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# AIRPORT PLANNING

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Secretary, Aerodrome Design and Operations Panel*

Lima, September 2018





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# TOPICS

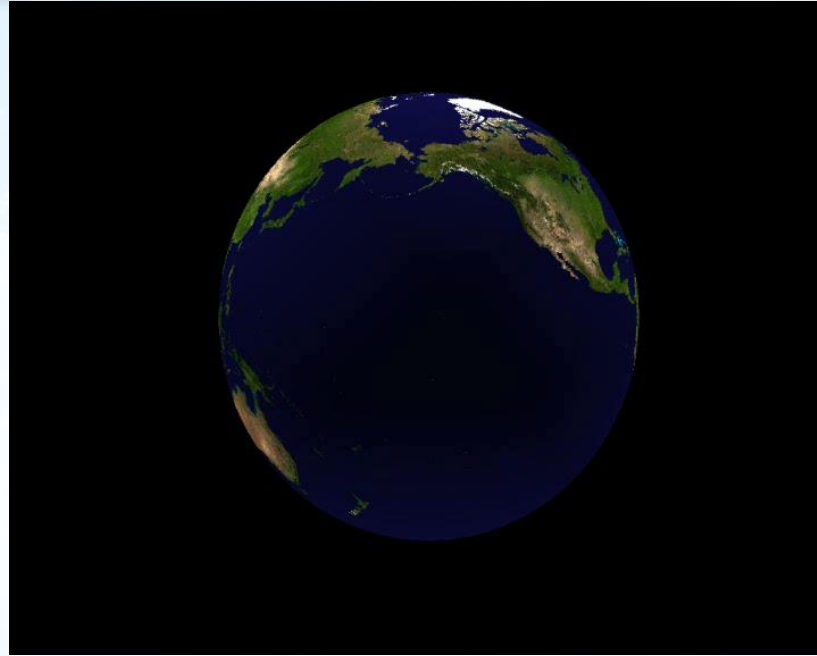
- THE AVIATION SYSTEM
- CHICAGO CONVENTION
- MASTER PLAN – WHY NEEDED
- THE TOOLS
- PAST & CURRENT PROVISIONS
- FUTURE PROVISIONS
- BIBLIOGRAPHY





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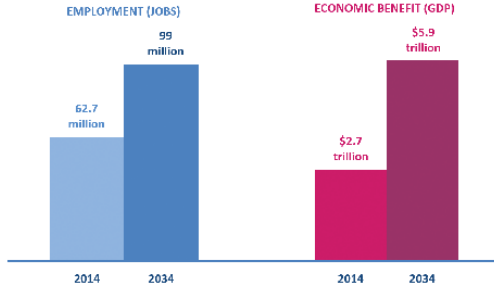


....all flights commence and terminate  
at an aerodrome.....



# International air transport





### Funding, Financing and Investment

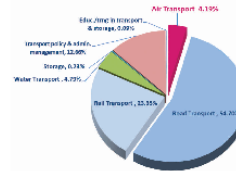
To foster this projected growth in a sustainable manner, a large number of investments in the modernization and expansion of quality aviation infrastructure are required over a long period. The global investment needs for airport expansion and construction, for example, are estimated at USD 1.8 trillion from 2015 to 2030<sup>12</sup>. Investment in aviation infrastructure ensure that the capacity of the global aviation system can meet future demand; generate gains such as reductions in travel time and improvement of service predictability and reliability; and, at the same time, maintain public confidence that aviation is safe, secure and environmentally responsible.

Although aviation's socio-economic benefits, its cross-cutting nature and multiple links to other economic sectors are widely recognized, this has rarely translated into the level of investment which is necessary to truly derive these benefits. It is noteworthy that air transport received a mere 4.2 per cent (USD 4.6 billion) of the total Official Development Assistance (ODA) provided by all donors for economic infrastructure and services for the past decade

(2005-2013). In comparison, road transport was allocated a share of 54.7 per cent, which amounts to USD 60.9 billion<sup>16</sup>.

Unlike other modes of transport, the aviation industry has been paying for a vast majority of its own infrastructure costs (runways, airport terminals, air traffic control), rather than being financed through taxation, public investment or subsidies. Infrastructure costs are covered through payments of user charges, most of which are added to airfares. In 2016, airlines and passengers were estimated to have paid USD 125.9 billion to airports and air navigation

ODA Donors contribution to Transport Sector 2005 - 2013





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the aerodrome  
within a total system concept...





