



The Future of Airports

A Vision of 2040 and 2070

Topic No. 2: Sustainable Business Models and New Sources of Funding

White Paper

ENAC Alumni – Airport Think Tank

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- ENAC – Ecole Nationale de l'Aviation Civile | National University of Civil Aviation
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Foreword



In February 2019, ENAC Alumni – the alumni association of the National University of Civil Aviation (ENAC) – organized a day of discussion and education on the current and future challenges in air transportation: **The State of the Air (“Les Etats de l’Air”)**. This event, held at the headquarter of the French General Directorate for Civil Aviation (DGAC), was part of a broader effort to fulfill some of our primary missions toward our 24,000 members: to maintain their knowledge up to date, to provide them platforms where to express and exchange ideas, and to promote excellence in aviation & space.

In addition to master classes on Airports, Aircraft and Systems, Design & Certification, Airline Operations, Air Traffic Management, Aircraft Maintenance, Pilots & Flight Operations, Safety & Compliance, and Entrepreneurship, **the State of the Air** featured a series of roundtables bringing together key leaders of the industry in the sectors of air transportation, tourism and general aviation who presented their vision of the future.

Following the large success of the State of the Air, and considering the dedication and expertise of our alumni, it has been decided to take the momentum and invite our think tanks to launch projects on the future of aviation. These think tanks reflect the diversity and excellence of our alumni community: air traffic management, airline operations, airports, digital innovation, and sustainable development.

The Airport Think Tank chaired by Gaël Le Bris is one of the most active of our research groups. The Future of Airports is an important study that brings a significant value added to help us foresee future challenges and prepare our industry for the changes to come. The participants of The Future of Airports have provided remarkable work. The output of the working sessions and the research findings are being released as white papers and other practice-ready materials that will be shared and brought to decision makers and leaders of both the public and private sectors worldwide. I am confident that the outcome of this Think Tank will be a huge move forward for the promotion and recognition of the ENAC Alumni.

Marc Houalla, President of ENAC Alumni

Introduction



From March to December 2019, the Airport Think Tank of ENAC Alumni conducted a research project on the long-term future of the airport industry: “The Future of Airports”. The project involved thought aviation leaders from diverse backgrounds and affiliations who looked at the trends and potentially disruptive changes, emerging transformational innovations, their impact on practice and their challenges for air transportation, and the needs in research, education and policies for anticipating and facilitating these changes.

The future of airports cannot be envisioned without considering the future of our societies. At the 2040 and 2070 horizons of our study, we will count more fellow human beings than ever. Overall, we will be wealthier and more educated, and have a longer life expectancy. However, we will all face increased impacts from climate change that will put pressure on resources and communities, and might increase inequalities. We will have different social expectations. How can aviation address these new paradigms and continue to provide mobility?

First and foremost, we shall never forget that safety always comes first. As we are making air transportation increasingly automated and connected, we shall remember that our top priority must be to safeguard life, health, and property, and to promote the public welfare.

Human-induced climate change is the most formidable threat to our civilization. Transportation must become greener if we want to sustain the development of our societies without degrading our well-being and endangering public health at a horizon increasingly visible. Aviation shall keep pioneering green policies.

As aviation professionals, we are on the front line to tackle the fundamental issues arising and still continue to interconnect people and move freight. Aviation shall remain a world of opportunities and “create and preserve friendship and understanding among the nations and peoples of the world” as stated in the Convention of Chicago of 1947.

By 2040 and 2070, it is likely that unforeseeable groundbreaking technological innovations, scientific discoveries, and social and political changes will occur and deeply impact our world. When reading these pages, remember that we conducted our work and prepared these materials with our eyes of 2019.

We are all part of this future, and we can make a difference individually if we make ethical and sustainable decisions. Aviator and writer Antoine de Saint-Exupéry said that when it comes to the future, “it is not about foreseeing it, but about making it possible”. Let’s make a bright aviation future possible together.

