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The potential of Unbundling ATM Services in Europe

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Abstract: European ATM network reform has been a continual challenge for all European aviation organisations. Its fragmentation has led to cost-inefficiencies and delays, which airline groups are continually scrutinising and pushing to streamline and defragment the ATM network. Some reform initiatives, such as the Single European Sky, have been deemed, for the most part, ineffective. While the SES reform is still ongoing and modifications are taking place, a new reform theory has emerged in the guise of airspace unbundling. Although there are small pockets of unbundled terminal airspaces around Europe, the push is to unbundle en-route services.

This chapter explores the current European ATM system and outlines the different approaches to reform the ATM network. It also presents the current business models of ANSPs, an aspect that influences ANS unbundling. It discusses unbundling at a terminal and en-route level and concludes with the barriers to reform.

Keywords: ANS unbundling, ANSPs business models, Single European sky, ATC reform, liberalisation, TANS, en-route.

1 Introduction

An air traffic management system is designed to provide safe and efficient aircraft movement both on the ground and in the air. Lawless (2020) highlights that an ATM system is classed as a critical infrastructure that allows for the safe movement of people and goods. An ATM system can be looked at from a national and international perspective as several agencies are involved in ATM service provision (CAA, 2020). In the European context, the ATM network is formed by the interaction of numerous organisations and agencies. These range from the national and private Air Navigation Service Providers (ANSPs), who provide the Air Traffic Control Service, to governing bodies such as EUROCONTROL and the European Aviation Safety Agency (EASA).

As Eurocontrol (2006) stated, the fragmentation of the European Air Traffic Management system has long been of concern. Lawless (2020) stresses that the modern European ATM network is still vital for the safe and efficient functioning of European aviation. However, it is still marred by cost and environmental inefficiencies and continuing criticism from airspace users. Eurocontrol released a statement that inefficiencies in the network contribute to an average additional fuel burn of between 8.6% - 11.2%, compared to the most fuel-efficient flights in the European Network (Eurocontrol, 2020a).

Inefficiencies still exist in the European ATM network despite reform initiatives like the Single European Sky and SESAR. The Single European Sky (SES) initiative was first proposed in the late 1990s, following a period where the safe operation of civil aircraft in close proximity to heavily active military areas was seen as problematic (Lawless, 2020). In 2004, the European Parliament passed the first iteration of the Single European Sky. SES 1 enacted regulations to transcend national borders and re-shape the European ATM network. This initiative has since evolved into SES II and SES II+.

The next stage of reform that has come to the fore in recent years is the unbundling of ATM services. As mentioned above, the ATM network suffers from large scale duplicity of services. The European Commission has now proposed that the ATM network be subject to a full unbundling of services (Lawless, 2020). The unbundling of Terminal ATM (controlled airspace in the vicinity of an airport) has already occurred in small pockets throughout Europe. For unbundling to have a large-scale positive impact on the network, full liberalisation of European ATM services will likely be required.

2 Current European Air Traffic Management

The European Union has attempted to liberalise the air transport industry since 1993 (Hiney et al., 2020; Efthymiou and Papatheodorou, 2018). However, and despite the introduction of the Single European Sky, the liberalisation of European airspace, in the ATC context, is currently in a state of gridlock (Baumgartner and Finger, 2014). As Adler et al. (2020) state, ATC provision is one of the last elements of the aviation supply chain to be considered for liberalisation.

ANSPs connect airlines and airports by providing safety-critical services whilst promoting efficient traffic flows (Dempsey et al., 2018). ANSPs are continually being criticised for not being cost-efficient and costing airlines millions of Euros in delays. The Director of Eurocontrol, Eamonn Brennan, said that 'airlines are charged billions of Euros for ATM services but are they receiving billions of Euro worth' (CAPA, 2019). This raises the question of why European ANSPs are not deemed cost-efficient. The first important aspect is how European airspace has evolved.

Following on from the Chicago convention, which took place in 1994, several rules were implemented concerning the provision of air navigation services. Importantly, it was stated

that 'each state is required to provide air navigation services for their own state' (ICAO, 2013). This ICAO regulation has created a European air traffic management architecture that is far from ideal as a direct result. European airspace is fragmented and comprises numerous Flight Information Regions (FIRs). Generally, each FIR is controlled by a specific sovereign state, over which the FIR lies.

