



Agenda Item 5: Other business

**EVALUATION OF THE
ECONOMIC CONTRIBUTION OF CIVIL AVIATION**

(Presented by the Secretariat)

SUMMARY

This paper summarises civil aviation's contribution to the global economy, describes the new ICAO guidance material on methodologies to assess the economic contribution of an airport to a local/regional economy and of aviation to a national economy, and outlines action to be considered by the Meeting

REFERENCE

Circ. 292, *Economic Contribution of Civil Aviation* (unedited version).

1. INTRODUCTION

1.1 ICAO's evaluation of civil aviation's economic contribution was mandated with two objectives: to assess the contribution of civil aviation in the global economy and to develop guidance material on assessment methodologies. The results are being published in ICAO Circular 292, *Economic Contribution of Civil Aviation*, Volume I – *Global Perspective* and Volume II – *Assessment Methodologies*. The Executive Summary of the Circular is attached for easy reference. While Vol. I contains the 1998 estimates of civil aviation's global contribution, this paper presents the latest estimates that were released during the Joint Workshop on the Maximization of Civil Aviation's Economic Contribution – Challenges and Potentials, organized by the World Bank, ICAO and ATAG from 6 to 8 June 2005 in Montreal¹.

¹ The Workshop programme, presentations and documentation can be accessed at www.icao.int/ATWorkshop

1.2 Methodological guidance material developed by ICAO can serve as a platform for States to evaluate civil aviation's contribution throughout a regional/local or national economy. In particular, in times of scarce funds but widening scope for aviation development, raising awareness about civil aviation's economic contribution becomes increasingly important for planners and decision makers in aviation financing and policy matters alike.

2. CIVIL AVIATION IN THE GLOBAL ECONOMY

2.1 Air transport services experienced rapid expansion along with the growth of the world economy and its demand is linked to the level of economic activity in markets and economies that the civil aviation industries serve. Higher levels of economic activity go hand in hand with a growing demand for air transport, benefiting not only from expanding industries and trade but also from generally higher income and consumer spending. In 2004, airline scheduled services carried almost 1.9 billion passengers and 38 million tonnes of freight worldwide. International tourism drives the demand for and depends on safe, well connected, accessible and affordable air travel. Last year, about 760 million tourists travelled to foreign countries, about 40 per cent of which by air, according to the World Tourism Organization.

2.2 Measuring the economic contribution of civil aviation gives an account of the output (from which the value added is derived) and employment generated by airlines, airports, the aerospace and other affected industries throughout a given economy on an annual basis. For the provision of air travel and freight services, air carriers and other operators purchase a wide range of products (goods and services) mainly from airports, air navigation services providers, governmental agencies, public corporations as well as aerospace manufacturing and other industries. These direct economic activities have "multiplier effects" upon industries providing either aviation-specific and other intermediate inputs along the value-added chain or consumer products. The total economic contribution of civil aviation consists of the direct economic activities and the multiplier effects.

2.3 Economic impact research assesses employment empirically where the jobs are located. Worldwide, in the order of 3.7 million jobs of civil aviation industries were located on or adjacent to airports in 2004. Airport operators had a work force of 330 000 people while other airport-based activities employed 1.9 million people. Of the global airline personnel of 2.1 million, an estimated 1.5 million was airport-based.

2.4 According to the 2004 global estimates commissioned by the Air Transport Action Group (ATAG), 13.5 million jobs worldwide can be attributed to civil aviation of which about 5.1 million people were directly employed by air transport and aerospace industries, 5.8 million jobs supported indirectly at suppliers and another 2.7 million jobs created through induced employment effects. The estimated total contribution of civil aviation in terms of value added amounted to US\$ 880 billion, which is composed of around U.S.\$ 330 billion direct demand, U.S.\$ 337 billion indirect demand and US\$ 176 billion induced demand.

