



ICAO

UNITING AVIATION

Recent & future amendments impacting airside planning

Joseph K W CHEONG

ADOP Secretary





GANP as an overarching framework to assist ICAO regions, sub-regions and States in the development of their regional and State air navigation plans.

6. AIR NAVIGATION SAFETY

6.1 In all of its coordinated activities, ICAO strives to achieve a balance between the need for increased capacity and efficiency and maintaining aviation safety at an acceptable level. ~~The conference will highlight emerging safety issues and discuss the future approach to managing aviation safety and the USOAP CMA methodology and tools evolution.~~

6.2 The Global Aviation Safety Plan (GASP) and GANP are complementary documents that provide opportunities for ICAO, planning and implementation regional groups (DIRGs) and regional



- **HAVE WE BEEN THE VICTIM OF OUR OWN SUCCESS?**

- ✓ **HAVE WE BEEN TOO SAFE & CONSERVATIVE AT THE EXPENSE OF OTHERS...**

“Safety at a reasonable cost” State CAA Motto

- ✓ **SHOULD WE STRIVE TO ACHIEVE A BALANCE BETWEEN MAINTAINING SAFETY AT AN ACCEPTABLE LEVEL AND THE NEED FOR INCREASED CAPACITY AND EFFICIENCY?**



Basis of Amendment 13

The existing (taxi centre line) separation distances .. were derived before the advent of modern, new large aircraft and many aerodrome systems in use today. The original design groups were correct to be cautious in establishing the present values, but scientific assessments, together with practical risk-based studies, have shown that there is room for the values to be reduced without having a negative impact on the safety or regularity of taxiing operations.



...to comprehend the PRESENT...we ought to have a clear understanding of the PAST ...in order to proceed to the FUTURE....



Reviewed no less than 70 archival papers

- ANConf/5 1967
- ANConf/8 1974
- ARCP/1 1978
- ARCP/2 1980
- AGA Divisional Meeting 1981
- ANWP/6911 Progress Report 1994 & AN Mins 136-6 & -7
- ADSG/1/2/3 1995/1996/1997
- ANWP/7320 Prelim Review 1998 & AN Mins 148-6
- State letter 45 of 1998
- ANWP/7385 Final Review 1998 & AN Mins 149-12 & 13
 - Adoption 1999 C156-7, first Code F provisions
 - 22 (AP/1) 2008 & AN Mins 179-4
 - 34 (AP/3) 2014 & AN Mins 197-8 & 199-10



AN Mins 149-12 & 13 (1998)

- Final review of proposed amendments related to impact of NLA
- Concerns raised in the ANC
 - *issue on width of runways was subject of lengthy discussion*
 - *did not appear to be any scientific justifications for many of the proposals*
 - *IATA/ACI/ICCAIA joint letter on setting a standard which could have serious consequences for major airports that had reached a limit on their land use*
 - *because Annex 14 provisions are not only for planning future aerodromes but for all aerodromes, there are views that there should be separate Annex 14 provisions for existing aerodromes*
 - *further studies need to be carried out on the rationale of the methods used in determining criteria for Code F proposals.*

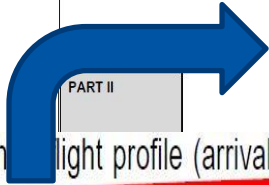


AN Mins 149-12 & 13 (cont'd)

- *no disagreement with the (then) proposal since (the requirement) was a Recommended Practice and ..should a State choose to allow operations of code F aeroplanes on 45 m wide runways, it could take appropriate decisions considering all relevant safety factors*
- *agreed that a note be included in the RP on runway width on the need for States to refer to various aspects in Doc 9157 Part 1 when deciding on the width of a runway that they determine to be adequate*
- *ANC, while agreeing to the 60 m Code F runway width proposals, **requested** the Secretariat to continue the study on the current ICAO methodology for developing Annex 14 specifications concerning the physical characteristics of runway, taxiways and aprons for the new code letter F in the Annex*

Working Group on Strategic Review and Planning – ANWP Amendment Input Form (Job-card)

