

Technological Free Zones (ZLTS): Contribution to Aviation Development - The Portuguese Experience

Executive Summary: (i) The logic of technological innovation contributes to increasing efficiency in the civil aviation sector; (ii) Increasing the safety of operations and air navigation is a fundamental pillar of technological innovation; (iii) Innovation will play a fundamental role in aviation development both reducing environmental impact and maximising the economic efficiency all companies want to achieve throughout the value chain; (iv) Regulatory or bureaucratic constraints are obstacles to development, leading investors/companies to weigh the respective opportunity costs and risks of investing in a given country or area; (v) The various existing regulatory frameworks can be an obstacle to the development of technology-based innovation. Portugal has defined a legal framework that allows technology-based innovative technologies, products, services, and processes to be tested safely in a real or quasi-real environment with the support and monitoring of the respective competent authorities; (vi) ZLT constitutes accelerators of experimental projects that allow testing new technologies possibly to be assimilated by the market and by the public entities that regulate the sector; (vii) The main idea of this legal framework is to attract investors through the creation of an entity that aims to reduce the bureaucracy in obtaining the various approvals or certifications required. (viii) Another advantage is the possibility to test the equipment or technology in a real context where it is possible to evaluate the failures and to overcome any faults detected during project implementation. In aviation the ability to test failures in a real context can be a contributing factor to technology development at minimum safety risk.

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(1) The Concept of Technological Free Zones (“Sand Boxes”)

Driven by the pace of competition in the commercial air transport market, aviation development is inextricably linked to technological innovation with several contributing suppliers. Technological innovation is driven by several factors, some of which raising regulation and environmental issues.

In a market economy, the main objective of air carriers and other air operators is profitability and for this efficiency is a key factor. Essentially, companies try to optimize the resources allocated to the production of goods or services including costs for human and material resources, taxes, fees, financial investment, and technological innovation (which is still an investment).

In a competitive environment, companies and their investors know that any changes introduced in the productive factor or service provision may prove a key differentiating element of a company's positioning in the market. And the civil aviation sector is no exception to this market logic guiding economic rationality in the choices of both companies and passengers.

The logic of technological innovation is a contributing factor to increasing efficiency in the civil aviation sector. Over the last 50 years the evolution of both jet engines (increase of the bypass ratio) and aircraft (use of lighter and more resistant materials) has led to major efficiency gains. This technological development was a contributing factor to liberalizing the air transport market resulting in lower operating costs and reduced fares.

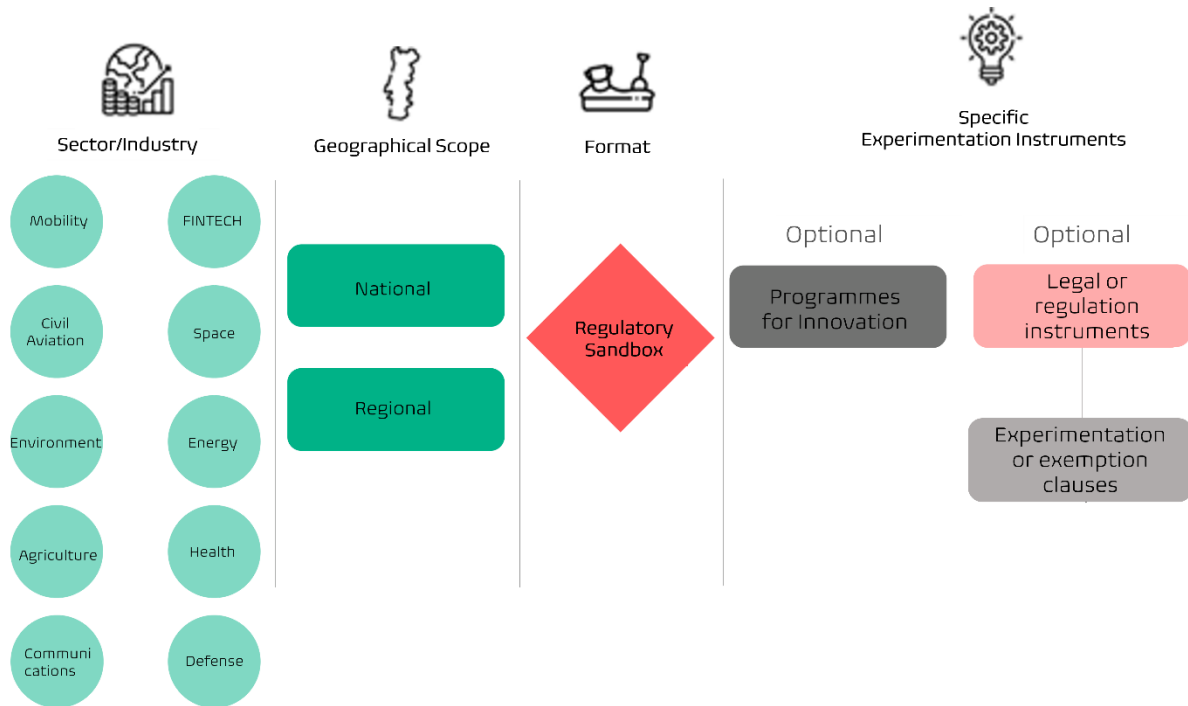
Apart from economics technological innovation also benefits operational and navigation safety. Civil aviation is heavily regulated around the world and this safety culture is reflected by the body of regulations (the standards and recommended practices set out in the 19 ICAO Annexes) arising from the 1944 Chicago Convention and EU law particularly over the last 20 years.