2.5 In that core approach for an impact assessment, the multiplier effects are calculated as ratio of the indirect plus induced effects to the direct effect. Both the multiplier for value added and employment amount to 1.7 because the proportions of indirect and induced effects to direct effect are very similar. In simple terms, every U.S.\$ 100 of value added produced and every 100 jobs created by civil aviation trigger additional demand of U.S.\$ 170 and in turn 170 jobs in other industries. A detailed explanation of how multiplier effects work is provided in paragraph 3.2.2 below.

2.6 The expanded multiplier effects of civil aviation include the catalytic demand effects of air transport users, such as visitor expenditures and revenues of freight forwarders. In a cumulative ripple effect, the U.S.\$ 330 billion direct value added of civil aviation generated a total core impact of US\$ 880 billion which is equivalent to 2 per cent of the global GDP. Including the catalytic demand of tourism industries, the total expanded impact amounted to US\$ 4.6 trillion value-added, equivalent to over 10 per cent of the global GDP (at market exchange rates) in 2004. One could say that the expanded impact is five-fold the core impact.

2.7 Similarly for the related employment effects, in addition to the 5.1 million direct civil aviation jobs, employment was created with the indirect, induced and catalytic economic activities, resulting in a total of 29 million jobs worldwide.

2.8 These latest estimates of the direct contribution compare reasonably well with the results of ICAO's earlier studies. This is partially explained by the steep demand contractions of air travel in 2001 followed by two years of stagnation which had domino effects also for airports and aerospace manufacturers, and their suppliers from which the industries are still recovering. The ramifications of these preceding years for the entire civil aviation business testify to its importance for the local/regional and national economies in which they are embedded.

3. **GUIDANCE MATERIAL ON ASSESSMENT METHODOLOGIES**

3.1 Circular 292, Volume II contains guidance material on the underlying methodology and possible approaches to assess the demand effects of economic activities associated with civil aviation.

3.2 **Economic Contribution of an Airport to a Local/Regional Economy**

3.2.1 The first part of the guidelines describes how to assess the economic impact of an airport in a local/regional economy by applying input-output analyses. Input-output analysis is a method which enables the cascading demand effects generated by an airport to be tracked sequentially along the production process throughout an economy. It is based on input-output tables within a system of national accounts which capture the supply-and-demand transactions, in terms of expenditures, between industries on an annual basis. The guidelines present the procedural steps to be followed for each assessment phase when conducting an economic impact assessment, using either a core or an expanded assessment approach. The methodological descriptions conclude with empirical case studies demonstrating the various approaches possible.

3.2.2 Taking a core approach of an impact assessment, civil aviation activities are captured, in terms of output and employment, on an annual basis in three dimensions: a) **directly** in servicing air transport users b) **indirectly** through transactions with numerous aviation-specific and other suppliers, and c) **induced** by generating direct and indirect income which is re-spent mainly in consumer industries. An expanded approach feeds into the analysis the additional **catalytic** demand of air transport users, such as off-airport expenditures of visitors and revenues of freight forwarders.

3.2.3 The employment generated by an airport could play an important role for the local/regional economy concerned or, in the case of some countries, even for the national economy. A well researched economic impact study can demonstrate the contribution that an airport makes to the economy concerned. This can be instrumental in obtaining financing or negotiating better loan conditions, particularly from public or foreign sources (such as governmental guarantees or development banks and funds), that may be attracted by the wider economic effects of a planned aviation infrastructure project or expansion of an existing facility.

3.3 **Economic Contribution of Civil Aviation in a National Economy**

3.3.1 The second part of the guidelines describes how to explore the contribution of civil aviation throughout a national economy with an expanded impact assessment. At the national level, the stimulating economic impact of civil aviation as job creator and contributor to economic growth is evident when airlines, airports, air navigation services providers and aerospace industries and their respective affiliates meet a growing direct demand for air transport services by expanding operations and fleets, ordering more goods and services from suppliers, hiring more employees and thus increasing their outputs. These direct economic activities have multiplier effects upon other industries throughout an economy. A wider or narrower spread of these multipliers will depend on the circumstances, notably the size of the industries associated with civil aviation and the assessment approach taken. For example, countries with significant aerospace manufacturing will show a wide spread, while those with limited air transport services may have a relatively narrow spread. Non-aviation travel and tourism businesses, such as hotels and restaurants, travel agencies, tour operators and retailers greatly benefit from trip-related expenses of airline passengers.