# AERODROME - AIRSIDE

Local ATM  
**Annex 11**  
PANS-ATM



Local CNS  
**Annex 10**



Runways, Taxiways, Aprons, Operations,  
Control Towers, Obstacles, etc. (Annex 14)

Local MET  
**Annex 3**



Local AIS/MAP  
**Annex 3**  
Annex 15



FLT OPS  
**Annex 6**  
PANS-OPS



ENVIRON  
**Annex 18**





# AERODROME - LANDSIDE

**Facilitation  
Annex 9**



**Local CNS  
Annex 10**



Terminals, Cargo, Ground Transport, Parking,  
Support Elements, etc.

**Security  
Annex 17**



**Local AIS/MAP  
Annex 3  
Annex 15**



**FLT OPS  
Annex 6  
PANS-OPS**



**ENVIRON  
Annex 18**





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# NEW LARGE AIRCRAFT

	Boeing 747-400	Airbus A380-100	Boeing 747-8/8F
Passengers	416	555	467
Wingspan	64.40 m	79.75 m	68.40 m
Length	71.00 m	72.60 m	76.40 m
Height	19.40 m	24.00 m	19.50 m
MTOW	400 tons	560 tons	440 tons



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# AEROPLANES WITH FOLDING WINGTIPS

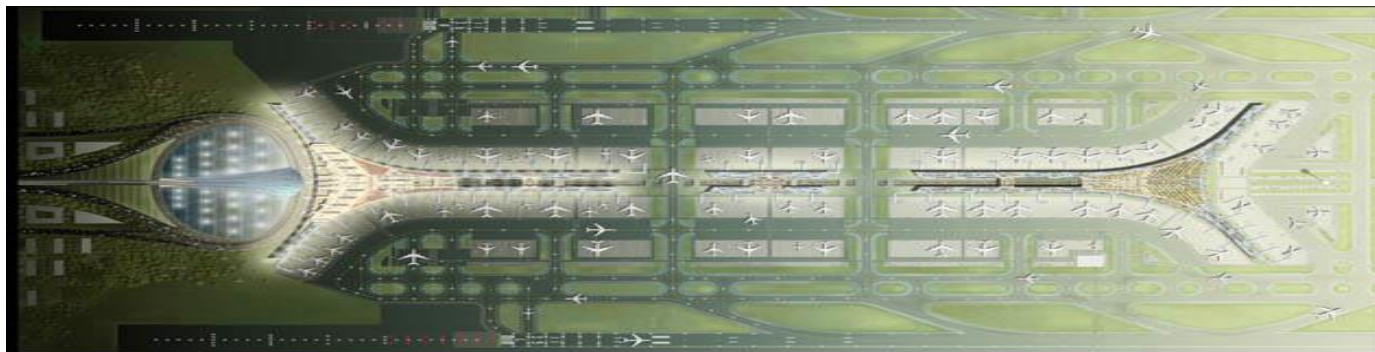


<https://www.boeing.com/777x/reveal/video-777x-Folding-Wingtip/>



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# Today's aviation environment....

- Large, global & complex industry
- Highly sophisticated technologies
- Reduced capacity of regulators to be THE expert across a whole range of disciplines/ specialties
- Highly complex, automated & integrated systems



# Today's aviation environment....

- Increased failures: technology/human interface
- Greater commercial pressure – costs & time
- Greater public expectations on safety issues
- Greenfield airports – opening day issues





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# International obligations

Doc 7300/8



**Convention on  
International Civil Aviation**  
**Convention relative à  
l'aviation civile internationale**  
**Convenio sobre  
Aviación Civil Internacional**  
**Конвенция о международной  
гражданской авиации**

This document supersedes Doc 7300/7.  
Le présent document annule et remplace le Doc 7300/7.  
Este documento reemplaza al Doc 7300/7.  
Настоящий документ заменяет Doc 7300/7.