Looking at history, there is a long way to go, but the history of aviation just as the history of mankind will always be unfinished until the "last man falls"¹. Innovation will play a fundamental role in aviation development both for minimising environmental impact and to achieve economic efficiency, a general aim of all companies in the existing value chain.

Heavy regulation, however, poses a challenge to the pace of the development of new technologies and their time to market. Regulatory and bureaucratic constraints are obstacles to development, leading investors/companies to weighing the respective opportunity costs and risks of investing in a given country or sector. Barriers to technological innovation obviously have a negative impact on economic and social

¹ In FUKUYAMA, Francis, «The End of History and the Last Man».

development. As such Portugal, recognising these constraints, has created a legal framework allowing the creation of disruptive processes essential to fostering technological development as discussed below.



Source: Portugal Digital

(2) Boosting technological development - the creation of aeronautical clusters

Given that the various existing regulatory frameworks can prove an obstacle to the development of technology-based innovation, Portugal has defined a legal framework allowing technology-based innovative technologies, products, services, and processes to be tested safely in a real or quasi-real environment with the support and monitoring of the respective competent authorities.

Triggering disruptive processes, using tools such as artificial intelligence to blockchain, 3D printing, virtual reality, or 5G network only appears feasible if it is possible to create derogations to the current regulatory framework.

Mere derogation does not imply that technology clusters "live" free from rules and immune to liability, but applies only to the extent necessary for developing technology. During such licensing processes in the aeronautical sector, the aeronautical authority assumes a fundamental role as guarantor of compliance with operational safety rules,

dictating the indispensable "rules of the game" in light of the applicable legislation. And, in the case of Portugal, ANAC (Portuguese CAA) assumes an important role in defining where aeronautical clusters may test equipment, materials, aircraft (manned and unmanned) and technology for future use both for airworthiness, air operations (aerial work² or commercial air transport), provision of air navigation services, and airport infrastructure management.

While state agencies for the promotion of technological innovation and investment take a leading role in attracting investment for companies including start-ups, the aeronautical authority must ensure that the minimum regulatory environment to be provided does not challenge rules established by EU and international legislation banning all derogation and exemptions (e.g. flexible use of airspace). This is the main challenge: reconciling technological innovation - testing of equipment, procedures or experimental aircraft - without compromising the functioning of the system itself where other operators carry out their operations and risk analyses without any compromise on safety.

The monitoring activities of aeronautical authorities put regulating challenges into perspective. Regulation is not static, without any elasticity for change. Quite on the contrary, it must follow technological evolution and possibly outline any necessary and essential adaptations in the regulatory environment.

In the case of Portugal regarding rules defining the use of airspace by unmanned aircraft ("drones"). As drones have obtained a significant role for both leisure and work purposes the question was what level of regulation should be imposed. Even though "heavy" regulations of everything from staff licensing (pilots) to aircraft, operations, infrastructure certification may sensible approach at first glance, it might hinder technological development, as the technology and the type of operations are not sufficiently mature to be properly regulated.

² Currently referred to as "specialized operations" in accordance with the provisions of Commission Regulation (EU) No 965/2012, of October 5, 2012, laying down the technical requirements and administrative procedures for air operations, as amended by Commission Implementing Regulation (EU) 2021/1296, of August 4, 2021.

A "comprehensive" legal regime would constitute a barrier to development and as such to technological evolution in a competitive market environment. As an alternative it was decided to create a minimum set of rules for the air traffic sector to guarantee operational safety and at the same time allowing technological developments in the sector. While regulation is fundamental to operation, any premature anticipation would create a set of obstacles to development. The European Union's regulation - Commission Regulation (EU) 2019/947 of May 24, 2019 on the rules and procedures for the operation of unmanned aircraft - has classified drone operations into risk-based categories: open, specific and certified. That said, technological innovation requires disruptive processes, both from the regulatory point of view and the creation of innovation spaces. Portugal has hence institutionalised a specific regime for the Technological Free Zones including aviation^{3 4} and goes by different names in different countries such as "regulatory sandboxes", "innovation spaces", "experimentation spaces", "living labs", among others.



