



**WORKING PAPER**

**TENTH SESSION OF THE STATISTICS DIVISION**

**Montréal, 23 to 27 November 2009**

**Agenda Item 4: Airport traffic data**

**COLLECTION OF DATA ON AIRPORT AND AIRSPACE CAPACITY,  
INVESTMENT AND FUNDING**

(Presented by the Secretariat)

**SUMMARY**

Continuous air traffic growth is leading to capacity constraints at airports and in the airspace in several regions of the world. Such constraints may be physical, technical, operational, financial, regulatory, political, etc. Timely identification of constraints supports effective and efficient planning and helps achieve safety, efficiency and environmental goals. In some cases these constraints may inevitably make it necessary to take them into consideration in forecasting and planning. The collection of data on future investments planned by airports and air navigation service providers may shed some light on the extent to which these constraints are being addressed. The purpose of this paper is to review the various possible constraints to air traffic growth and to propose ways in which adequate information can be collected.

Action by the division is in paragraph 5.

**1. INTRODUCTION**

1.1 Air traffic (passenger and cargo, international and domestic) has grown steadily since the late forties and this growth is expected to continue for the foreseeable future, albeit at varying rates across world regions. There is no doubt that the world has greatly benefited from this growth.

1.2 In the process of providing their services, air carriers, airports, air navigation service providers and other stakeholders make use of various resources including airports (land side and air-side), aircraft, airspace (including airspace design and structure), human resources (pilots, air traffic controllers, maintenance specialists, etc.), as well as financial and other resources. But these resources are limited in nature. Although civil aviation activities, and in particular air transport, have a positive economic and social impact, they generate polluting by-products, such as engine emissions and aircraft noise, which have detrimental effects on the environment.

1.3 As a result, air traffic growth is already facing or is likely to face, in some regions, serious capacity constraints, parts of which are physical (airports), technical and operational (airspace), human, natural or financial resources related as well as political and regulatory (environmental and others).

1.4 As constraints grow, their effects will need to be taken into consideration in the development of realistic long term air traffic (passenger, cargo and aircraft movements) and fleet forecasts. Apart from the technical characteristics of airports, ICAO has not been collecting data on airport and airspace capacity and constraints. Information on other constraints is fragmented. It is noteworthy that during the last meeting of the Steering Group of ICAO's Committee on Aviation Environmental Protection (CAEP) held in September 2008, there were discussions on the issue of the use of non-constrained forecasts for CAEP analyses. The meeting acknowledged that further consideration should be given to existing and future system constraints to traffic growth, in CAEP work over the next cycles (the forthcoming cycle will start in 2010). It was mentioned that as a first step, airport and airspace constraints could be applied to the unconstrained forecasts used by CAEP for the assessment of the environmental impact of civil aviation.

1.5 This paper offers a review of the possible constraints to the growth of civil aviation, with a view to preparing the ground for a discussion of the related data collection requirements.

## 2. CONSTRAINTS

### *Physical capacity constraints*

2.1 *Airport air-side capacity constraints.* The air-side of an airport is comprised of runways, taxiways, gates and parking positions. The number and configuration of each of these components determine the capacity of an airport in terms of number of aircraft movements (departures and arrivals) per unit of time (typically the hour). Air-side capacity corresponds to the minimum capacity of all of these components. It also depends on the aircraft mix and on weather conditions among other parameters.

2.2 *Airport land-side capacity constraints.* The land-side of an airport is comprised of the terminal and all the facilities used by passengers and cargo shippers, including security, immigration and custom facilities as well as access (roads and railways), parking space and storage facilities. Land-side capacity is measured in terms of the number of passenger per year or the maximum number of passengers per day. Land-side capacity corresponds to the minimum capacity of the various components listed above.

### *Technical and operational constraints*

2.3 *Airspace constraints.* Unlike airports, airspace does not (generally speaking) present physical constraints. Advancements in airspace design, air traffic management techniques, practices and operational procedures, lead to higher airspace capacity in terms of number of aircraft movements per unit of time (typically the hour). However, at any given time, airspace capacity is limited by these conditions and it takes significant effort, investment and time to change them.

### *Human resources' constraints*

2.4 Civil aviation is a regulated industry and personnel such as pilots, air traffic controllers and maintenance engineers and technicians are required to hold valid licenses or equivalent authorizations in order to perform their functions. The issuance and renewal of these documents by the appropriate

authorities is subject to detailed conditions covering training, experience and medical records where necessary. In addition, training organisations have to be approved by these authorities.

2.5 There is therefore a need to balance the capacity of the approved training organisations with the increasing demand for these qualified personnel. An imbalance between this capacity (supply) and demand would ultimately constrain the growth of civil aviation. WP 20 includes further explanations on this need and a proposal for new data collection on licensed personnel.

### ***Financial resources constraints***

2.6 Civil aviation activities are capital intensive. The acquisition and renewal of aircraft, the construction and expansion of airports and the modernisation of air navigation services are important long term investments that require significant financial resources. Funding these investments might come from accumulated profits, loans, bonds and equity financing, among other sources. In most cases, accumulated profits are not sufficient and external financial resources are required. Access to these sources may be difficult, depending on the status of the financial markets and the financial health of the borrower.

2.7 The current financial crisis and the tight credit market offer an illustration of the difficulties the civil aviation operators may face in trying to respond to traffic growth through the expansion of capacity.