Eighth Edition – Huitième édition – Octava edición – Издание восьмое — 2016

International Civil Aviation Organization  
Organisation de l'aviation civile internationale  
Organización de Aviación Civil Internacional  
Международная организация гражданской авиации

## The Chicago Convention





# The Chicago Convention

- Signed on 7 December 1944
- Currently 192 States ratified – one of world's most widely accepted international treaties
- Only global set of principles/rules governing international civil aviation



# The Chicago Convention (cont'd)

- Contains 96 Articles in 22 Chapters
- Provides for the establishment of the International Civil Aviation Organization (ICAO)
- Gives Contracting States certain “RIGHTS” in exchange for meeting certain “OBLIGATIONS”



# States “Rights”

- Uphold fundamental principles of Sovereignty of Contracting States (Art. 1)
- Grants transit & landing rights for non-scheduled traffic (Art. 5)
- Grants each State the right to reserve the traffic within its borders to its own airlines (Art. 7)



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## States “Rights” (cont’d)

- Grants each “User” State the right to equitable treatment from a “Provider” State in terms of rules of entry to, transition, through and departure from that State’s airspace and airports (Art.11&15)
- Provides for mutual recognition of certificates of airworthiness, personnel licences, etc. (Art. 33)



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# States “Obligations”

- Each State agrees to give uniform treatment to aircraft from other States when in their airspace or using their airports (Art. 11 & 15)
- Each State agrees to provide airports and air traffic services in conformance with standards and practices established under the Convention (Art. 28)



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## States “Rights” (cont’d)

- Each State agrees to implement in their national regulations the International Standards and Recommended Practices (SARPs) and Procedures adopted by ICAO in order to ensure the highest practicable degree of uniformity (Art. 37)



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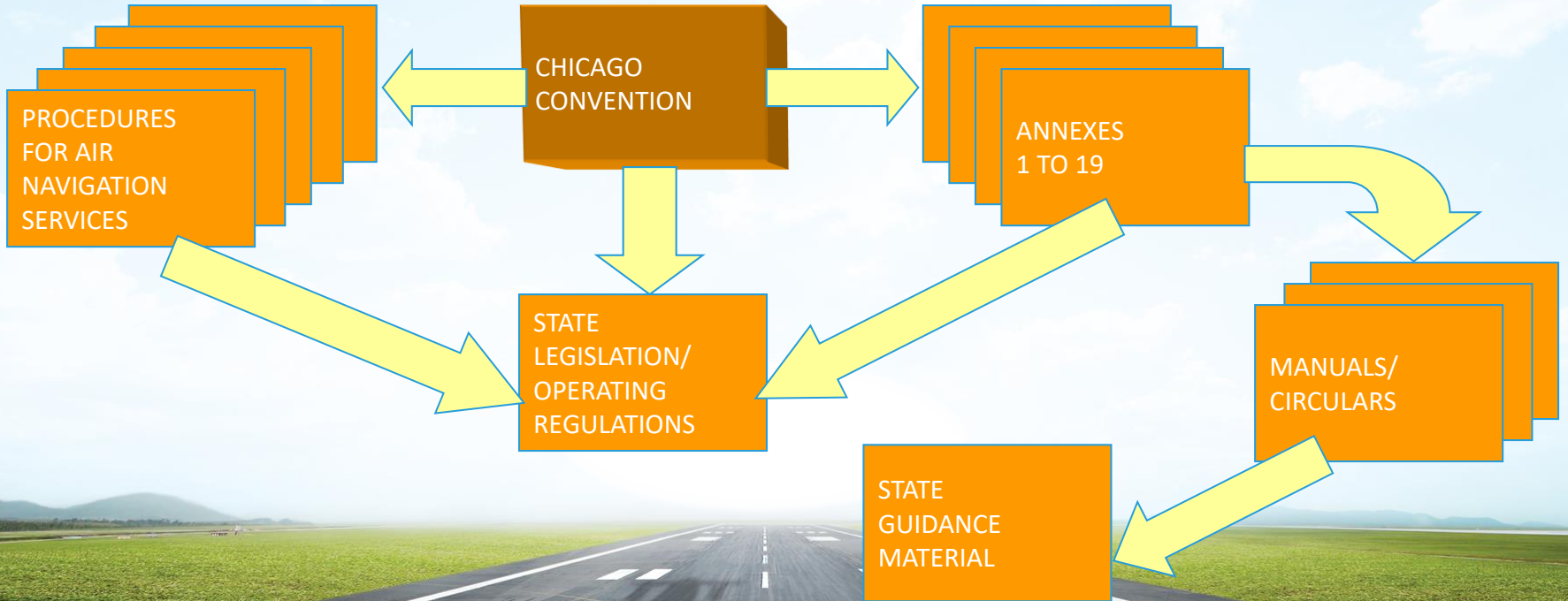
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## States “Rights” (cont’d)