3.3.2 The impetus of civil aviation in the United States economy has been selected as a case study to demonstrate the procedural steps of the assessment phases. It has been evaluated over a number of years by Wilbur Smith Associates on behalf of the U.S. Federal Aviation Administration. In 2000 (the most recent year for which data are available), the provision of airline services, general aviation activities, airport operations and acquisition of aircraft totalled an output value of U.S. \$ 177.3 billion and created more than 1.2 million jobs. Expenditures associated with business and leisure trips by air totalled U.S. \$ 176.3 billion and created over 3.1 million jobs. These direct and catalytic expenditures generated additional expenditures of U.S. \$ 654.6 billion and over 5.5 million jobs through the indirect demand of suppliers and induced demand effects.

3.3.3 These results for the U.S. economy can also be expressed as multiplier effects of the direct demand: every U.S. \$ 100 of output produced and every 100 jobs created by civil aviation in 2000 trigger another U.S. \$ 469 of output and 669 jobs in many different industries. The value of all economic activities of civil aviation and air travel-related expenses, plus indirect and induced multiplier effects, totalled U.S.\$ 1 008.2 billion and employed 10 million people who earned U.S. \$ 310.1 billion in 2000.

4. **FUTURE WORK**

4.1 ICAO will explore the possibility of developing training modules on this subject to be delivered in suitable regional or sub-regional fora, for example, in ICAO workshops/seminars; and

4.2 ICAO will provide technical support to Contracting States upon request to assist with the implementation of economic impact assessments of civil aviation, on a cost-recovery basis.

5. **ACTION**

5.1 The Meeting is requested to:

- a) note the information provided in this paper;
- b) use this information in support of efforts to define the contribution of civil aviation to States/Territories/International Organization's economies; and
- c) consider using this definition in obtaining financing for important aviation projects.

Attachment: Executive Summary of Circular 292.

APPENDIX

Executive Summary

1. The air transport industry has experienced rapid expansion along with the growth of the world economy, and the demand for air transport services is primarily driven by economic development. In turn, civil aviation acts as an economic catalyst for local/regional and national economies around the globe. The level of economic activity of the air transport industry is closely linked to the level of economic activity in markets and economies that the industry serves. Higher levels of economic activity go hand in hand with a growing demand for air transport, benefiting not only from expanding industries and trade but also from generally higher income and consumer spending. Air transport (airlines, airports and air navigation infrastructure) accommodates the needs of millions of individuals to travel and of business communities to have goods transported by air. In 2002, worldwide scheduled services carried over 1.6 billion passengers and 30 million tonnes of air freight and mail.

Volume I — Global Perspective

2. Volume I of this circular emphasizes the importance of civil aviation in the world economy and provides an assessment of the contribution of civil aviation (in terms of global output and employment), followed by a profile of the major contributing civil aviation industries.

3. Economic activity is the value of goods and services produced in an economy. In this study, economic activity includes the goods and services produced by civil aviation, and other industry groups affected by civil aviation. Economic activities that are directly attributed to civil aviation industries comprise those of airlines, other aircraft operators and affiliates, airports, air navigation services providers and affiliates, aerospace and other manufacturers as well as other industries and their affiliates.

4. Airlines deliver air transport services, the final product of civil aviation industries, to their customers. It has been estimated that civil aviation industries generated a total **direct output** of \$652 billion worldwide in 1998. When these values, which include intermediate inputs, are consolidated in order to eliminate the components of double counting, it is estimated that civil aviation contributed to the world economy some \$370 billion in consolidated direct output in 1998, the production of which required employment of at least 6 million people along the supply chains of intermediate inputs and final demand.

