Aircraft and Airport Compatibility

Evanicio Costa – Principal Lead Engineer

September 2022

Agenda

- ❑ Market Outlook
- ❑ Sustainability
- ❑ Product Update
- ❑ Physical Characteristics
- ❑ 777X Folding Wingtips Concept of Operations
- ❑ Pavement Loading
- ❑ Impacts of long-term parking on runways/taxiways and non-parking areas.

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Market Outlook

Airlines will need 41,170 new airplanes over 20 years

20-year forecast: long-term fundamentals remain intact

- **2.6%** World economy (GDP)
- **3.8%** Passenger traffic (RPK)
- **4.1%** Cargo traffic (RTK)
- **2.8%** Fleet growth (jets)

By type

Regional jet	Single-aisle	Widebody	Freighter
2,120	30,880	7,230	940
5%	75%	18%	2%

By region

Forecast period 2022-2041, Asia Pacific does not include China

Sustainability

Sustainable Aerospace Firsts

2008

A Boeing-converted Diamond DA20 conducts the world's first crewed flight using fuel cells powered by hydrogen

A Virgin Atlantic 747 makes the world's first sustainable aviation fuel test flight using a commercial aircraft

2009

The Boeing 787 Dreamliner becomes the first commercial airplane made largely from lightweight carbon composites, informing efficient design

Boeing breaks ground on the LEED Gold-certified North Charleston, South Carolina 787 Final Assembly Facility, creating an environmentally responsible approach to construction

2010

Boeing supports the supersonic flight of a U.S. Navy F/A-18 on a 50/50 SAF blend - U.S. Navy photo

Boeing partners with the U.S. Air Force on an in-depth fuel study as part of their efforts to certify the C-17 Globemaster to use SAF

2011

Boeing is a founding member of the International Aerospace Environmental Group, developing a standard approach to supply chain environmental issues and innovative solutions for the aerospace industry

2012

The ecoDemonstrator 737-800 tests regenerative hydrogen fuel cell technology for onboard auxiliary power applications

The Phantom Eye uncrewed aircraft flies several flights powered by liquid hydrogen

2014

2015

Boeing supports research to help small-scale farmers in South Africa bring their feedstock crops to the aviation biofuel market

A Boeing uncrewed demonstrator flies over 100 flights in Spain using fuel cells powered by green hydrogen

2016

Boeing matures its Transonic Truss-Based Wing concept after its first wind tunnel test

2018

The ecoDemonstrator 777 Freighter becomes the first commercial airliner in the world to fly on 100% SAF

Boeing and ELG Carbon Fibre Ltd. create a first-of-its-kind partnership to recycle excess carbon composite fiber generated from making 777X wings

2019

Boeing joint venture Wisk begins flight-testing the Cora electric air taxi for urban mobility markets

2021

Boeing commits to making an entire family of commercial airplanes 100% SAF capable by 2030

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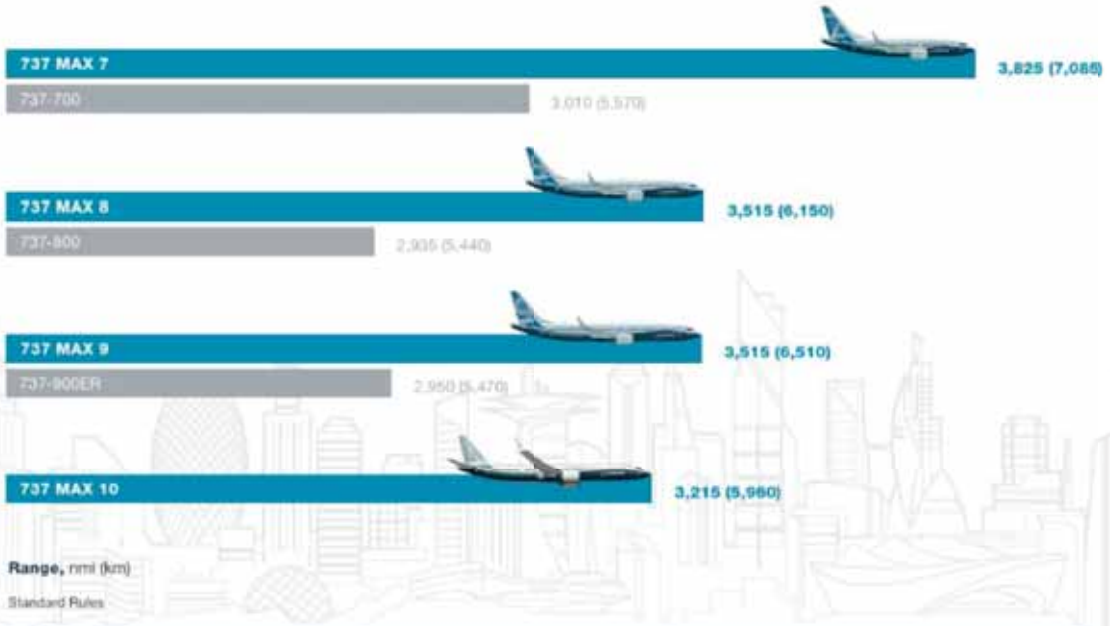
Product Update