Gaël Le Bris, Chair of the Airport Think Tank of ENAC Alumni

Topic No. 2: Sustainable Business Models and New Sources of Funding

Toward More Independent Airport Operators

During most of the 20th century, airports were planned, built and operated by central governments as tools of sovereignty, prestige, national defense, and territorial development. Over this period of economic interventionism, airports were entrusted to ministries and National Aviation Authorities (United Kingdom, 1923-1965; Malaysia, 1969-1991), and public agencies (India, 1972-1995) or public companies (Brazil, 1973-Today^a; France, 1945-2005; United Kingdom, 1965-2006).^b In the years 1980 to 2010, countries where airport operators were within the same body than the safety oversight functions and the air navigation services organically separated them from the latter (Finland, 1991). In the context of growing ancillary activities and capital expenditure, they were then turned into organizations created for the purpose of operating airports often with a private corporation status and state-ownership.

This move toward more independence promotes a culture of efficiency and a strategic vision, establishes the autonomy of decision from other national priorities, and enables the airport governance itself to be more independent from political agendas. Also, this change ensures an independent oversight and economic regulation of airports by the governments.

Today, while airport ownership is mostly retained by central or local governments around the world, operations are increasingly transferred to or contracted with airport management entities. In Canada, airports are leased by the Federal government to non-for-profit airport authorities. State-owned private companies operate airports in Northern Europe and Southeast Asia. Public agencies or companies remain still a popular model in Africa, Middle East, and Central Asia. Many of them are changing business model with concessions (Infraero, Brazil), partial privatization of individual airports (GACA, Saudi Arabia), or other Public Private Partnership (PPP) (Tanzania Aviation Authority).

Because of history and local specificities, some larger public or semi-public entities still manage airport systems. Most of the U.S. airports are managed by city or county departments. The Port Authority of New York and New Jersey (PANYNJ) is a body controlled by two U.S. states – or interstate compact – created for developing and operating vast transportation assets and real estate – including EWR, JFK, and LGA. The Alaska DOT owns and operates a unique state airport system comprised of 239 facilities – the majority of them providing a vital infrastructure to connect remote rural areas.¹ The Departamento Aeroviário do Estado de São Paulo (DAESP) operates about 30 smaller airports within the State of São Paulo, Brazil. 5 of them are operated under a PPP (management contract), and the State of São Paulo intends to privatize the remaining facilities in the coming years. Created as a statutory authority in 1994, the Airports Authority of India (AAI) operates 126 airports and still provides CNS and ATM services as well.

Privatization and Global Competition

Airport privatization might be seen as the next step of state-owned corporatization, but can actually take different forms – concessions of the entire airport, Built-Operate-Transfer (BOT) and Design-Build-Operate (DBO) of individual facilities (e.g. passenger terminal), etc. There are privatization projects in virtually all the regions of the world. Public control of airport management is not considered anymore as a necessity for national interests, and private operators are seen as more versatile, cost-efficient and innovative. Therefore, governments can focus on its role of market regulator and safety/security oversight.

^a The legacy public operator Infraero still operates airports but has transferred the management of the largest commercial service airports to private joint ventures under Federal long-term concessions. As of 2019, more than 50% of passengers and more than 80% of air cargo fly privately operated airports in Brazil. By the end of 2023, it will be the case of over 90% of passengers and air cargo.

^b The United States is a noticeable exception with a transfer of these assets to local governments as soon as the end of World War II.

While separation with NAA can provide better overall governance, privatization is a more radical move out of state-interventionism in transportation with benefits, but also consequences that should not be neglected.

In the United States, few airports are privatized per se: San Juan Luis Muñoz Marín International Airport (SJU) is the only airport successfully transferred to a private operator through the FAA Airport Investment Partnership Program (formerly known as Airport Privatization Pilot Program).² Orlando Sanford International (SFB) is operated by a private firm through a joint-venture with the Airport Authority. Branson Airport (BKG) in Missouri is the only privately-owned and developed commercial service airport in the United States. However, U.S. airports are more privatized than it appears. Several terminal buildings have been developed and funded by air carriers and various forms of Public Private Partnerships (PPP) exist. LaGuardia Gateway Partners (LGP) is redeveloping and will operate the Central Terminal B at LGA under a concession with PANYNJ.