PART I				
Category	Safety	Sustainability	Implementation	Reference: ADOP005
Title	Review of Aerodrome Reference Code design method and governing parameters			
Proposed by	ANC (183-12)			
Problem Statement	Review the basis and the adoption of an operationally-based approach for the development of aerodrome design SARPs on physical characteristics, review the aerodrome reference code design method and the consequential development of revised SARPs as deemed necessary			
Specific Details (including impact statements)	<p>Annex 14 Volume I specifies SARPs and guidance material (green pages) for aerodrome design and operations. Runway and taxiway widths relationship, including separations, with aircraft wingspan codes and assumed associated maximum landing gear widths are no longer linked as when the ARC was introduced. Landing gear widths are mostly related to fuselage width, not to wingspan, hence some inconsistencies for some aircraft, including the Dash 8-400, 757, 747-8, 777-8/9, AN124 and A380. Use of a reference field length that is not adjusted to either actual conditions (elevation, temp, etc.) or actual flight profiles planned for the aerodrome is no longer valid. Consideration must be made to separate the reference field length from aeroplane design code. Further, flight profile (arrival / departure) and associated minima must be introduced to support designs that will enable future development of the GANP.</p> <p>Overbuilding of runway and taxiway widths to meet an aeroplane design code is burdensome for both initial construction and annual maintenance. Design allowance needed for aeroplanes that have been certified to operate on runway widths that are one reference code lower than would otherwise be specified by wingspan or maximum gear span.</p> <p>New designs for commercial airplanes are considering the adoption of folding wings / wings in order to gain the aero-performance benefit of the larger span on the runway and after takeoff, yet have the benefit of aerodrome compatibility of the lower aeroplane design code once off the runway.</p> <p>This work item should, where relevant, encompass existing approved work programme items. In some cases, an approved work programme item may</p>			
PART II				



aeroplane design code. Further, flight profile (arrival / departure) and associated minima must be introduced to support designs that will enable future development of the GANP.

Overbuilding of runway and taxiway widths to meet an aeroplane design code is burdensome for both initial construction and annual maintenance. Design allowance needed for aeroplanes that have been certified to operate on runway widths that are one reference code lower than would otherwise be specified by wingspan or maximum gear span.

Z Review and develop provisions, as suitable, in Annex 14 volume 1 determining that the reference code to be assigned to the aircraft is relative to the location of the aircraft on the aerodrome, and identify designated transition areas adjacent to the runway where the higher reference code may need to be maintained in order to maintain the runway capacity.	ADOP/PASG	Proposed amendments to Annex 14 Volume 1 and PANS-Aerodromes	14 2016
Issue Date: 12 February 2015	Date Assessed by SRP: TBD	Date Approved by ANC: TBD	Next Review Date: TBD



- Current provision is a RP of a minimum of 60 m for Code F runway width. Factors affecting runway width is available in Doc 9157 Part 1: “Should aircraft operations be planned on runways with lesser widths than specified above, the consequent impact on safety, efficiency & regularity of operations and on airport capacity must be studied”
- Current position of including “additional” width in the RP, appropriate when the requirements were first developed 2 decades ago, is now seen to be excessive and costly and penalizes certain States /operators based on proven operational experiences.
- New provision proposes a 45 m Code F runway width and if “additional” width is required, refer to guidance in Doc 9157.1 – a *tactical change*.



Some Facts & Figures

- 1999 : Amendment 3 to A14VI introducing first ever Code F provisions
- 2007 : Operations of A380 commenced
- 2011 : Operations of B747- 8 commenced
- 2016 : > 1 million Code F movements at aerodromes globally
 - **B747- 8** currently operates into > 199 airports in 85 States
 - 103 airports (52%) have 45 m wide runways
 - 52 airports (26%) have 60 m wide runways
 - 44 airports (22%) have a mix of 45 m / 60 m wide runways
 - 2 airports with 50 m wide runways
 - **A380** currently operates into > 61 airports in 32 States
 - 22 airports (36%) have 45 m wide runways
 - 16 airports (26%) have 60 m wide runways
 - 23 airports (38%) have a mix of 45 m / 60 m wide runways



SOME FACTS & FIGURES (cont'd)