737 Flight Crews Will Feel at Home in the MAX

737 MAX Flies Farther Than the Next-Generation 737



	737 MAX 7	737 MAX 8	737 MAX 9	737 MAX 10
Seats (2-class)	138 – 153	162 – 178	178 – 193	188 – 204
Maximum seats	172	210	220	230
Range nm (km)	3,850 (7,130)	3,550 (6,570)	3,550 (6,570)*	3,300 (6,110)*
Length	35.56 m (116 ft 8 in)	39.52 m (129 ft 8 in)	42.16 m (138 ft 4 in)	43.8 m (143 ft 8 in)
Wingspan	35.9 m (117 ft 10 in)	35.9 m (117 ft 10 in)	35.9 m (117 ft 10 in)	35.9 m (117 ft 10 in)
Engine	LEAP-1B from CFM International	LEAP-1B from CFM International	LEAP-1B from CFM International	LEAP-1B from CFM International
		210 seats: 737-8-200	*one auxiliary tank	*one auxiliary tank

Product Update

777-8F Characteristics

71.8 m / 235 ft 5 in (wing tips extended)
64.8 m / 212 ft 8 in (on ground)
WINGSPAN

19.5 m / 64 ft
HEIGHT

70.9 m / 232 ft 6 in
LENGTH

Payload
Structural (Gross): **118.2** tonnes
Revenue (Net): **112.3** tonnes

Range
4,410 nmi

World's most capable and fuel efficient twin-engine freighter for the future

777-8F builds on the worldwide success of the best-selling 777F and the new 777X

Highest payload and long-range capability to open new markets

Most fuel-efficient and lowest CO2 emissions for a sustainable future

Structural Payload (Gross): 118.2 tonnes
Revenue Payload (Net): 112.3 tonnes

Range: 4,410 nmi

Lowest operating costs per tonne for more profit

777-8F carries 31 main deck pallets

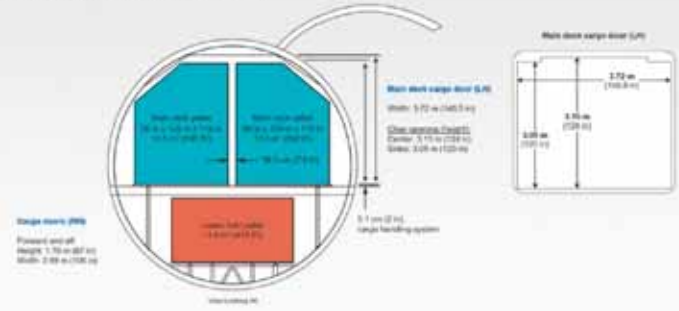
17% more volume than the 777F

ULD Type	Capacity ft³ (m³)	Tare lb. (kg)	Deck	Cargo Volume
26	96" x 125" x 118" pallet	660 (19 lb)	300 (136 lb)	Main Deck	21,001 ft³ (594.4 m³)
4	96" x 125" x 118" pallet	627 (17 lb)	300 (136 lb)	Main Deck	
1	96" x 125" x 96" pallet	613 (17 lb)	300 (136 lb)	Main Deck	
12	96" x 125" x 64" pallet	415 (11 lb)	200 (91 lb)	Lower Hold	5,099 ft³ (160.9 m³)