<Insert Figure 11.1 here>

Figure 11.1: European Flight Information Regions (Eurocontrol, 2019a)

This fragmented approach to European ATM has created the situation whereby ANSPs operate as natural monopolies (Grebensek and Magister, 2012). Europe has a staggering 37 ANSPs controlling approximately 1000 different airspace sectors. Because of this fragmented approach, delays in these European airspace sectors cost airlines a vast amount of money (Grebensek and Magister, 2012).

In 2019, the European ATM network handled over 11.1 million flights, an average of 30,427 flights daily. This also equates to a 0.9% increase in daily traffic compared with 2018, an upward trend since 2014 (Eurocontrol, 2019b). Despite these large numbers of aircraft moving through the ATM system daily, the Network Manager reported a reduction of en-route ATFM delay of approximately 9%. This is quite a reduction, considering traffic numbers increased on 2018 levels. However, the reduction was mainly due to fewer weather disruptions in en-route airspace, more so than related to any ANSPs directly (Eurocontrol, 2019b).

Even though a reduction of delays in the order of 9% was observed and reported, airline groups are not happy with the en-route performance of the European ATM network. Ryanair, one of the most vocal airlines in Europe, argues that these continuing ATFM delays are unacceptable, and changes must be made. CANSO (2019a) have long argued that ATM leaders are continuously making changes and reforms to address the capacity and cost efficiency issues. This highlights that ANSPs are open to reform while not allowing an open ATM market.

As well as delays to air traffic, the cost-efficiency of the fragmented European airspace is continually being highlighted by airline lobbying groups, such as IATA and A4E. IATA (2010) argues that airline groups feel that Europe is continually taking two steps forward and one step back in terms of cost-efficiency. Likewise, A4E (2020), a lobbying group for European airlines, has recently stated that "European ATC remains inefficient, expensive and unreliable for millions of passengers". The reality is that the costs imposed on airlines by an ANSP, called 'unit rates', are highly regulated by the European Commission. Therefore, an ANSP cannot charge an airline a unit rate that has not been approved. However, it is important to note that before the introduction of performance and risk-sharing charging regulation, the situation existed in which European ANSPs were seen as natural monopolies (Artblaster, 2018). Essentially, this meant that revenues generated for ANSPs were done so within a captive

market with a cost-recovery charging mechanism and airlines had no other choice but to use the services of a particular ANSP. Thus, the motivation for ANSPs to have a good economic performance was particularly weak (Artblaster, 2018). This would suggest that a performance and charging scheme regulation was required to keep control of ATC unit charges and ensure a cost-effective ATM network for airspace users.

The current cost-efficiency and performance monitoring regulation is commission implementing regulation 2019/317 (European Commission, 2019). Castelli (2005) states that a specific policy governing ANSP performance and cost-efficiency was an important move by the European Commission. They highlight that to guarantee maximum efficiency at minimum cost to all airspace users and help realise the goals of the Single European sky (which will be discussed later), ANSP operations must be monitored and controlled. It is important to note that this formal performance regulation only came into force in the EU in 2009; however, a performance review framework had already been in existence since 1997 (Eurocontrol, 2019d).

Under the 2019/317 regulation, all national supervisory authorities of each state must supply the performance review board with the planned unit rates for the subsequent 5 year period – called reporting periods. This is performed by the national supervisory authority (which is generally the aviation regulator in most states), allowing for a level of independence from the ANSP and the unit rate charged (European Commission, 2019). However, the ANSP can put forward their predicted costs for the relevant period to aid the NSA in determining the correct unit rate.

The provision of gate-to-gate ATM/CNS is costly. There are significant costs at both en-route and terminal levels (See Table 1). Despite the aim of Performance regulation to reduce the cost for airspace users, inefficiencies continue to exist. Castelli (2005) has said that whether the performance regulation has achieved its cost-efficiency goals is very much up for debate. It is even the case that CANSO, the representative group of ANSPs, agrees that the performance regulation has not lived up to its aim and does not assure airlines of an ANSP being as cost-efficient as possible (CANSO, 2012). Interestingly, both IATA and CANSO have issues with the performance scheme regulation. Perhaps it is now timely to review or adopt the regulation and move into a more modern and interoperable ANSP framework within Europe. Artblaster (2018) argues that having a performance scheme that does not work lends great weight towards the benefits of creating an open ATM market.