- Combined **A380 & 747-8** figures
 - more than 300 commercial code F aeroplanes in operations
 - currently operates into > 208 airports in 86 countries
 - 110 airports (53%) have 45 m wide runways (including 2 with 50 m)
 - 52 airports (25%) have 60 m wide runways
 - 46 airports (22%) have a mix of 45 m / 60 m wide runways
- Observation
 - If many States file a difference w.r.t to an Annex provision, it is prudent to review that provision. Runway width provision is a RP and States are not required to file a difference w.r.t to a RP according to the Convention. However, the figures above is perhaps indicative on the acceptance/otherwise of the current RP requirement for runway width

NEW TECHNOLOGIES

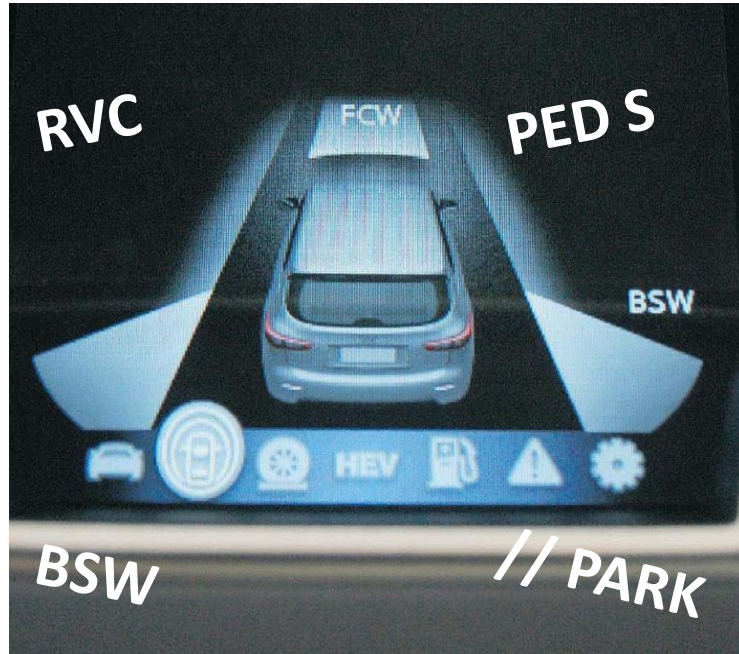
“AUTONOMOUS CARS”

AEB

FCW

RCW

LDW



ADAPTIV
CRUISE
CTL



Ford's Cellular Vehicle to Everything (C-V2X) system will, among other things, warn motorists of dangerous situations ahead of them. **BYRON HARRIS**

Cars connected to everything in the works

Ford road tests technology developed with tech giants Panasonic, Qualcomm

the 2018 Consumer Electronics Show (CES) in Las Vegas. Which is why the company has teamed up

Demonstrations of the future of C-V2X took place at Panasonic's CityN/W headquarters in Denver.

variable road users* 4

mining trucks on the road, and "left-turn assist"

NEW TECHNOLOGIES

“AUTONOMOUS HOUSING”

EVERYTHING YOU NEED TO KNOW ABOUT AUTONOMOUS HOUSING

USUELA KRONOWICZ
FORNIA CONSULTING

Most people know what environmentally friendly and LEED-certified housing consists of, but there's still a lot to learn about autonomous housing. So we took our questions to Alain Cella, owner and founder of Enerflex Concept, a Rivière-Beauport company that specializes in manufacturing prefabricated steel, gold and platinum LEED-certified and autonomous houses.

WHAT IS AN AUTONOMOUS HOUSE?
An autonomous house doesn't depend on an electric power supply or grid for energy because it runs independently. Most owners of autonomous houses opt for renewable sources like solar energy to power their homes.

WHAT ARE THE ADVANTAGES OF HAVING AN AUTONOMOUS HOME?
The first advantage is not depending on the grid, which means being able to build anywhere—even in places where electricity isn't available. These days, an increasing number of people want to live independently from infrastructure services to avoid situations like power outages, and to save money. For them, it's important to be able to manage their own energy consumption, oversee the operation and design of their house, and give it its own personality, especially when building a new home. For many, it's about raising awareness and living an environmentally responsible lifestyle.