Total Cargo Volume 27,086 ft³ (766.4 m³) Total Tare Weight 13,670 lb. (5,828 kg)

Both 777 Freighters can carry 3-meter (10-ft) tall pallets

Seamless interlining capability between 777F and 777-8F



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Physical Characteristics

❑ Aerodrome Reference Code

❑ ICAO Annex 14 Vol I, Table 1-1

Table 1-1. Aerodrome reference code
(see 1.6.2 to 1.6.4)

Code element 1	
Code number	Aeroplane reference field length
1	Less than 800 m
2	800 m up to but not including 1 200 m
3	1 200 m up to but not including 1 800 m
4	1 800 m and over
Code element 2	
Code letter	Wingspan
A	Up to but not including 15 m
B	15 m up to but not including 24 m
C	24 m up to but not including 36 m
D	36 m up to but not including 52 m
E	52 m up to but not including 65 m
F	65 m up to but not including 80 m

Note 1.— Guidance on planning for aeroplanes with wingspans greater than 80 m is given in the Aerodrome Design Manual *(Doc 9157), Parts 1 and 2.*

Note 2.— Procedures on conducting an aerodrome compatibility study to accommodate aeroplanes with folding wing tips spanning two code letters are given in the PANS-Aerodromes (Doc 9981). Further guidance can be found in the manufacturer's manual on aircraft characteristics for airport planning.

ICAO Reference Code

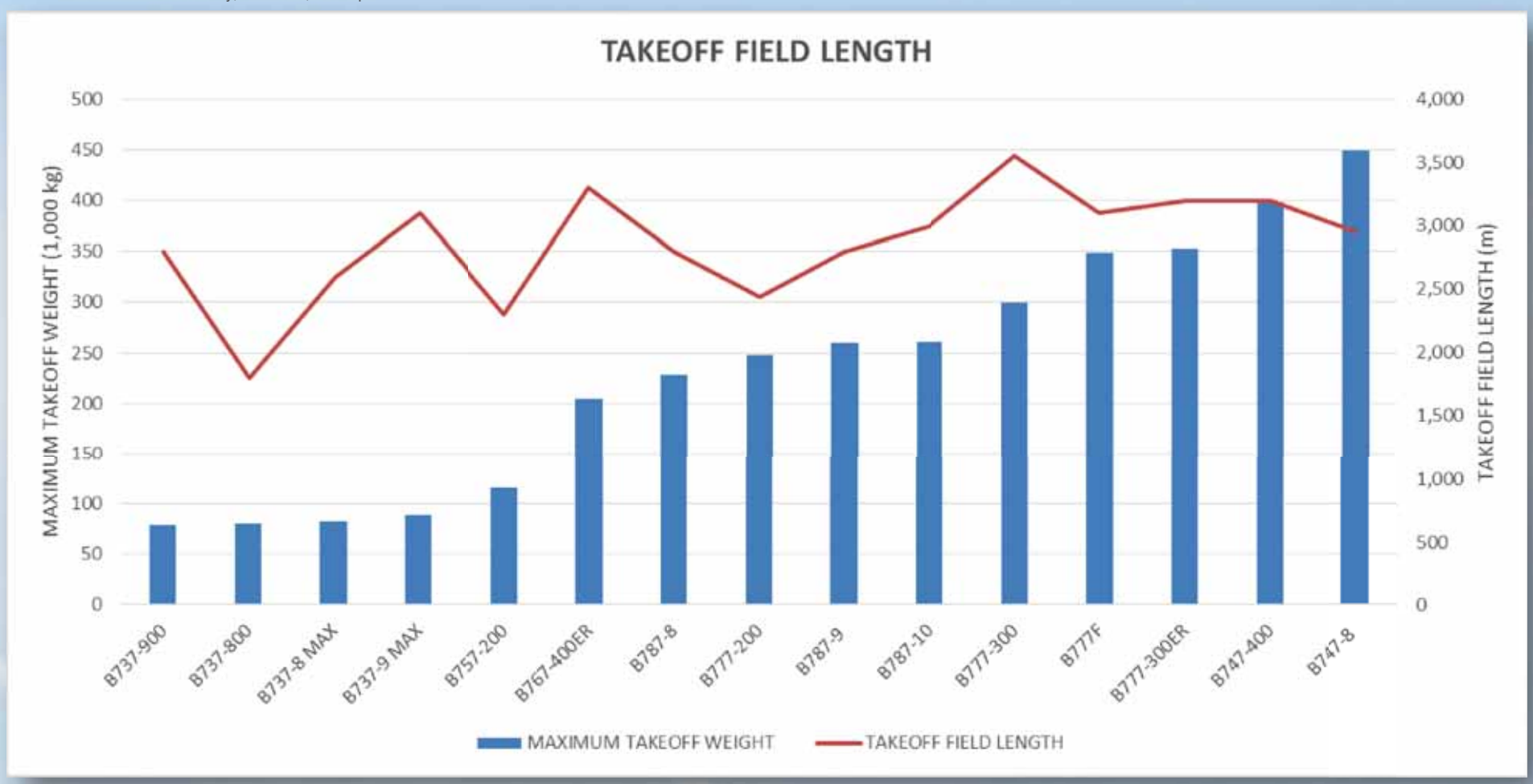
Model		Wingspan (ft./m)	ARFL (ft./m)	Code Number	Code Letter
787-9		197.3/60.1	9,186/2,800	4	E
747-400		213/64.9	9,481/2,890	4	E
747-8		224.4/68.4	9,698/2,956	4	F
777-300ER		212.8/64.8	10,236/3,120	4	E
777-8F	Wingtip Folded	212.8/64.8	---	4	E
	Wingtip Extended	235.4/71.8	---	4	F
777-9	Wingtip Folded	212.8/64.8	9,514/2,900*	4	E
	Wingtip Extended	235.4/71.8	9,514/2,900*	4	F