In Europe, where privatization occurred first, former public operators grew into horizontally integrated groups seeking international expansion – AENA Aeropuertos, Changi Group, Fraport, Groupe ADP, Schiphol Group. Hub airports in Asia and the Middle East have relied for decades on expertise from western leading firms to bloom. Today, these organizations are gaining in maturity and experience. They are constituting their own design bureau and project management offices. Will they get full independence from their government – facilitating their entrance to new markets? Will they compete with already well-established groups on concessions abroad?

Ownership of airports themselves is a question because they were originally developed with taxpayer money and because of their massive implications on territorial development and connectivity. Because they benefit and impact first their community, countries have transferred full ownership of smaller airports to local administrations (France, 2005³). Groupe ADP, Heathrow Airport Ltd or Fraport have control over the infrastructure and land. In the United States, the Federal government does not own civilian facilities^c that were turned to cities and counties after World War II through the Surplus Property Act of 1944. Retaining ownership and signing concessions, Build-Operate-Transfer or Design-Build-Operate ensure the continuity of operations and facilitate transfer to another firm – a choice that Brazil has made. Canada, where the Federal government owns airports and gives concessions to non-for-profit operators, has been considering “privatizing” (selling) these assets to private operators. Studies were suspended in 2018 with strong opposition from both airports and air carriers. The future will see more diversity in ownership, with local, private, and perhaps at some point foreign ownership.

Table 2-1 - Evolution of Airport Ownership and Management

Yesterday (20 th Century)	Today (2000-2020)	Tomorrow? (Toward 2070)
Airports operated by govt. State-monopolies National assets Policy-driven offer <i>Airports are public assets operated by Dept. of Defense or Transportation. Offer is largely piloted by govt.</i>	More airports operated under PPP Little competition between operators Govt. ownership of infrastructure Market-driven offer <i>Former public airport operators team with investors for finding external growth with concessions.</i>	PPP and Authorities are the norm Global competition between operators Local, private & foreign ownership Market-driven offer <i>Open competition between airports. Secondary airports capture more point-to-point markets.</i>

^c With very few exceptions such as Atlantic City Intl. Airport (ACY) with most of its land owned by the FAA and leased to the South Jersey Transportation Authority (SJTA).

Economic Viability of Private Operators

Airports compete on larger catchment area over costs, connectivity, and level of service.⁴ However, airports are locally monopolistic businesses even in metropolitan areas served by multiple aviation facilities such as London. Because of their footprint and cost, they cannot fall under the characteristics of a fully demand-driven, oligopolistic market. In other words, a competitor cannot build a new airport nearby another for expanding the offer. Consequently, the central administration provides economic oversight and regulates airport operators by creating an adequate framework. Most of the time, airports agree with their stakeholders under the umbrella of an autonomous regulating body on the airport charges and short-term investments through pluriannual plans or contracts of economic regulation. Profit margin is sometimes a substitute for a cap on airport charges.

Commercial service airports shall be allowed to adequately fund infrastructure maintenance and realistic development through their charges as they can no longer rely on direct public funding. Airport concessions and other PPP shall ensure benefits for both sides, and a fair distribution of profit and financial burden as well. High expectations on infrastructure development not consistent with the actual level of traffic can challenge the financial viability of airports requiring vast capital improvements as shown with the bankruptcy of ABSA, the consortium operating Viracopos International Airport, Brazil in 2018.

Experience shows that larger airports need to generate an acceptable profit to fund their infrastructure without cash inflows. In Europe, airside facility improvements are mainly funded through aviation facility charges negotiated regularly with the airlines under the umbrella of an independent body for matching 5-year capital improvement programs. Passenger terminal buildings are generally paid with money borrowed to banking institutions or public investment banks such as the European Investment Bank (EIB). PPP can be an option building and operating as well (JFK Terminal 4).

These considerations do not necessarily apply to smaller airports. Their financial equilibrium is more often precarious. While some of them might not appear as profitable, their impact on the local economy and connectivity has to be considered too. Brazil is experimenting with the privatization of secondary airports through regional packages of individual facilities of different profit prospects. However, several remote aviation facilities provide vital access to the world for air taxi, air ambulance, and subsidized air routes. They will remain public and require direct public funding. They cannot be profitable and are not intended to do so.