Gate-to-gate ATM/CNS provision costs (European Level)		
€8,213M		
	En-route ATM/CNS costs (European Level)	Terminal ATM/CNS costs (European Level)
	€6,387M	€1,825M
Staff costs	€4,098M	€1,244M
Non staff operating costs	€1,011M	€305M

Depreciation costs	€785M	€158M
Cost of Capital	€407M	€89M
Exceptional costs	€85M	€29M

Table 1: Breakdown of ATM costs for an unnamed European ANSP, 2017 (Performance Review Commission, 2019)

3 ATM Reform Initiatives

3.1 Limitations of SES & FABs

As Baumgartner and Finger (2014) indicate, the SES programme was due to have been delivered by 2020. This has not happened yet. Remarkably back in 2012, the vice-president for transport in Europe made the stark announcement that the single European Sky initiative was not delivering. \$5 billion a year were being lost by airlines due to a drastically inefficient ATM network (Kallas, 2012). This was backed up by Blondiau, Delhay, Proost and Adler (2006), who had illustrated that the whole SES process would only work if a performance scheme was introduced. However, as we can see, even after the introduction of performance regulation, the aims of the SES have still not been realised. To date, this has been largely unsuccessful, with 2019 being a record year for both traffic numbers and delays.

Lawless (2020) indicated that FABs were used to transcend national borders; however, they also state that FABs were still conformed to the traditional national borders. Also, although the creation of FABs played a fundamental role in SES, it is well known across Europe that most ANSPs feel that FABs have not worked (Efthymiou, 2016). For example, the UK and Ireland still operate independently despite the UK – Ireland FAB (Lawless, 2020). As Nava-Gaxiola and Barrado (2015) state, following a review of the southwest FAB, state boundaries limit the operational improvements proposed in the SESAR programme to modernise the Single European Sky. It indicates that something other than FABs needs to be considered to defragment European airspace.

From the environmental perspective, FABs have also been shown to have been of no real benefit (Efthymiou and Papatheodorou, 2018). Environmental concerns are very real in today's aviation industry, and elements such as en-route flight efficiency need to be addressed. However, Efthymiou and Papatheodorou (2018) study found that ANSPs and FABs lack a strong environmental ethos. Indeed, it was said that FABs have generally failed to address the issue. For example, FABs introduced the concept of conditional airways to reduce track miles flown and hence fuel burn, but the conditional routes are massively underutilised (Efthymiou and Papatheodorou, 2018).

Interestingly, Buyle et al. (2020) suggest that ANSPs as individual entities are already operating in the most cost-efficient manner possible. Therefore, they argue that there is nothing concrete to definitively say that Reg. 371 and the consolidation of ANSPs through

FABS would be of any benefit whatsoever to the ATM network (Buyle et al., 2020). Baumgartner and Finger (2014) stated that the SES and SES II projects were the latest and likely to be the last attempt to harmonise European airspace.

3.2 Air Navigation Service Providers

3.2.1 ANSP business models

It is important at the outset to mention that there are many different types of ANSP business models. Before introducing any performance review regulations, ANSPs in Europe could be considered natural public monopolies (Artblaster, 2018). However, because of the introduction of performance regulation, they are now seen as regulated monopolies – albeit still monopolies (Blondiau, Delhay, Proost and Adler, 2016). As Artblaster (2018) indicates, airlines have no option but to use the services of an ANSP. Essentially, they are a captive market. Artblaster (2018) believes that the time is right to look beyond individual ANSPs and start the liberalisation of the en-route European ATC network. Following the Chicago convention, when each state was required to provide a national air traffic control service, it was the status quo that these early ANSPs were state-controlled. Although that has not changed fully, within European ANSPs, there are now different models of ownership. Indeed, NATS in the UK were the first part-privately owned ANSP that operated on a ‘for profit’ basis (Dempsey- Brench and Volta, 2018).

Blondiau et al. (2016) performed interesting research, using a public utility approach, into the business models of ANSPs, considering they are heavily regulated entities. In doing so, they identified four key aspects of ANSPs that must be considered when researching their business models. They are

1. The semi-public nature of ANSPs
2. The heterogeneity of ANSPs
3. Monopoly nature of en-route ATM
4. Likely emergence of special interest groups

The study found that cost-plus regulation, also known as ‘cost-recovery’ (for example, setting unit rate charges as per 2019/317), does not act as an incentive for ANSPs to reduce costs. It was found that with this type of regulation, excessive costs and capital investments have occurred (Blondiau, Delhay, Proost and Adler, 2016). This has occurred because, according to the performance regulation, ANSPs will be compensated for fixed investment costs, therefore ANSPs will invest more, thus raising the unit charge. However, a positive from this is that ANSPs are more inclined to adopt newer and more efficient technologies (Blondiau et al., 2016). Adler, Delhay, Kivel and Proost (2020) concluded that ANSPs with public-private ownership, such as NATS, have higher cost efficiency and productivity levels. However, these ANSPs are only a small subset, so in reality, there would need more public/privately owned ANSPs to get ‘the real picture’. They also determined that those ANSPs under semi-state

ownership (such as the Irish Aviation Authority) are inclined to look more after the national interest than reduce the airspace users' cost base. The research shows these ANSPs to be more inefficient than privately owned ANSPs.