- Preliminary data
- Aeroplane reference field length (ARFL) is based on Maximum Taxi Weight at standard day, seal level conditions.

Physical Characteristics

❑ Aircraft Field Length Requirement

- ❑ ICAO Annex 14 Vol. I 8th Edition - Table 1-1
  - ❑ Conditions: Standard Day, Sea level, 0% slope



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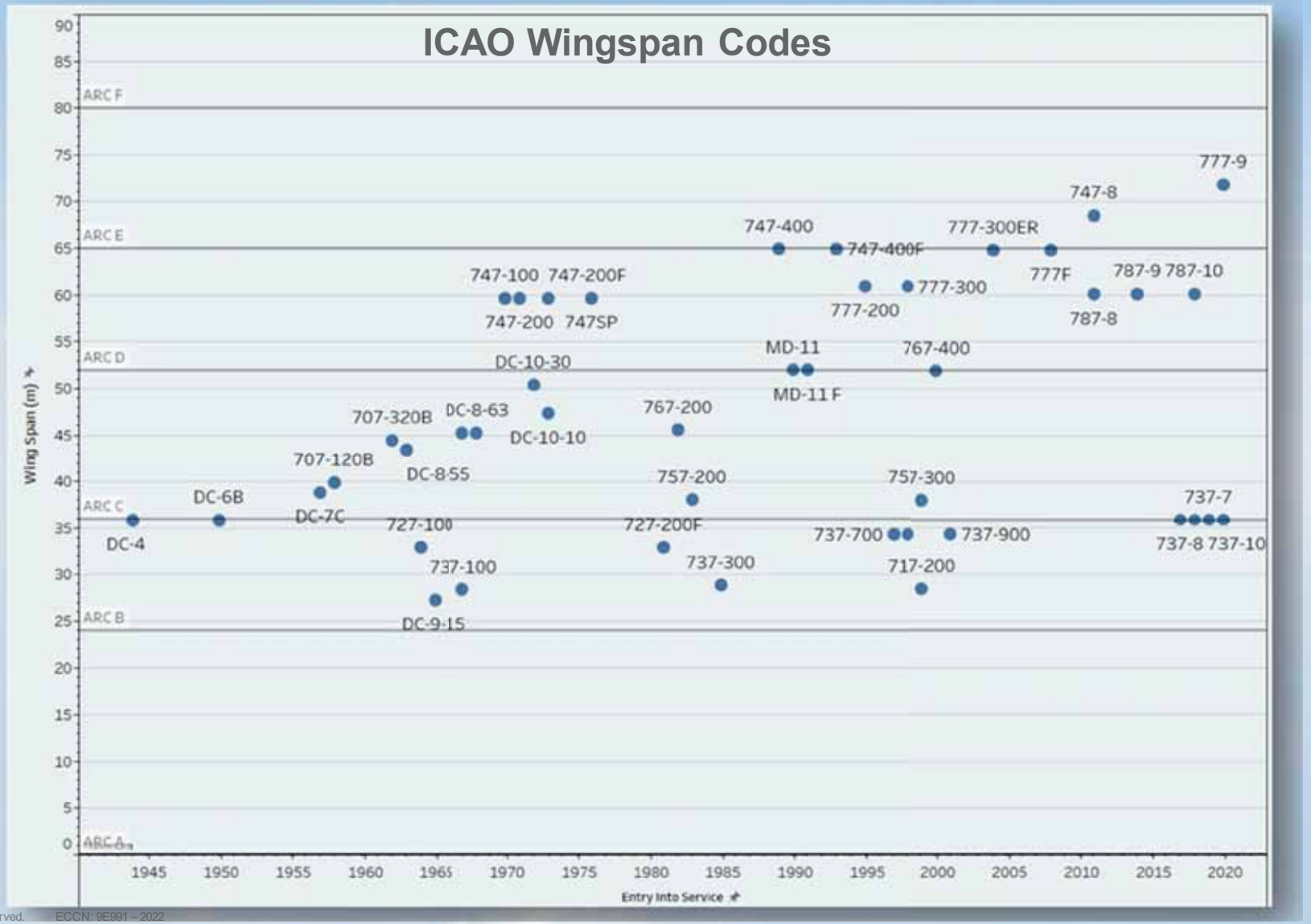
Physical Characteristics