Supporting Airports Modernization and the Development of National Infrastructure

Several programs exist around the world to ensure airports are safely developed and meet the needs of the nations. Their form and extent depends on the size of the airports and their local specificities. In the United States, the Airport Improvement Program (AIP) finances up to 90% of eligible projects that enhance capacity, safety or security at airports of national interest. This program is funded by taxes on plane tickets and aviation fuel. In Canada, the Airports Capital Assistance Program (ACAP) specifically assists regional airports in funding their infrastructure. In Switzerland, safety upgrades are eligible for grants from a national transportation fund. In Brazil, mechanisms exist to support smaller airports serving local communities. However, several of these programs show their limits with available funding not meeting anymore the overall need – leading to stricter criteria or tighter policies.

Also, these funds usually exclude terminal facilities from grants. How to rejuvenate and develop this infrastructure without massively increase the debt ratio or involve air carriers? In several countries, public investment banks can lend money at lower interest rates for this purpose as long as the operator is based in the country (BNDES⁵, EIB⁶). In the United States, while bonds have been a major source of funding, new strategies emerge. For instance, Paine Field, in the Washington State in the United States has entrusted private interests to develop and operate the new terminal passenger building. In developing countries, regional banks (African Development Bank) or the World Bank can support large infrastructure

projects. In every case, airport operators and local governments shall carefully balance the opportunities created by these projects and their level of financial risk to prevent placement under receivership (Ciudad Real Central – CQM, Spain, 2012), waste of taxpayer’s money (Castellon), and incapacity of repaying debt (Sri Lanka). Good management, a realistic business model, a resilient strategic vision, and robust business partners are important factors to the long-term success of airports.

Airports are usually safe long-term investments praised by banking institutions, hedge funds, and other investors. Grants are often more controversial and might not be always understood by taxpayers. The U.S. and Canadian examples are interesting, as their national airport funds are based on charges on aviation users only (ticket or aviation fuel). The fundamental principle is that “aviation shall pay for itself”. Indeed, direct injection of public money coming from the general budget of a state raises legitimate questions on national priorities – especially when projects are not profitable nor necessarily justified from a social profit perspective. Concessions to private operators of infrastructure developed with public money raise also the question of a fair return on investment to governments.

Funding Innovation: The Vital Role of Governments and Institutions

Investing in innovation is crucial not only for the industry but for the air transportation ecosystem entirely. Some larger airport operators have the ambition to be leaders in innovation. San Diego (SAN) invites innovators to test their technologies with its Innovation Lab. Groupe ADP has invested in different start-ups (e.g. Safety Line, Innov'ATM) and has various initiatives to promote innovation such as the Airport Startup Day and the Play Your Airport challenge. Avinor is the national coordinator of the electric aircraft roadmap of Norway. ACI and IATA are exploring together the future of airports with NEXTT.

However, the groundbreaking trends and transformational changes that will be explored further in this paper require wider efforts supported by national policies and funding. NextGen in the United States and SESAR in Europe intends to prevent bottlenecks in the airspace at the 2025 horizon. Similar programs of airspace modernization are now following worldwide under the guidance of the ICAO GANP (e.g. Sirius in Brazil). The step beyond will be the rise of automation and will need similar efforts for developing and implementing artificial intelligence and machine learning technologies that can assist further pilots and controllers (e.g. RECAT-3), and even provide decision-making without human in the loop when needed (e.g. Urban Air Traffic Management). Other topics such as cybersecurity or generational inclusion might need similar initiatives and shall be identified as soon as possible.

During the 2019 TRB Annual Meeting, State Departments of Transportation warned the audience on the lack of skills and means they foresee with emerging challenges such as UAS, cybersecurity, etc. Institutional leadership is much needed, especially with smaller airports and local agencies that cannot have specialized staff and fund research projects. It will require adequate education from universities and a change in agency staffing or outsourcing. Globally, international institutions and especially ICAO will need to provide guidance and standards to operators. ICAO regional coalitions and global plans will help with implementing these standards and leveling up the less developed countries.