Contrary to the results from Adler et al. (2020), Dempsey-Brench and Volta (2018) argue from their research that the ownership state of an ANSP does not impact cost-structures or cost-efficiencies. Therefore, we can see that no one conclusion is drawn concerning European ANSP business models. More research needs to be conducted.

Tomova (2016) looks at ANSPs business models from a different perspective to Blondiau et al. (2016). She argues that the discussion at the European level regarding how ANSPs operate is generally focused purely on how their business operates in terms of performance regulation. Commercial revenues of European ANSPs are generally ignored. Tomova (2016) suggests a couple of reasons as to why this is the case within Europe,

1. Privatisation is still very rare among ANSPs
2. Within Europe, the focus on commercial revenues has been on airports and airlines and rarely on ANSPs,

Compared to the other parts of the world, Europe seems to be lagging. Tomova (2016) highlights that in other fragmented airspaces (non-European), there is now competition for an open en-route market. This sharpening of competition among ANSPs has driven costs down and encouraged ANSPs to operate with more commercial business models. This is not yet the case in Europe, apart from some liberalisation of terminal airspace (to be discussed later). One ANSP can provide ANS services to another; however, there is little research in the European context. Europe needs to adopt more radical changes towards more liberalisation (Tomova, 2016).

Materna (2019) describes the liberalisation of ATM in greater detail. She describes a situation whereby state-owned ANSPs were publicly funded historically. It is now the case that ANSP business models have adapted to take advantage of more commercial revenues that can be generated (Materna, 2019). However, low-level terminal airspace has been somewhat liberalised, not quite on a global ATM network level (Materna, 2019).

Buyle et al. (2020) investigated the economies of density and economies of scale in European ATM and found no cost complementarity between en-route and terminal services. This is particularly important as this could pave the way for future unbundling of ATM en-route services and creating an open ATM market.

4 Reform of ATM Services in Europe

4.1 Unbundling of Terminal ANS

Materna (2019) discusses terminal airspace's liberalisation or 'unbundling'. She stated that the UK pioneered the liberalisation of the ANS market. Thompson et al. (2016) undertook Porter's five forces analysis of the UK Terminal ATM (See figure 11.2). They highlight that whilst the CAA established targets under the SES performance scheme, they discovered that they could do it in two ways. One was to deliver a performance target for the en-route service (which the CAA described as monopolistic). Rather than establishing targets for terminal airspace, the second option decided to liberalise that element of the UK ATM network and create a competitive market. Under the performance scheme at the time, nine UK Terminals fell under the rules governing the scheme, and all were under the control of the UK ANSP, NATS. To use London Gatwick as an example, following a competitive tendering process, the air navigation service company called ANS solutions won the contract and is currently providing the service at London Gatwick. ANS are a subsidiary of the main German ANSP, DFS. Importantly for the future of ATM, Thompson et al. (2016) concluded that creating competition at nine UK airports has had the effect of realising high cost and service benefits. By entering negotiations to win ATM contracts, ANS providers have become more customer-focused and developed strong interoperability with NATS. These are key findings and highlight what could be achieved should liberalisation occur in en-route airspace.

<Insert Figure 11.2 here>

Figure 11.2: An industry analysis of United Kingdom TANS at nine largest Airports (Thompson et al., 2016)

However, soon as the issue of Brexit was raised, the CAA commenced a review of TANS operations in the UK. The issue that the UK has now run into is whether or not TANS at UK airports is still subject to what is referred to as 'market conditions' (CAA, 2017). Under the reporting period structure, the UK were granted exemptions from RP2, as the EU had considered that market conditions existed in the UK. However, with RP3 submissions now in process and following on from the UK's departure from the EU, the CAA are unsure if they can continue TANS operations under RP3 (CAA, 2017).