Source: image courtesy of OGMA

³ Decree Law No. 67/2021, of July 30, which establishes the regime and defines the governance model for the promotion of technology-based innovation through the creation of technological free zones.

⁴ In Portugal it is possible to create FTZs in areas under military jurisdiction which allows sharing technology with the business sector or the involvement and sharing of knowledge between various public entities in the assumption of certain common objectives (e.g. combating maritime pollution, observing marine fauna, patrolling the coast).

(3) The regulatory role of authorities in technological innovation in the aviation sector

Creating segregated airspace areas for different operations is a possible solution including compliance tests with European legislation. European law requires compliance with "*the principle of the primacy of European Union Law*"⁵ which neither allows approval of national legislative acts (of the European Union Member States) contrary to the rules approved by the Union institutions nor any application of law preceding European regulation supervening and in contrast with national regulation. This is the main challenge for the entities involved, mainly ANAC as the civil aviation regulatory authority, i.e. the authority tasked to prevent any fragmentation of the airspace once such a situation generates inefficiency of use. Especially in smaller countries airspace must be carefully managed to safeguard the interests of all users including general air navigation and civil and military aeronautical activities must be kept in balance.

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Creating - ab initio - a test area necessarily implies the involvement of the various competent sectoral regulators for the activities to be developed in the ZLTs to make sure that the test areas will not compromise air navigation (commercial air transport), namely operations near or in controlled airspace areas or in areas of large urban agglomerations, where the population density is high.

Regulatory assessments consider regulatory impact, its benefits and probable costs, whilst also identifying potential regulatory improvements and providing a positive contribution to the sector's development and society.

It must be pointed out that in Portugal various entities (public and private) have issued "expressions of interest" from tendering to the creation of ZLT. ZLT can include airspace so that it will be necessary to ensure the safety of other airspace users, with particular emphasis on unmanned aircraft, given that such zones are essentially being designed for the development of technology associated with the use of drones.

⁵ This principle is a pillar of European integration and of the construction of a common/single market in which the various operators "play" according to exactly the same rules, are subject to the same legal framework - i.e. European Union Regulations - thus allowing the mutual recognition of documents issued by the competent authorities of the various Member States and the free movement and provision of services.

In civil aviation even the most elementary safety standards require risk assessments encompassing several factors and determining the (in)viability of specific types of operation in specific locations (ZLT). In the case of European rules applicable to drones, this is essential/mandatory, primarily to identify the risk category of the operation and the specific rules applicable (depending on classification in the open, specific or certified category - see articles 3 to 6 of Implementing Regulation (EU) 2019/1139).

Despite the assumed and recognised importance of ZLTs, the safety of air navigation and of goods and third parties on the surface must not be impaired, and in European Union countries they must comply with the respectively applicable European legal framework which does not allow for derogations based on national legislative acts. In many cases the existence of ZLT (within civil aviation) may be irrelevant to the tests or the development of the technology and alternatives should be explored within the European regulations in force, opting in advance to select locations outside air space control or densely populated areas. Use in a more complex operational environment such as cities or within controlled airspace should only be promoted following the proven and mature development of new aircraft and their respective components.

It is indeed a challenge and a balance of interests should be sought between innovation and development and the safety of air navigation in general, without any compromise for safety in the air and on the ground.

As a general rule, the project promoter shall be responsible for ensuring adequate coverage of damages. Test promoters must also ensure that the authorities involved (testing authority and managing entity) monitor and supervise the tests, having free access to information regarding the technology, products, services and processes tested.

Under the provisions of Regulation (EU) No 376/2014, of 3 April, on the reporting, analysis and follow-up of occurrences in civil aviation the obligation to report incidents and accidents falls on the promoter.

ZLTs are accelerators of experimental projects making it possible to test new technologies that may be assimilated by the market and by the public entities regulating the sector. The fundamental step for innovation and technological development is to simplify the authorisation processes, so that these ZLTs create competitive advantages for the development investments and opportunity costs.

In ZLTs investors do not need to bother about obtaining any approvals or certifications required. The project management entity is in charge of assessing the operational needs and legal obligations and which type of ZLT to create (physical, virtual or hybrid). This is one of the main advantages of ZLT creation. Project success is independent of bureaucratic progress. Equipment and technologies can be tested in a real-life context evaluating failures and overcoming faults detected during project.

In Portugal, the first steps have already been taken and it is expected that soon companies, investors, public partners (research centre, universities, laboratories), regulators and the managing entity of the ZLT can test innovative projects in the aviation sector.



Source: image courtesy of OGMA