Beyond governmental action, coalitions of airport professionals under the umbrella of aviation institutions have proven themselves as a powerful source of innovation and knowledge. The Transportation Research Board in the United States has produced research studies and practice-ready materials beneficial to the industry beyond the U.S. borders. Regional airport associations are roundtables for sharing expertise between airports of all sizes, and providing support and representation to smaller airports that cannot afford a large staff. The French-Speaking Airport has released innovative recommended practices and practice-ready materials that became later industry standards on topics not covered by the regulations. Specific associations such as NFPA are normative bodies in their domain.

Appendix No. 2-1 - Current Examples and Trends on Airport Business Models

	Status	Examples	Trends
Private Companies	Majority Private Shareholding Corporations	ACSA, ADR, Aeropuertos Argentina 2000, Aéroports de la Côte d'Azur, Aéroports de Lyon, Aéroport Toulouse-Blagnac, ASUR, Auckland International Airport Limited, Australia Pacific Airports Corporation, AvPorts, Edeis, Ferrovial, GMR, Grupo Aeroportuario del Pacífico, GRU Airport, SOCICAM Aeropuertos, Sydney Airport Holdings, Vinci Airports, Voa São Paulo	This model has been growing since the years 1980. Private airport management groups include firms founded by investors, and former public operators sold by their governments to private interests. Both seek concessions of airports, or joint-venture (PPP) with local governments.
Toward Corporatization	State-Owned Companies	ADAC, AENA Aeropuertos, Airports of Thailand, Airports Corporation of Vietnam, Avinor, Bahrain Airport Company, Capital Airport Holding, Changi Airport Group, Dubai Airports Company, Finavia, Groupe ADP, Isavia, Malaysia Airports, Schiphol Group, Swedavia	Many former governmental agencies or companies became autonomous state-owned companies in the years 1980 to 2010. Most of the time, central governments still own a majority shareholding. The question of maintaining ownership is raised in some of these countries with governments reconsidering their role. Their degree of autonomy authorizes them to pursue concessions outside of their historical airports and export their know-how.
	Local government-Owned Companies	Flughafen München, Flughafen Zürich AG, Fraport, Manchester Airport Holdings	In Germany and Switzerland, the federal system promoted a development of airports by the local governments. Later, operators followed a similar process than central government-operated airports and became incorporated with a majority shareholding from local authorities. Their degree of autonomy authorizes them to chase concessions outside of their historical airports and export their know-how.
	Non-For-Profit	ADM, GTAA, YQB	This status is particularly popular in Canada as an alternative to Airport Authorities.
Public Entities	Public Companies	ACITA (State of Coahuila), Aeropuertos y Servicios Auxiliares, EGSA/Alger, EGSA/Oran, EGSA/Constantine, EHCAAN, Infraero, ENANA-EP, ONDA, Régie des voies aériennes	This model, that was common in Europe in the years 1950 to 1980, is now limited to few operators in the world (mostly in Africa, Central Asia, Middle East, Latin America). Public companies are chartered by governments or parliaments. They are not incorporated. Management typically answers to the Department of Transportation. Employees are public workers or similar status.
	Port Authorities	AAI, AAJ, Kenya Airports Authority, MWAA, PANYNJ	This model is popular in the United States to move airport management toward more independence from the political agendas of local governments.
	Governmental Aviation Departments	Alaska DOT, Civil Aviation Authority of Mongolia, DAESP, DEN Airport, GACA, LAWA, MDAD, SAAS	We observe a transition of the business models of Aviation Departments toward concessions and other PPP for the larger airports. Smaller, community-service airfields are still operated by local governments.