The autonomous house at the Laurentides. ©2019/ICAO

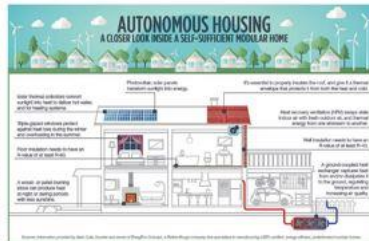
IS THERE AN AUTONOMY SPECTRUM?

There is. A house that's 60 per cent autonomous uses mostly solar energy for power, but is still connected to a grid, mostly for emergency situations. A house that's 80 per cent autonomous produces almost all its own energy using a variety of renewable energy sources. A 100 per cent self-sufficient home is completely independent from the grid and has emergency power stocked in battery systems.

HOW EASY IS IT TO TRANSFORM A REGULAR HOME INTO AN AUTONOMOUS HOUSE?

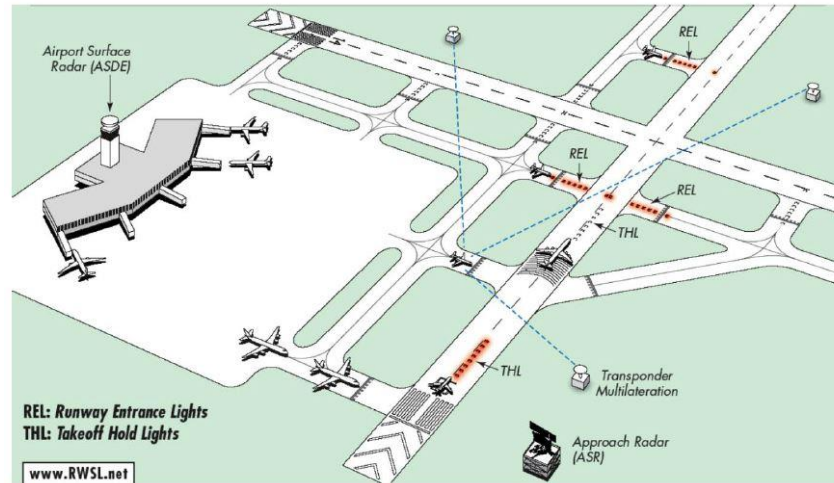
An autonomous house needs to have an extremely high-quality thermal shell, which means excellent roof (R-70), flooring (R-60), wall (R-40) and window (triple-glazed) insulation. Photovoltaic solar panels and solar thermal collectors also need to be installed, as well as systems like a ground-coupled heat exchanger and heat recovery ventilation. These transformations can be costly, so the ideal is to start with a LEED-certified house, because it already covers the basic requirements for autonomous housing. Otherwise, the prefabricated modular homes that Enerflex Concept builds are a very affordable option.

An Enerflex Concept autonomous house will be on display at the House Expo show, taking place at the Olympic Stadium from Feb. 9 to 12. Visit enerflexconcept.ca for more information.







NEW TECHNOLOGIES

“AUTONOMOUS RUNWAY INCURSION WARNING SYSTEM”



NEW TECHNOLOGIES - AEROPLANES

- Modern aeroplanes have significant systems improvement
 - Fly By Wire
 - Upgraded control laws
 - Asymmetric thrust management
 - Brake To Vacate
 - Airbus Runway Overrun Prevention Systems
 - Boeing 777 Enhanced Safety Features 
 - EuroCAE's ROAAS 
 - ICAO Global Reporting Format  

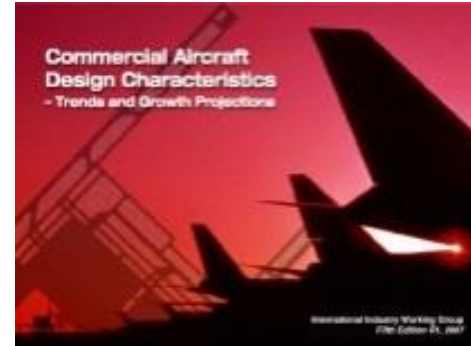


More Facts & Figures...

- Today's operational conditions bear little resemblance to those at the beginning of the jet age.
- No veer-off incidents/accidents related to insufficient runway width involving A380 and B747-8 since their introduction in 2007 and 2011, respectively.

