are to improve the capacity, flexibility and resilience of our ATM system. We need to gradually move to a service-based system where the provision of ATM data (flight information, surveillance, weather, aeronautical information) and the provision of an Air Traffic Service (ATS) are not necessarily linked [5]. Let’s look at the example of Aviation Capacity Resources (ACR), a Swedish ANSP which provides aerodrome
services to 15 airports in Sweden and approach services to 12 of those airports. Of 115 employees, more than 88% are operational staff, clearly indicating that their business is the provision of an ATS and along the lines of the service-based organisational structure in [5].

The following seems to be a recurrent theme in this article but, again, the above paragraph is nothing new. Let’s look at the example of the telecommunications industry in the UK. In 2006, British Telecom agreed with the regulator to create BT Openreach, which became the infrastructure division of BT Group. Its task was to manage the local network between the local BT exchange and the phone socket. That way, rival telecom companies and Internet service providers could have fair and equal access to that section of the network. That arrangement was ground breaking at the time and soon extended to other European countries. It did have its fair share of criticism too, due mainly to inappropriate regulation and oversight. A move towards a service-based architecture is indeed possible but it is a fundamental paradigm change in ATM, it requires the appropriate regulatory framework and oversight to make it work effectively and deliver its full potential. The EC and the European Aviation Safety Agency (EASA) are already hinting at that paradigm change with Regulation (EU) 2017/373 [12].

Standards, Standards, Standards

One of the words you could hear most during the World ATM Congress in Madrid was “harmonisation”, referring to procedures and platforms. That is one step short of what we really need: “standardisation” of technology. The only way the service-based structure in the previous section can work effectively is if technology standards are developed and ATM and ATC companies can use Commercial Off-The-Shelf (COTS) products. The efficiency of the future European ATM system relies heavily on interoperability and standardisation. Figure 5 shows the flight data processing system suppliers in Europe. Having a number of suppliers is not a problem per se, it becomes a problem when their systems are developed in complete isolation with a high level of customisation. The claim is normally that ANSPs, due to the particularities in their airspaces and procedures, need systems tailored to their needs. I am not sure how true that is since I believe it would not take me long to provide the ATC service I provide daily (Heathrow Approach) using a platform from a different ANSP. Sure there will be differences in the Human-Machine Interface (HMI) and the tools available, but the basic principles would be largely the same and the sector and procedures would not change. Do we really need that level of customisation in our industry? As somebody once told me: imagine if all the major airlines went to Airbus and Boeing and told them how they had to design the cockpit of their aircraft, what technology had to be in place and with which features, what do you think Airbus and Boeing would say to that?

There are two projects by European ANSPs which are trying to reverse this state of fragmentation. COOPANS is an international partnership between the ANSPs of Austria, Croatia, Denmark, Ireland, Portugal and Sweden and Thales as the industry partner [13]. At the same time, iTEC is a partnership between the main ANSPs in Germany, Spain and the United Kingdom and Indra as the industry partner (the ANSPs of Lithuania, Netherlands, Norway and Poland have recently joined this initiative) [14]. However, they all stop at the harmonisation stage, without looking at standards that would ensure the interoperability of all platforms.

You might think, why the obsession with standards? Harmonisation should deliver everything we need without having to go through a (normally painful) standardisation process. Let’s go back to the telecoms industry again. Some of you might remember how, in the 1990s, there was little point in
taking your 1G or 2G mobile phone from Europe to the USA or Japan because it was not going to work. The development of communication technology and standards at the time was done mostly at a national level, normally with government control. It was only when the standardisation of mobile technology fell in the hands of international organisations like the International Telecommunication Union (ITU) and the European Telecommunications Standards Institute (ETSI), created through a mandate of the EC in 1997, that we saw mobile communications grow exponentially, reaching its true potential and being as ubiquitous as they are today.

The Human is Key

An ICAO representative stated at the World ATM Congress in Madrid that “the human remains at the centre of decision making” and I could not agree more with that statement. The human is an integral part of the ATM system and the most critical source of its performance, safety and resilience. At the same time, our industry is experiencing an unprecedented level of technological and automation changes. Those changes cannot happen independently but with the human in mind, in what IFATCA calls the “Joint Human-Machine System”. I am sure I do not need to remind you of how catastrophically wrong things can go when there is a disconnect between the development of automation and the human operator.

Unfortunately, developing technology with the operator in mind is not the only problem we have from a human point of view. Years of little to no recruitment have resulted in the lack of air traffic controllers we are currently experiencing, a situation not likely to change in the short term. In addition, the lack of staff mobility has made it impossible for the industry to react dynamically to the shortage of staff. Now, how do we change that going forward? First, we need to attract the right people for the job, in a world where work-life balance and quality of life is increasingly important. The 24/7 nature of our job and its shift patterns are not sufficiently attractive to young professionals. We have to accept the diversity of our present and future workforce and their different motivations. More flexible shift patterns (with
potentially different terms and conditions) or professional development opportunities are just some of the aspects we could be working on if we want to attract and keep the best professionals for the job. Staff mobility remains an issue with some ANSPs hiring only young professionals with no previous experience, discarding a pool of experienced controllers already holding a European licence. Other ANSPs require successful candidates to obtain all the possible licences or ratings before joining the company, even if they are never going to use some of them. We even have the case of military ATC professionals with 20/30 years of experience who have to go through the same long training programme as an 18-year old with no previous aviation knowledge. Is that the best we can do to address the staffing problem?

I would not want to finish this article without making a comment about airlines chiefs’ call for faster training of air traffic controllers to ease delays. Cutting corners is never a good approach to solve a staffing problem. Highly-skilled safety professionals become so through appropriate and thorough training. I am not disputing that training could not be shortened in some areas, but that should not be the aim, it should be the direct consequence of simplifying and optimising the European ATM system.

This article does not address all the issues which have created this capacity-constrained European ATM system. Others, like the fragmented approach regarding RP3 cost targets, the use of old procedures which should have been superseded by available technology or the amount of expensive technology in aircraft cockpits which is not being used to improve the system, would probably need an article of their own. However, this article does show areas where a fundamentally different approach is needed if we are not to repeat the errors of the past. We do love forecasts in the ATM industry, so my forecast, based on our progress since 2001, the lack of political will and the endemic inaction in some areas, is that in 20 years’ time we are going to be talking about a constrained ATM system in the same way that we are doing now and we did 20 years ago. Does that mean all is lost? Not yet, but we need to challenge the status quo of our industry and address the issues described in this article with the collaboration and commitment of all stakeholders if we want to succeed where others have failed.
References