Physical Characteristics

Compatibility Trends

- Wingspan vs Weight

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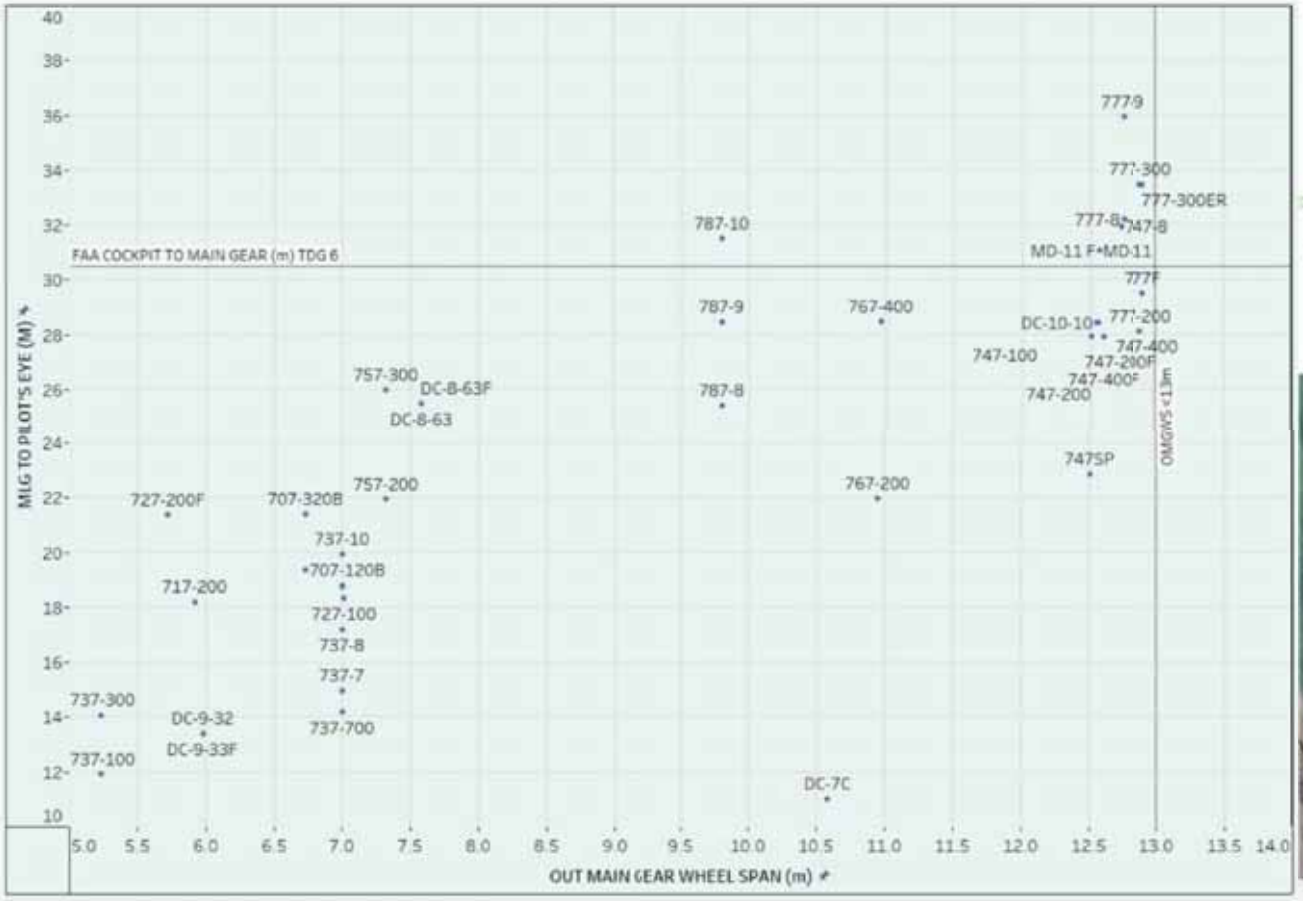
Physical Characteristics