Commercial aircraft design characteristics

- Growth & trends and how they influence aerodrome physical characteristics
- Wing growth
 - Wingspan growth trend (*impacts separation distances, OFZ dimensions, location of holding positions, dimensions of aprons and holding bays*)
 - Wingspan growth vs gross weight (*directly related to each other*)
- Fuselage growth
 - Overall length trend (*impacts ground movement and control, stand clearances, RFF*)
- Landing gear (OMGWS) growth
 - OMGWS vs gross weight (*impacts rwy & twy widths and fillets radii*)
 - OMGWS vs wingspan (*impacts rwy & twy widths and separation distances*)
 - Wheelbase vs fuselage width (*impacts turning areas*)



Commercial aircraft design characteristics

- Important to know which aeroplane physical/operating characteristics affect which aerodrome physical/operating characteristics
- Example: Width of taxiway shoulders
CURRENTLY based on location of outer engine (Code F: 60 m)
PROPOSED based on location of inner engine (Code F: 44 m)
RESULT 27% reduction in width (x total length of taxiways)
- AN Min 149-12 : “..very small margins could make a large difference in airport infrastructure..”

Paris CDG Airport - Taxiway



Rabbit!

Grass without loose gravel

Elevated edge light



WHAT'S NEW?



you guys need to work on
how you deliver that news





Characteristic	Proposed amendment	Formerly
	AMENDMENT 13	
Taxiway CL to Taxiway CL	A: 23.00m	23.75m (<i>reduced 0.75m</i>)
	B: 32.00m	33.50m (<i>1.50m</i>)
	C: 44.00m	No change
	D: 63.00m	66.50m (<i>3.50m</i>)
	E: 76.00m	80.00m (<i>4.00m</i>)
	F: 91.00m	97.50m (<i>6.50m</i>)
Taxiway CL to Object	A: 15.50m	16.25m (<i>reduced 0.75m</i>)
	B: 20.00m	21.50m (<i>1.50m</i>)
	C: 26.00m	No change
	D: 37.00m	40.50m (<i>3.50m</i>)
	E: 43.50m	47.50m (<i>4.0m</i>)
	F: 51.00m	57.50m (<i>6.50m</i>)







Characteristic	Proposed amendment	Formerly
Stand <u>taxilane</u> to stand <u>taxilane</u>	A: 19.50m B: 28.50m C: 40.50m D: 59.50m E: 72.50m F: 87.50m	No previous requirement
Stand <u>taxilane</u> to object	A: 12.00m B: 16.50m C: 22.50m D: 33.50m E: 40.00m F: 47.50m	No change No change 24.50m 36.00m 42.50m 50.50m