- Each State is required to notify ICAO immediately if it finds it impracticable to comply in all respects with any International Standard or Procedure (Art. 38) – “filing of differences”





- ICAO Annexes directed to the state
- Contents of ICAO annexes must be transposed into national regulations
- License personnel, certify aerodromes & organizations
- Monitor licensed subjects for continued compliance



# Two complementary roles



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STATES

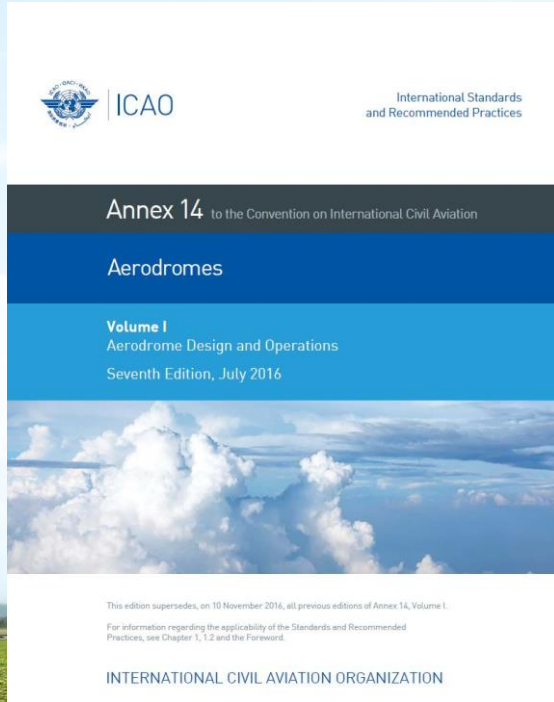
- Develops principles and techniques to be adopted in Annexes
- Approves regional air navigation plans

- Apply Annex Standards
- Carry out oversight responsibilities
- Implement infrastructure according to regional plans



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# Annex 14, Volume I Aerodrome Design and Operations



This edition supersedes, on 10 November 2016, all previous editions of Annex 14, Volume I.  
For information regarding the applicability of the Standards and Recommended Practices, see Chapter 1, 1.2 and the Foreword.

INTERNATIONAL CIVIL AVIATION ORGANIZATION



## FOREWORD

### Historical background

Standards and Recommended Practices for Aerodromes were first adopted by the Council on 29 May 1951 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 14 to the Convention. The Standards and Recommended Practices were based on recommendations of the Aerodromes, Air Routes and Ground Aids Division at its third session in September 1947 and at its fourth session in November 1949.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

### Action by Contracting States

*Notification of differences.* The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specified request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

*Promulgation of information.* The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

### Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.—*Material comprising the Annex proper:*

- a) *Standards and Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

*Standard:* Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of

# Foreword





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# STANDARD

“Any specification for physical characteristics, configuration, material, performance, personnel or procedure, the **uniform application** of which is recognized as **necessary** for the **safety** or **regularity** of int’l air navigation and to which Contracting State **will conform** in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Art. 38”.



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# RECOMMENDED PRACTICE

“Any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognised as desirable in the interest of safety, regularity or efficiency of int’l air navigation and to which Contracting State will endeavour to conform in accordance with the Convention.”





- Notes included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.
- Attachments comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.





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# Airport Master Planning Why Needed?





**Exploiting Infrastructure for Future Passenger Growth**

A discussion on the challenges facing the aviation sector as passenger numbers continue to climb.

**Address Infrastructure Crisis to Secure Aviation's Future**



Singapore – The International Air Transport Association (IATA) is calling for urgent attention to address infrastructure challenges in order to secure the industry's future.

# AIRPORT PLANNING AND DEVELOPMENT – AIRPORTS CAN DO MUCH BETTER!

Planning new airport infrastructure is a complex and multidisciplinary task which can determine its future

ICAO NEWS RELEASE

ICAO Council President: African airport capacity critical to continent-wide sustainable prosperity

The Heathrow Forecast: Growth, Expansion and New Markets

**Construction & Design** SUPPLEMENT



**03** AVIATION INFRASTRUCTURE

Develop quality aviation infrastructure (including air navigation systems and airports) commensurate with the level of predicted traffic growth and based on ICAO's global plans.