Abbreviations

AAI	Airports Authority of India
AAJ	Airport Authority of Jamaica
A-CDM	Airport Collaborative Decision Making
ACSA	Airports Company South Africa
ADAC	Abu Dhabi Airport Company
ADM	Aéroports de Montréal
ADR	Aeroporti di Roma
AENA	Aeropuertos Españoles y Navegación Aérea
AFIS	Aerodrome Flight Information Service
AI	Artificial Intelligence
ANN	Artificial Neural Network
APOC	Airport Operations Center
ASEAN-SAM	ASEAN Single Aviation Market
ASUR	Grupo Aeroportuario del Sureste, S.A.B. de C.V.
ATL	Hartsfield-Jackson Atlanta International Airport
ATM	Air Traffic Management
BCB	Body Cavity Bomb
BKG	Branson Airport
BNDES	Banco Nacional de Desenvolvimento Econômico e Social
CAAC	Civil Aviation Administration of China
CAG	Changi Airport Group
CAH	Capital Airport Holding
CDG	Paris-Charles de Gaulle Airport
CDM	Collaborative Decision Making
CNS	Communication, Navigation and Surveillance
DAC	Dubai Airports Company
DAESP	Departamento Aeroviário do Estado de São Paulo
DFW	Dallas-Fort Worth International Airport
DOK	Donetsk Airport
ECAA	European Common Aviation Area
EGSA	Etablissement de Gestion de Services Aéroportuaires
EHCAAN	Egyptian Holding Company for Airports and Air Navigation
EMI	Electromagnetic Impulse
ENAC	Ecole Nationale de l'Aviation Civile
ENANA-EP	Empresa Nacional de Exploração de Aeroportos e Navegação Aérea E.P.
ERAU	Embry-Riddle Aeronautical University
FIT	Florida Institute of Technology
GACA	General Authority of Civil Aviation
GANP	Global Air Navigation Plan
GASeP	Global Aviation Security Plan
GMF	Global Market Forecast
GMR Group	Grandhi Mallikarjuna Rao Group
GTAA	Greater Toronto Airport Authority
HCC	Hub Control Center
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation

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Infraero	Empresa Brasileira de Infraestrutura Aeroportuária
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IST	Istanbul Airport
KUL	Kuala Lumpur International Airport
LAWA	Los Angeles Airport World
LGP	LaGuardia Gateway Partners
LHR	London-Heathrow
MANPAD	Man-Portable Air-Defense System
MDAD	Miami-Dade Aviation Department
MIA	Miami International Airport
ML	Machine Learning
MRS	Marseille-Provence International Airport
MWAA	Metropolitan Washington Airports Authority
NEXTT	New Experience Travel Technologies
NFC	Near-Field Communication
O&C	Ownership & Control
OCC	Operations Control Center
OER	Örnköldsvik Airport
ONDA	Office National Des Aéroports
ORD	Chicago-O'Hare International Airport
ORY	Paris-Orly International Airport
PPP	Public-Private Partnership
PPP	Purchasing Power Parity
PKX	Beijing Daxing International Airport
RPA	Regional Plan Association
RTC	Remote Tower Center
rTWR	Remote Tower
RVA	Régie des Voies Aériennes de la République Démocratique du Congo
SAAS	San Antonio Airport System
SAATM	Single African Air Transport Market
SAT	San Antonio International
SDL	Sundsvall-Timrå Airport
SFB	Orlando Sanford International Airport
SIIED	Surgically Implanted Improvised Explosive Device
SIN	Singapore-Changi International Airport
SJU	San Juan Luis Muñoz Marín International Airport
SWIM	System Wide Information Management
TAM	Total Airport Management
TIP	Tripoli International Airport
TNC	Transportation Network Companies
TRT	Turnaround Time
UAM	Urban Air Mobility
UATM	Urban Air Traffic Management

References

¹ *Alaska Airports and Aviation – 2018 Annual Report*. Alaska Department of Transportation & Public Facilities, Division of Statewide Aviation, Anchorage, AK, USA, 2018

² Tang R. Y. *Airport Privatization: Issues and Options for Congress*. Congressional Research Service, August 2017

³ Loi du n° 2005-357 du 20 avril 2005 relative aux aéroports. NOR: EQUX0400177L. Version consolidée au 20 décembre 2019. <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000786314>. Accessed December 15, 2019.

⁴ *The continuing development of airport competition in Europe*. Oxera for ACI Europe, September 2017

⁵ Airport infrastructure auctions. BNDES, Rio de Janeiro – RJ, Brazil, 2016. https://www.bndes.gov.br/SiteBNDES/bndes/bndes_en/Institucional/Press/Noticias/2016/airport_infrastructure_auctions.html. Accessed December 15, 2019.

⁶ EIB financing of airport projects. EIB, Kirchberg, Luxembourg, 2008. <https://www.eib.org/en/press/news/eib-financing-of-airport-projects.htm>. Accessed December 15, 2019.