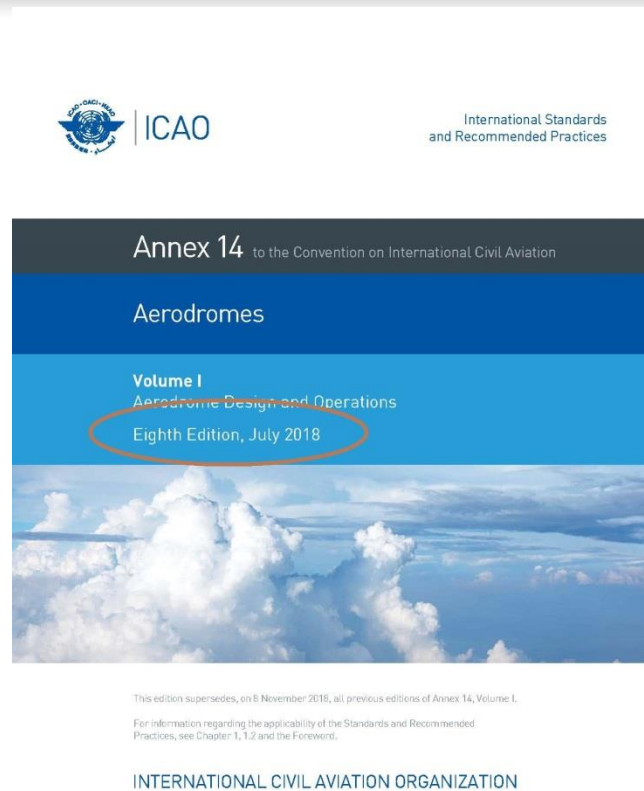


Characteristic	Proposed amendment	Formerly
	AMENDMENT 14	
Minimum width of Runways	Reduced to 45m for aircraft with OMGWS from 9 to 15m.	Was 60m for aircraft with OMGWS from 14m to 16m and wingspan over 65m (code F).
Minimum width of "Runway + shoulder"	New recommendation 60m for Codes D, E & F with 2- or 3-engines; 75m for Code F (4- or more engines). New recommendation for Code F to be paved to not less than 60m.	Was 60m for Codes D, E; 75m for Code F. No explicit requirement for shoulders to be paved.
Minimum Width of Runway strip	Reduced to 140m for Codes 3 or 4 (i.e. for aeroplanes with reference field length over 1200m). Reduced to 70m for Codes 1 or 2 (i.e. for aeroplanes with reference field length over 800m). <u>Std</u> for PA/Rec for NPA	Was 150m for Codes 3, 4 Was 75m for Codes 1, 2



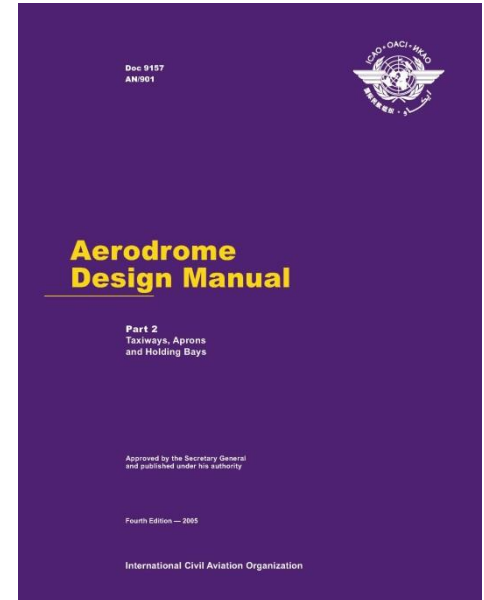
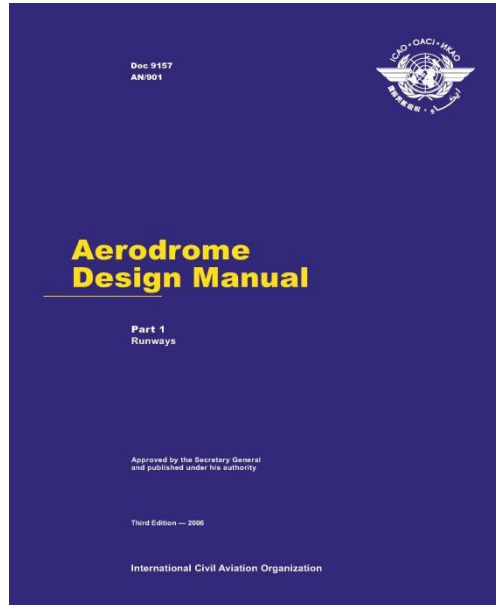
Characteristic	Proposed amendment	Formerly
Minimum distance from edges on Runway turn pad & Taxiway	Reduced to 4m, based on OMGWS from 9 to 15m.	Was 4.5m.
Minimum Width of Taxiway	Reduced to 23m for OMGWS from 9 to 15m.	Was 25m for Code F.
Minimum width of Taxiway and shoulders	Reduced to 44m for Code F. Reduced to 38m for Code E. Reduced to 34m for Code D.	Was 60m Was 44m Was 38m
Minimum Runway-Taxiway separation distance	Reduced to 180m for Code 4 instrument runways.	Was 190m

- **8th Edition Annex 14 Vol I, July 2018 includes:**
 - Amendment 13B
 - Amendment 14
- **See also:**
 - State letter AN 4/1.1.57-17/44 (English & Spanish)  
 - State letter AN 4/1.2.27-18/23 (English & Spanish)  