# INFRASTRUCTURE CRISIS



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# Airport Master Planning Why Needed?

- Assembly Resolutions
- PIRGS - regional activities paper
- ADOP/3 paper



Adobe Acrobat  
Document



Adobe Acrobat  
Document



Adobe Acrobat  
Document



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Doc 10075

Assembly Resolutions in Force  
(as of 6 October 2016)



Published by authority of the Secretary General.









INTERNATIONAL CIVIL AVIATION ORGANIZATION

# Assembly Resolutions





# ASSEMBLY RESOLUTIONS

- A23-14 Systems planning – new aircraft types 
- A27-11 Airport & Airspace Congestion 
- A39-1 Appendix F: Land Use Planning & Management 
- A39-15 Appendix C: Airports charging policy 
- A39-15 Appendix E: Forecasting, planning & economic analysis 
- A39-18 Appendix C: Security 
- A39-20 Facilitation 
- **A39-22 Appendix J: Provision of adequate aerodromes** 



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# The Tools (in chronological order)





# Airport Planning Manual (Doc 9184)

- First edition - 1967  Adobe Acrobat Document
- General review - 1976
- Second edition - 1987





## Purpose & principle of Doc 9184 - Part 1

- Exclusively informational and advisory in character.
- Provide advice & guidance to responsible authority on methods to follow in developing the solutions to design problems, rather than presenting typical solutions for consideration.
- Emphasis on:
  - harmonizing airport master plan with plans for the future development and total transportation system.
  - inter-relationship of all elements of the airport design – movement areas, including aprons, passenger and cargo loading system, terminal building design, car parking areas and access roads etc – and ensuring that the master plan will permit expansion of any of its elements as requirements increase during the life of the plan



## Purpose & principle of Doc 9184 - Part 1 (cont'd)

- It would be restricted to state-of-the-art material and would not present theoretical or unproven concepts, except as may prove necessary in connection with new types of aircraft not yet in service.
- Advisory and informational rather than regulatory
- Deal with practice rather than policy



# Cycles of amendments

- Since 1967, most Annexes had undergone series of amendments:
  - Annex 14: 33 cycles of amendments
  - Annex 3: ??
  - Annex 6: ??
  - Annex 9: ??
  - Annex 17: ??
  - Annex 18: ??





# Amendment 1 to Annex 14 Vol I (1995)

- Consequential to Amendment 8 to Annex 17
  - **Recommendation** .— *Architectural and infrastructure-related requirements for the optimum implementation of international civil aviation security measures shall be integrated into the design and construction of new facilities and alterations to existing facilities at an aerodrome.*



Note.— Guidance on all aspects of the planning of aerodromes including security considerations is contained in the Airport Planning Manual (Doc 9184), Part 1.

- Upgraded to a Standard via Amendment 3 (1999)



## Amendment 7 to Annex 14 Vol I (2005)

- Arising from Recommendation 3/5 CAEP/6

***Recommendation.***— *The design of aerodromes should take into account, where appropriate, land-use and environmental control measure.*

**Note.**— Guidance on land-use planning and environmental control measures is contained in the Airport Planning Manual (Doc 9184), Part 2.



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That was the past...  
...now the future





# Aerodrome Design and Operations Panel

- First meeting, 9 - 13 Feb 2015
- Job card on airport master planning created
- Airport Master Planning Task Force (AMPTF)



ADOP.014.02

Airport planning

**Source**

ADOP/1

**Problem Statement**

ICAO guidance material on Airport Master Planning (Doc. 9184, Part 1) has not been updated since 1987. This guidance material needs a complete review to include the most up-to-date airport planning tools and techniques. In addition, SARPs on airport planning requirements may be needed in Annex 14, Volume I to support airport capacity enhancements in a timely manner to avoid airport congestion and delays.

airport capacity enhancements in a timely manner to avoid airport congestion and delays.

Good airport planning, including master planning, is vital in building the airport capacity timely in a phased approach, thus avoiding significant delays in the future due to capacity constraints. Airport capacity will be increased; and airport delays will be reduced through more precise and up-to-date airport planning.

Airport capacity will be increased and delays reduced through more precise and up-to-date airport planning techniques.