5. The full economic impact of civil aviation industries cannot be assessed without taking into account the indirect and induced impacts involving other related industries. **Indirect impacts** involve the transactions with related suppliers along the production chains. **Induced impacts** cover successive rounds of increased household spending that result from the direct and indirect impacts. In addition, an impact assessment may also include the off-airport expenditure of air transport users (passengers and freight forwarders) and related employment, which are referred to as **catalytic impacts**. These levels of economic activity can be viewed as having a cascading effect on the global economy. The output of the air transport component of civil aviation yields the direct impacts which in turn stimulate the indirect and ultimately the induced impacts as well as catalytic impacts. These direct economic activities have **multiplier effects** upon industries providing either aviation-specific and other inputs or consumer products (goods and services). The air transport component of civil aviation is estimated to have generated a total output of \$1 360 billion and 27.7 million jobs worldwide in 1998, representing about **4.5 per cent of the world output in terms of real gross domestic product (GDP)**.

6. The multiplier effects of air transport can be calculated as a ratio of the sum of catalytic, indirect plus induced demand effects to the direct demand effects, in terms of output and employment. It is estimated that each dollar of output produced in the air transport industry worldwide creates a demand of \$3.25 output in other industries, and that each job in air transport creates 6.1 jobs in other industries.

Volume II — Assessment Methodologies

Part I. Economic Impact of an Airport

7. Volume II of the circular describes the methodologies to assess the economic impact of civil aviation industries, in terms of output and employment. In order to demonstrate these methodologies, North American and European case studies are used as illustrative examples. Unfortunately, examples from developing countries were not available.

8. The employment generated by an airport could play an important role for the local/regional economy concerned or, in the case of small countries, even for the national economy (particularly islands or land-locked countries). A well researched economic impact study can demonstrate the contribution that an airport makes to the economy concerned. This can be instrumental in obtaining financing or negotiating better loan conditions, particularly from public or foreign sources (such as governmental guarantees or development banks and funds), that may be attracted by the wider economic effects of either planned new aviation infrastructure or expansion of an existing facility.

9. Part I of Volume II describes how to capture the economic contribution of an airport in the adjacent local/regional economy, using two approaches described as a core approach and an expanded approach. A core approach of an impact assessment captures economic activities of an airport in three dimensions: directly in servicing its customers; indirectly through the inter-industry trading and production necessary to provide the final goods and services; and induced impacts generated by increased household spending that result from direct and indirect impacts. The distinction between a core approach and expanded approach lies in their coverage of spin-off demand effects by air transport users. An expanded assessment incorporates the off-airport expenditure of airport users and the related employment as catalytic demand effects.

10. This study uses input-output (I-O) methodology to quantify the output value of transactions that are associated directly or indirectly with civil aviation industries. I-O analysis enables the cascading demand effects generated by an airport to be tracked sequentially along the production process throughout an economy. I-O tables within a system of national accounts capture the supply and demand transactions, in terms of expenditures between industries on an annual basis.

11. I-O tables may be readily available in States from their national accounting systems. While the process appears complex, once the corresponding matrices for external demand stimulus and the relevant sets of impact multipliers are determined, calculations can be executed with spreadsheet software. If impact multipliers can be obtained without applying I-O analysis, they can be used with expenditure and/or employment data to estimate the economic impact of civil aviation.

12. When selecting an I-O framework for an impact assessment, it is important to consider the geographical coverage needed. A significant portion of the economic activities of an airport could occur in the local/regional economy. An airport survey can be used to gather direct output, labour income (wages)

and employment data. For example, economic activities of 203 firms/organizations at **Hamburg Airport** were surveyed to obtain data on their annual expenditures and employment in the metropolitan region. Airport expenditures were converted into sales of supplier industries (local, regional or national).

13. Another case study, at **Frankfurt Airport**, illustrates an economic impact assessment covering income and employment effects in both the regional and national economy, using a core approach. The results indicate that in 1998, Frankfurt Airport generated economic activities throughout Germany. For every DM earned at the airport and for every airport-based job, there were DM 2.01 earned and 1.77 jobs created throughout the national economy, including DM 1.26 earned and 1.29 jobs created in the regional economy.