- Maneuvering Capabilities

Outer Main Gear Wheel Span (OMGWS) vs Cockpit to Main Gear (CMG)



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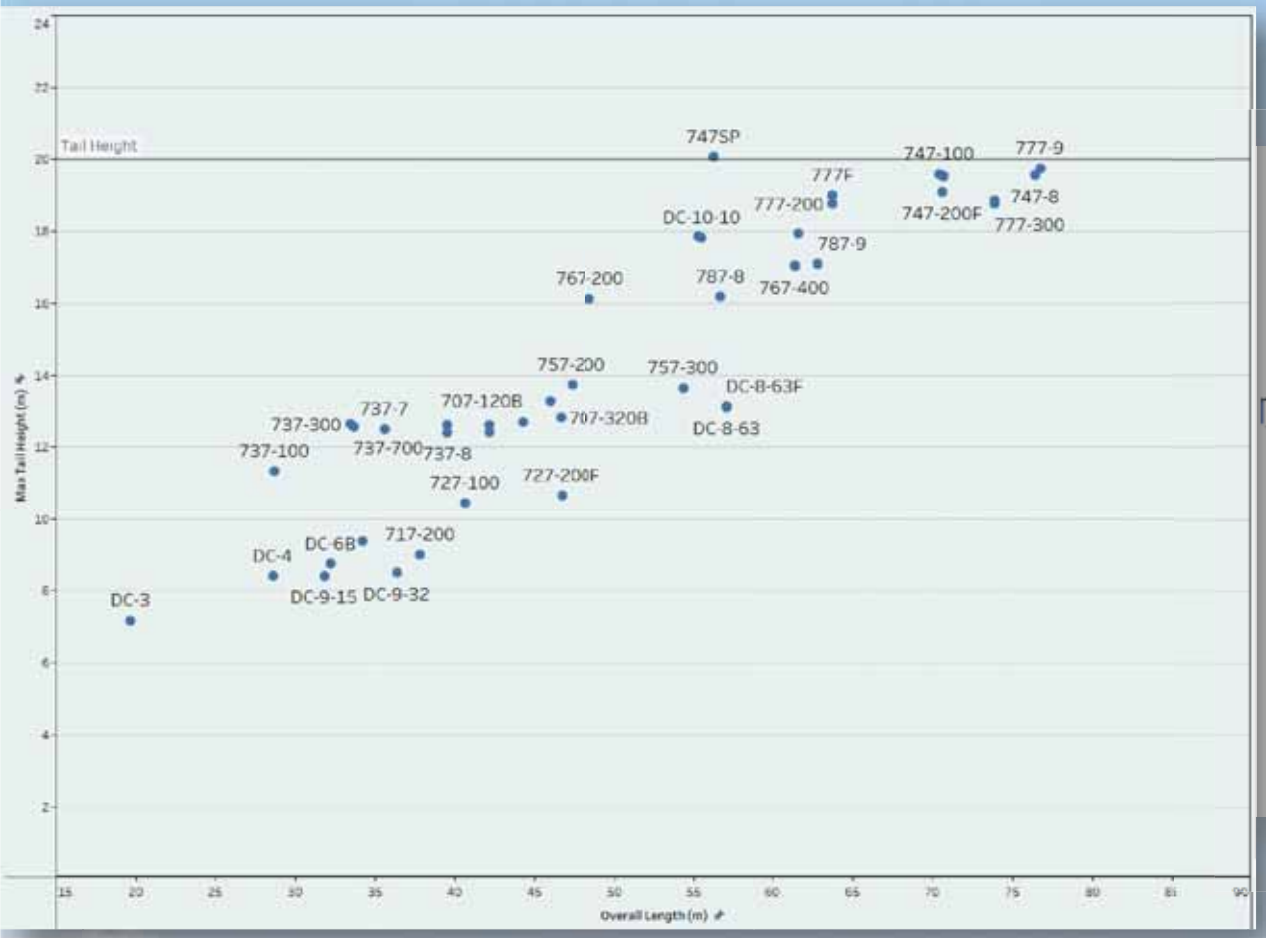
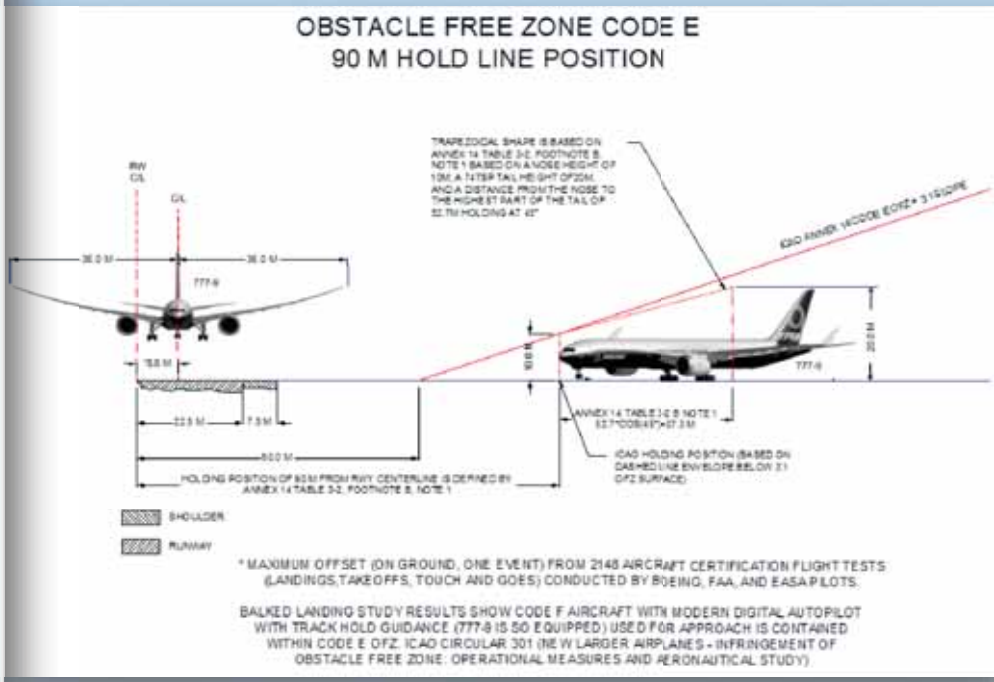
Tail Height vs Overall Length