Following the UK example, Spain was another country to look at the liberalisation of its Terminal airspace. Comendador, Valdes and Sanz (2012) stated that the main aim of the liberalisation process in Spain was to break up the current monopolistic situation and reduce ANS costs. In Spain, the control of Terminal airspace was out forward for tender for 20 different airports. They identified an important comparison between the liberalisation of ANSPs and airlines. As we know, the airline industry was liberalised many decades ago, and it is still the case that new private airlines attempt to enter the market all the time. The ATM world has been very slow to catch up. Comendador, Valdes and Sanz (2012) make a key

observation that could be very important as the liberalisation of ATM continues. Comendador, Valdes and Sanz (2012) found that companies that plan to avail of these opportunities must:

- Plan the process in detail
- Obtain the relevant certification first
- Ensure adequate selection and training of personnel
- Effectively organise the service within current regulations.

Sweden has also been a pioneer in terms of TANS. Sweden began to deregulate its terminal airspace in 2010 and has opened up for any certified ATS providers to tender for terminal airspace. The Swedish company, ACR, have taken great advantage of this open market and have won the tender for 17 of Sweden's regional airports, with an 18th likely to come on stream quite soon (ATC Network, 2021). ACR's business model has been described as a monopoly breaking business concept. This approach by ACR has been seen as a 'game changer' within the industry. ACR focus on creating a lean business whilst also focussing on innovation. Indeed, since ACR has entered the Swedish TANS market, the cost of terminal ATS has been reduced by 30 – 40% (ATC -Network, 2021).

4.2 En-Route Unbundling

The 'unbundling' or liberalisation of en-route airspace has been at a more embryonic phase. In Europe, en-route ATM services are still provided by the ANSPs for each sovereign country, as per the original ICAO regulation. Despite the lack of literature, that is not to say that the unbundling of en-route airspace has not been mentioned in different aspects. Artblaster (2018) states that now is the correct time to fully liberalise the en-route ATM market if Europe wants to create a cost-efficient environment. However, Naxa- Gaxiola and Barrado (2016) stated 'state boundaries are the barriers to reform'. Traditional boundaries need to be fully overcome to harness an open ATM market.

However, whilst full en-route liberalisation is yet to be achieved, there have been a lot of advancements in cross-border activities between ANSPs. As we saw above, the European ATM masterplan sets out cross-border initiatives and improvements that need to be made to reduce the fragmentation of the EU airspace and develop a level of interoperability. It will be interesting to observe how these cross border initiatives may lead to full unbundling of services.

To take an example from elsewhere in Europe, Baumgartner and Finger (2014) suggest that the liberalisation of European airspace should be compared to other European initiatives, such as creating a single European power and telecommunications market. The liberalisation of the telecommunications market is quite an interesting example, as it compares quite well with that of aviation. They are similar in that they started with creating a framework of interoperability (much like modern ATM) and progressively moved towards a fully liberalised

telecommunications market. However, the liberalisation of the telecommunication market was difficult to achieve due to national boundaries and certain countries that were not initially willing to take part (Waverman and Sirel, 1997). At that point, the European Commission could use its power and ultimately, a fully open telecommunications market was realised. As more and more competitors entered the market, alliances began to form between many operators (Waverman and Sirel, 1997). This could well be a blueprint of what will occur in European ATM.

5 Push and pull factors for ANS unbundling

Singh (2011) identified that cooperation between organisations in the air transport industry is essential for strategic performance. Singh (2011) suggests that the same cooperation models adapted by airlines could be applied to ANSPs. For example, Airline alliances have led to a seamless network, cost efficiencies, improved service quality, strategy for growth and new technology motives (Singh, 2011). These are all aspects that are relevant to the ATM industry also. Therefore, if airline alliances have achieved positive momentum in terms of those items listed above, then perhaps alliances could be as equally fruitful for ANSPs.

The way forward in ATM is to create cross-border air traffic services. Cross-border data flow, dynamic airspace configuration, and “capacity on demand” are needed to enable this. These require strong ANSP interoperability and collaboration. Also, as Baumgartner and Finger (2014) indicate, the technology providers all feel like ATM should now be borderless.

An example of interoperability and collaboration that may become key in an open ATM market is COOPANS. COOPANS is an Air traffic control system that several European ANSPs developed in conjunction with the service provider, Thales (Kearney and Li, 2015). COOPANS is a cross border alliance of 6 ANSPs. One of the COOPANS objectives is to lower costs by harmonising the air traffic control system between the 6 ANSPs. This level of interoperability and collaboration between ANSPs can act as a competitive advantage when or if there is ever an open ATM market.