14. The impact multiplier concept provides a simple method of assessing economic impacts; however, this does not provide industry-by-industry distribution of demand effects. A study conducted by **Vancouver International Airport** demonstrates a core assessment, using direct employment data and impact multipliers to estimate the indirect and induced employment as well as output and value added impacts.

15. Employment and income effects for **23 selected European airports** in terms of direct, indirect and induced effects, including multipliers, are reviewed. The income multiplier ranges from a low of 0.36 to a high of 2, whereas the employment multiplier ranges from a low of 0.28 to a high of 3.06. The variation in the multiplier value can be partly attributed to airport location, underlying assumptions and the scale of the benefiting economy. Based on the results for the 23 European airports, an indicative range of multiplier effects of airport employment were identified for international airports, medium/large airports and small regional airports.

16. An example of an expanded assessment approach, which incorporates the off-airport expenditures as catalytic demand, is presented. The 1990 impact assessment of **Los Angeles International Airport** captured off-airport expenditures of airport users.

17. The application of an expanded assessment, using total impact multipliers, is explained and illustrated, using an airport study conducted by the Department of Transportation, State of Colorado. This study follows procedures recommended by the Federal Aviation Administration (FAA) for economic impact analysis of airports, using RIMS II, a regional Input-Output modeling system that maps the flow of products and the interconnection of producers and consumers within the U.S. economy. It identifies the direct and catalytic output of **Colorado's 79 public-use airports**. These outputs together comprise an external demand stimulus which in turn created multiplier effects in the impacted local economies. Total impacts were also measured for the state-wide economy by type of industry.

Part II. Impact of Civil Aviation in a National Economy

18. Whereas Part I of Volume II focussed on the economic impact of an airport, Part II describes how to explore the contribution of civil aviation throughout a national economy.

19. Transportation Satellite Accounts (TSA), such as those jointly developed by the U.S. Departments of Transportation and Commerce, help assess the contribution of air transport to a national economy. These accounts consist of a **make** table and a **use** table (production and consumption accounts), a **direct requirements** table and a **total requirements** table. The direct requirement table shows the amount of commodity that is required by an industry to produce a dollar of the industries output. In the United States, air transport has a total industry output multiplier of 1.89 which implies that in order to deliver a one dollar increase in the final demand of air transport, a total industry output worth of \$1.89 is produced. The TSA framework demonstrates that, in the evaluation of GDP, civil aviation's contribution is underestimated, since GDP considers the final demand for air transport services and excludes expenditures on intermediate inputs. Other multiplier effects are only accounted for in an impact assessment.

20. The impetus of civil aviation in **the United States economy** has been selected as a case study which demonstrates the procedural steps of the expanded assessment phases, using RIMS II and its multipliers. It has been evaluated over a number of years by Wilbur Smith Associates, on behalf of the FAA, and focuses on the provision of airline services, general aviation activities, airport operations and acquisition of aircraft. Expenditures associated with business and leisure trips by air are taken into account. These direct and catalytic expenditures generated additional expenditures and jobs through the indirect demand of supply and induced demand effects. The results for the U.S. economy can be expressed as multiplier effects of the direct demand: every \$1 of output produced and each job created by civil aviation in 2000 triggered another \$4.69 of output and 6.86 jobs in many different industries.

21. At the national level, the stimulating economic impact of civil aviation as job creator and contributor to economic growth is evident when airlines, airports, air navigation services providers and aerospace industries and their respective affiliates meet a growing direct demand for air transport services by expanding operations and fleets, ordering more inputs from suppliers, hiring more employees and thus increasing outputs at all levels. These direct economic activities have multiplier effects upon other industries throughout an economy. A wider or narrower spread of these multipliers will depend on the circumstances, notably the size of the industries associated with civil aviation and the assessment approach taken. For example, countries with significant aerospace manufacturing will show a wide spread, while those with limited air transport services may have a relatively narrow spread. Non-aviation travel and tourism businesses, such as hotels and restaurants, travel agencies, tour operators and retailers greatly benefit from trip-related expenses of airline passengers.