## Traffic forecasting

ID	Document Affected	Description of Amendment proposal or Action	Supporting Expert Group	Status	Expected Dates		
					Delivery Date	Effective	Applicability
74	Airport Planning Manual, Part 1 (Doc 9184)	Update of Doc 9184 to include up-to-date airport planning tools and techniques	-	On-schedule	Q4 2018	Jul 2018	Nov 2018
69	Annex 14 - Vol I	Provisions on airport planning requirements.	-	On-schedule	Q4 2018	Jul 2018	Nov 2020
9458	PANS-AERO (Doc 9981)	Procedures on airport planning requirements to support airport capacity enhancements	-	On-schedule	Q4 2018	Jun 2016	Nov 2020

**Status:**  
Approved

**Priority:**

**Initial Issue Date:**  
17 Jun 2015

**Date Approved by ANC:**  
18 Feb 2016

**Session / Meeting:**  
201-8



# Aerodrome Design and Operations Panel

- Third Meeting, 26 – 29 March 2018
- See ADOP/3 – WP/9
- Provisions developed
- Supported by updated guidance in Doc 9184 Part 1 (work ongoing)



Adobe Acrobat  
Document



Adobe Acrobat  
Document



# Airport Planning Manual (Doc 9184)

- *1st Edition - 1967*
- *2nd Edition - 1987*
- *3rd Edition - 2019 (expected)*
  - SECTION 1
  - SECTION 2
  - SECTION 3
  - SECTION 4



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# Airport Planning Manual (Doc 9184)

- *Job card Leader: David Stewart (IATA)*
- *Section 1: Airport Planning Process : Hendrik Orsinger (PASCALL & WATSON)*
- *Section 2: Airside Development : Marco Plarre (JACOBS)*
- *Section 3: Landside Development : Martin Landry (ARUP)*
- *Section 4: Airport Ops & Support Elements : Russell Blank (LANDRUM & BROWN)*





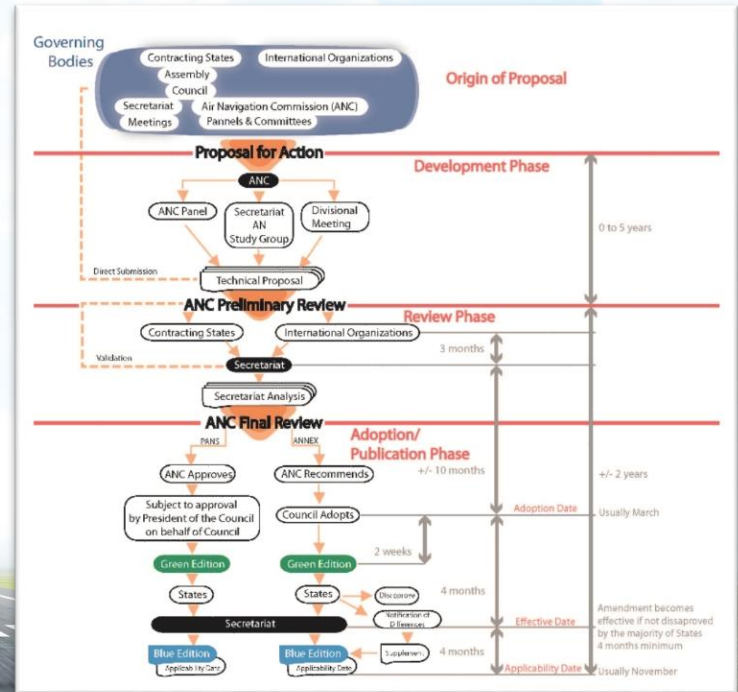
# ICAO publications related to Aerodrome Master Planning

- *Appendix B of Doc 9184 Part 1*   
Adobe Acrobat Document
- *5 Annexes*
- *1 PANS*
- *35 Manuals : aerodromes, facilitation, CNS, Env, Sec, traffic forecasting, statistics, charges, etc.*



# Where do we go from here..

- *ANC Preliminary Review (Oct 2018)*
- *State letter consultation (Q4/2018)*
- *Secretariat analyses (Q2/2019)*
- *ANC Final Review (Q3/2019)*
- *Council adoption (Q1/2020)*
- *SARPs applicable (Q4/2020)*





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MUCHAS GRACIAS



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