Apart from COOPANS, there are some examples of collaboration between ANSPs, with Borealis being the most successful one. Borealis has a track record of ANSP cooperation for the mutual benefit of ANSPs and airline customers. The flagship project of the Borealis alliance was that of Free route airspace. Free route airspace now accounts for fuel savings of 3,000 tonnes a day and as much as 10,000 fewer CO₂ tonnes a day in the European ATM network. Cooperation among ANSPs is essential to surviving in an open market environment. The collective negotiating power is higher than the individual; ANSPs share resources and expertise, leading to cost reductions and economies of scale.

Moreover, Aeronautical Data Service Providers (ADSPs) can play an important role in unbundling. Outsourcing this service can provide significant cost savings. The move towards CNS unbundling and the provision of services through third-party ADSPs is already evident in

Europe. For example, the Spanish ANSP ENAIRE has teamed up with INDRA, a technology company, to launch satellites into space, ultimately resulting in the provision of space-based aeronautical data, reducing reliance on traditional RADAR but also covering large volumes of airspace. This can give ENAIRE a competitive edge in an open market environment.

The technology and system interoperability are already sufficiently developed, and ANS can be provided remotely from any other ACC. However, one of the major barriers to ATM liberalisation is political will or the lack of it. The proposal to unbundle ATM en-route services has very strong support at European Parliament and European Commission levels; however, this is not the case for the European Council.

There are several reasons why the full liberalisation of ATM is unlikely to pass the European Council stage. The ever-present issue of sovereignty continually arises. Sovereignty is certainly not a new issue in the world of ATM as it dates to the Chicago convention in 1944 when each state was to be responsible for Air Traffic service provision. It is very difficult to relinquish sovereignty over their airspace for states because sovereignty is intrinsically linked to security and military.

Moreover, some ANSPs are 'scared' of potentially entering an open market, so ANSPs and states do not want a full liberalisation of services. State-owned ANSPs do not have the required competencies and resources to operate in a market environment. Risk-averse ANSPs would also not invest in technologies and implement market dominance strategies. Natural monopolies' current market environment has not created the incentives to act competitively. For an ANSP to be ready for market conditions, they need to develop solid market knowledge and position themselves to gain a competitive edge.

Full liberalisation of the ATM network will create some legal issues. First, the topic of who will actively regulate the ATM service arose. For example, EASA is considered the European aviation regulator. However, each state is still required to have their own National Supervisory Authority. Secondly, the social aspects of such a move must be considered. If an ANSP takes over another member state's upper airspace, will it be the case that staff will provide the service remotely or will the ANSP take over the local ACC units? Also, the Transfer of Undertakings (TUPE) law will need to be considered.

The risk to an ANSP is very real. Smaller ANSPs would likely disappear, and rationalisation of the medium-large ANSPs would occur under market conditions, similar to airlines merging. When viewing such a rationalisation of ANSPs from the top down, it is perhaps not such a bad situation to occur as it reduces the fragmentation of the ATM network. However, from an ANSPs perspective, this may be undesirable. Nevertheless, in the case of ANA, Luxembourg's ANSP, despite all the reforms that have been attempted within the ATM network, including the small pockets of terminal unbundling that has already occurred, the smallest state-owned ANSP has still survived.

6 Conclusion

The European ATM network is fragmented, with numerous ANSPs operating various ownership models. Based on this inefficiency, reforms have been attempted, including unbundling. Terminal unbundling has already occurred in small pockets throughout Europe. ANS solutions, for example, a subsidiary of DFS, is offering Terminal Air Navigation Services (TANS) in Gatwick airport in the UK. En-route unbundling has not progressed, but it is a potential future for the European network.

Whilst it appears that a full unbundling of ANS is not quite there at the moment, it is prudent for an ANSP to prepare for the forthcoming liberalisation of the European ATM network. The key strategic characteristics that an ANSP must adopt in the event of an open en-route ATM market are: a) strong technological capabilities, b) excellent customer service quality, c) adaptability and flexibility, d) mature Safety Management System, e) strong presence in an ANSP alliance and ATM groups, f) financial independence, g) commercially driven mindset and h) strong link to CNS data providers.

The global covid-19 pandemic has undoubtedly wreaked havoc on European aviation. The pandemic impact has not yet been realised. Fundamentally, any reform is at the behest of the EU member states. Until the European Commission can enforce liberalisation on the EU nations, we are still decades away from the full ANS unbundling and reform.

Discussion Questions:

- In the event of full liberalisation of ATM services, what key strategic characteristics should an ANSP have?
- What are the implications of an open market?
- How do market structures affect ATC liberalisation?
- What are the conditions for ATC unbundling, and what are the potential impacts?

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