### ***Political and regulatory constraints***

2.8 Most aspects of civil aviation activities are regulated to some degree. The operation of international air transport, in particular, has been subject to bilateral agreements which regulate market access, capacity offered, air carriers' ownership and control, among other aspects. Despite the progress achieved since the 1990s in liberalising these "bilaterals", restrictions on air carriers' ownership and control remain thus amplifying the impact of limited financial resources.

2.9 The environmental impact of civil aviation in general and air transport in particular has, in many countries, led to the adoption of a number of regulatory and market measures intended to curb this impact. Such measures include curfews, limitations to the number of aircraft movements by year, day or hour at certain airports. In some instances, environmental concerns have led to strict regulations for building new airports or the expansion of existing ones.

2.10 At the international level, despite ICAO's active role in setting standards and recommended practices on noise and emissions related to international civil aviation, there is a growing sense that more action is needed in particular to reduce or limit the climate change impact. While the impact of the options being considered will mostly be reflected in air carriers' costs and may not be considered as a constraint, alternative options may lead to regulatory limits to the growth of civil aviation activities.

## **3. DATA COLLECTION**

3.1 Data on land-side and air-side airport capacity will be required for the development of constrained forecasts. The land-side capacity may be expressed in terms of the maximum number of passengers per year and/or per day while the air-side capacity may be expressed in terms of maximum aircraft movement rate which could be reached with the mix of aircraft and of take offs and landings under defined conditions for that airport, minimum and safe separation being maintained between all aircraft. The collection of this data may be performed through a modified Form I (Airport Traffic).

3.2 Although airspace capacity is subject to change by changes in airspace structure and design and air traffic management operations and procedures, the collection of data on airspace capacity in terms of maximum number of aircraft movement per hour for a Control Centre, FIR or traffic flow has to be explored. The collection of this data may be performed using an annual survey or if it is decided to keep Form L (En-route Services Traffic Statistics), through a modified version of it.

***Data on investments to increase airport and airspace capacity***

3.3 The effects of physical capacity constraints at airports and in the airspace may be addressed or alleviated through investments in new runways, taxiways, parking positions, terminal facilities, access roads, etc. A process through which data on these projects (nature, targeted increase in capacity, timeline, financial cost, etc.) is collected by ICAO would need to be established. The collection of this data may be performed through modifications to Form J (Airport Financial Data) and Form K (Air Navigation Services Financial Data).

***Data on constraints***

3.4 In addition to data on physical capacity constraints, data on human resources related (addressed by WP/20), political, regulatory and funding constraints would also need to be collected.

**4. RECOMMENDATION OF THE FOURTEENTH MEETING OF THE STATISTICS PANEL**

4.1 The Panel noted the data requirements for ICAO forecasting activities and agreed that the Secretariat, with the help of ACI, survey the most congested airports across the world in order to identify the best practices in the measurement of airport capacity and its constraints.

4.2 It is noteworthy that ACI, due to conflicting internal priorities, was unable to survey its members prior to the convening of STA/10.

**5. ACTION BY THE DIVISION**

5.1 The division is invited to approve the collection of data on airport constraints according to the Appendix to this paper, through a State letter.

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## APPENDIX



### QUESTIONNAIRE ON AIRPORT CAPACITY AND CONSTRAINTS

**Date:**

**Airport Name:**

**ICAO four letter code:**

**Contact person:**

**Name:**

**Email address:**

**Phone Number:**

**Is Slot allocation applied (Y/N)?**

**Purpose of this questionnaire:**

This questionnaire was designed and distributed in application of the recommendations of the meeting of the ICAO Statistics Division meeting held in Montreal from 23 to 27 November 2009 regarding the collection of data on airport and airspace capacity, investment and funding.

**Important Note:**

Information provided through this questionnaire will be used for forecasting purposes. It is considered strictly confidential by ICAO and will not be shared with any third party, except in aggregated (at the State, region or global levels) format.

## I. Capacity

### 1.1. Airside

Year		2009	2015	2020	2025	2030
<b>Runway Capacity</b>						
Number of runways						
Declared / nominal capacity <sup>1</sup>	Arrival					
	Departure					
	Both					
Please provide a short description of the method used to estimate capacity						
<b>Aircraft parking stands</b>						
Number of parking stands						

### 1.2. Landside

Year		2009	2015	2020	2025	2030
<b>Passenger Terminal Capacity</b>						
Number of gates						
Number of passengers per year						
<b>Cargo Terminal Capacity</b>						
Tons of cargo per year						

<sup>1</sup> This capacity is usually expressed in terms of *Hourly airport capacity* which is defined as the maximum number of aircraft operations that can take place in an hour, which may include arrivals and departures, separately. In some cases a capacity Pareto chart is developed. If this is the case, please attach a copy to this questionnaire. In many cases, only an annual capacity can be provided, if this is the case, please specify.

**II. Demand / Capacity relationship**

Year	2009	2015	2020	2025	2030
Average delay per departure (minutes)					
Average delay per arrival (minutes)					
Per cent of time airport operating at or above declared capacity					

**III. Constraints**

Year	2009	2015	2020	2025	2030
<b>Constraints on operations</b>					
Number of runways	<input type="checkbox"/>				
Number of gates	<input type="checkbox"/>				
Number of parking stands	<input type="checkbox"/>				
Terminal	<input type="checkbox"/>				
Road access	<input type="checkbox"/>				
Noise restrictions	<input type="checkbox"/>				
Staffing	<input type="checkbox"/>				
<b>Constraints on physical expansion</b>					
Limited land due to geographical location	<input type="checkbox"/>				
Limited land due to housing encroachment	<input type="checkbox"/>				
Lack of funding	<input type="checkbox"/>				
Political opposition	<input type="checkbox"/>				