- Amendment 2 to ADM Part 1
- Amendment 1 to ADM Part 2



Part 2. Taxiways, Aprons and Holding Bays
Chapter 1. Taxiways

1-5

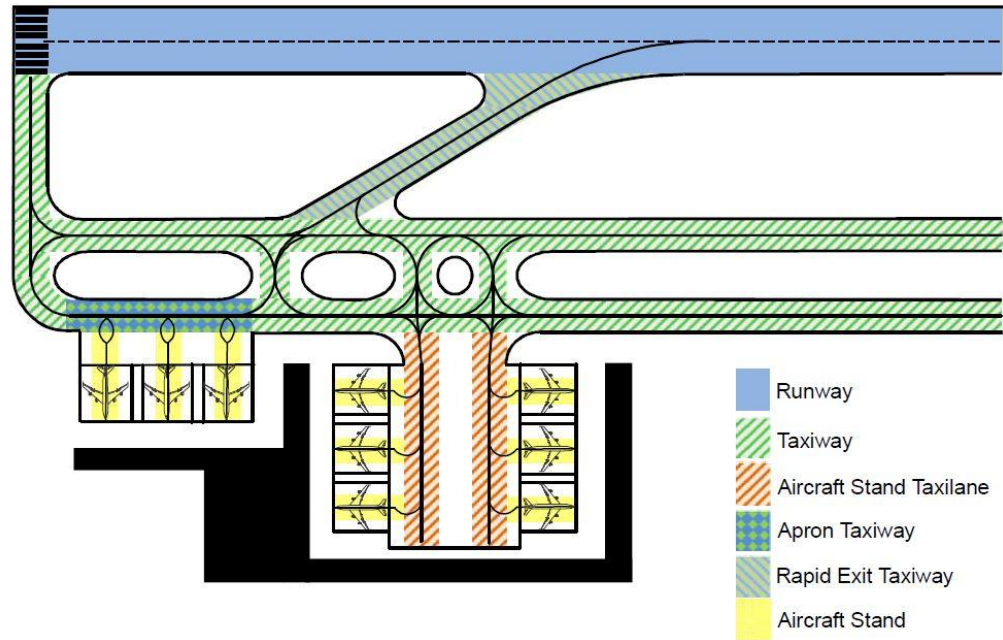


Figure 1-1. Taxiways on aprons

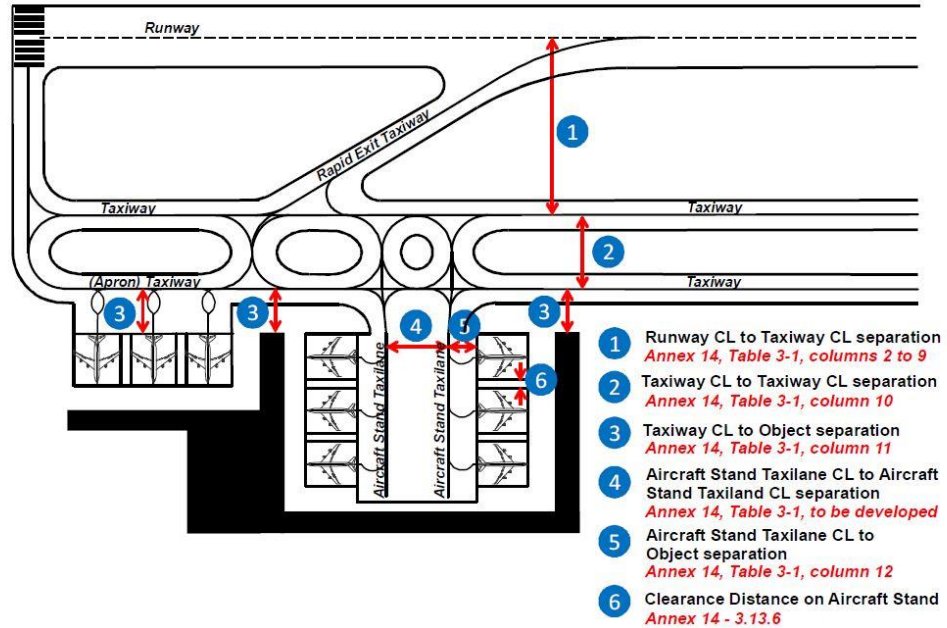


Figure 1-2. Taxiway minimum separation distances



Salient features of proposals

- Remove OMGWS in current ARC code letter, retain only wingspan used to determine separation distances
- OMGWS used to determine ground-based manoeuvring characteristics such as runway and taxiway widths
- Confirmation from aircraft manufacturers that the trend for max OMGWS is to be revised downwards from 16 m to 15 m;
- Runway width for aeroplanes with $9\text{m} \leq \text{OMGWS} < 15\text{m}$ to be 45 m instead of 60 m
- Runway shoulder width : 7.5 m of paved shoulder for codes D, E and F; for code F with four engines, additional 7.5 m unpaved shoulder to resist jet blast and FOD ingestion
- Runway (half) strip width : 140 m instead of 150 m for codes 3 & 4 INST runways
- Runway – taxiway separation : 180 m instead of 190 m for codes 3F & 4F INST runways
- Taxiway width for aeroplanes with $9\text{m} \leq \text{OMGWS} < 15\text{m}$ to be 23 m instead of 25 m



Benefits to industry

- Improve capacity & efficiency
- 1st – ease certification of aerodromes that are non-compliant by a few meters (refer AN Min 149-12) and avoid very costly runway/taxiway improvements, potential savings \$billions/aerodrome
- 2nd – aerodrome operators able to accept large aeroplane operations within existing infrastructure or with fewer major modifications. Eg. a 60 m wide runway costs ~ 20% more to build than a “45 m wide runway + 15 m paved shoulder”. For taxiways, large aerodromes can have as much as 50 km or more of taxiways (16 m reduction x 50 km x US\$100 – \$300 /sq m savings)annual maintenance costs?
- 3rd – airlines unable to operate larger aeroplanes at some airports due to regulatory restrictions would have greater opportunities to deploy their fleet and therefore open new routes
- 4th – aerodrome operators would be able to reduce operational restrictions such as designated taxi routes for large aeroplanes which can save taxi time and increase capacity.



Other Benefits

- **Benefits to environment**
 - less pavement surfaces, smaller footprints, potentially smaller perimeter for new aerodromes and more grass surfaces
- **Benefits to economy**
 - by reducing overall paved surfaces to be unnecessarily built or maintained



WHAT'S COMING? (short term)

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- 3RD MEETING OF AERODROME DESIGN AND OPERATIONS PANEL (ADOP/3, March 2018), among others:
 - revised definitions of INST & NINST runways
 - revised width of clearways
 - provisions to accommodate aeroplanes with folding wingtips
 - standardized taxiway naming convention
 - provisions for airport master planning
- AN-WP/9267 Preliminary Review taken up by ANC on 4 October 2018
- Will become Amendment 15 to Annex 14, Vol I after due process
- Applicable November 2020

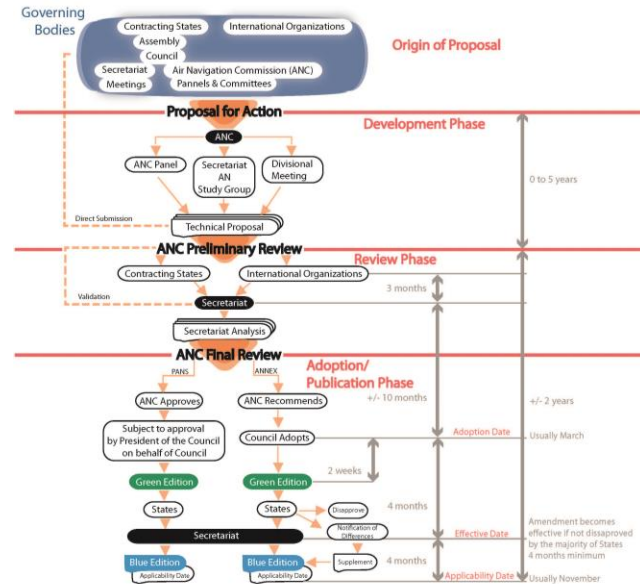


WHAT'S COMING? (long term)

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- Continue work on, among others:
 - Arresting systems
 - Wing tip separation with VDGS
 - Width of runway strips for NINST runway
 - Impact of new OLS methodology on physical characteristics
 - Rapid exit taxiways
 - Taxiway turns and fillet designs
 - Turnpad design
- Will become Amendment 16, after due process, in Nov 2022





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UNITING AVIATION



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