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Physical Characteristics

		777-9 (m)	777-300ER (m)	777F (m)	787-8 (m)	787-9 (m)	787-10 (m)	747-8 (m)	767F (m)	737-7 (m)	737-8 (m)	737-9 (m)	737-10 (m)
Wingspan	Wingtip Folded	64.8	---		---	---	---	---	---	---	---	---	---
	Wingtip Extended	71.8	64.8*	64.8*	60.1*	60.1*	60.1*	68.4*	47.6*	35.9*	35.9*	35.9*	35.9*
Overall Length		76.7	73.9	63.7	56.7	62.8	68.3	76.4	54.9	35.6	39.5	42.1	43.8
Tail Height		19.7	18.9	19.0	16.9	17.0	17.0	19.51	16.1	12.5	12.5	12.4	12.5
Wheelbase		32.3	31.2	25.9	22.8	25.8	28.8	31.2	22.8	13.4	15.6	17.2	18.3
Outer Main Gear Wheel Span		12.8	12.9	12.9	11.6	11.9	11.9	12.7	10.9	7.0	7.0	7.0	7.0
Weights (ton)													
Maximum Taxi Weight (MTW)		352.4	352.4	348.7	228.4	254.7	254.7	449.1	187.3	80.5	82.8	88.5	89.9
Maximum Takeoff Weight (MTOW)		351.5	351.5	347.8	227.9	254.0	254.0	447.7	186.8	80.2	82.6	88.3	89.7
Maximum Landing Weight (MLW)		266.3	251.3	260.8	172.4	192.7	201.8	312.1	147.8	66.0	69.3	74.3	75.9
ICAO Classifications													
ICAO Aerodrome Reference Code		4F/4E**	4E	4E	4E	4E	4E	4F	4D	3C	4C	4C	4C
Rescue and Firefighting Category		10	9	9	8	9	9	10	8	6	7	7	7

*** Airplane does not have a folding wingtip system**
**** Wingtips folded**

BOEING

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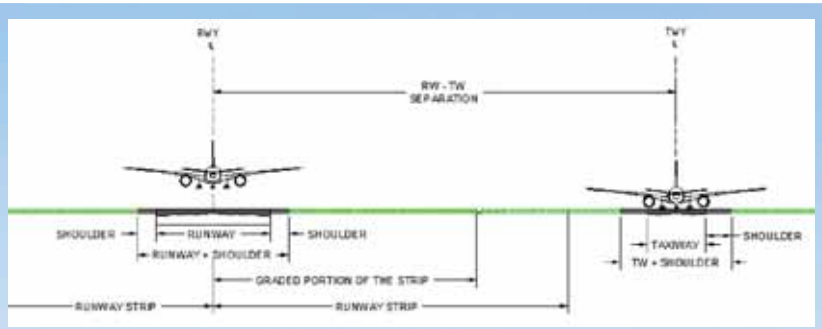
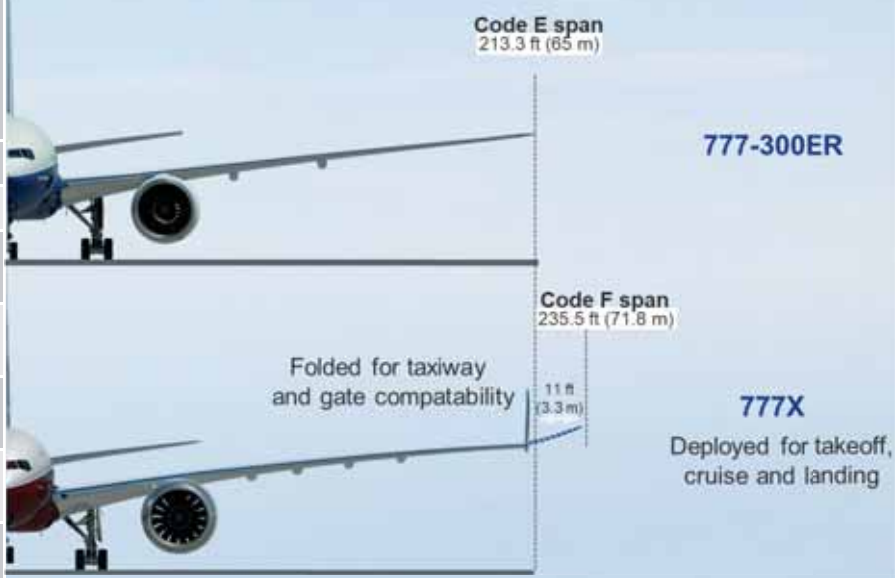
Physical Characteristics

❑ Airfield Geometry Features Separations



ICAO Standards and Recommendations (ICAO Annex 14 Vol I 8th Edition)	777-9		777-300ER	787-9	747-400	747-8	A350-1000	A380
Runway – Taxiway Centerline Separation (m)	Code F (FWT Extended)	Code E (FWT Folded)						
-- Instrument Runways	180	172.5	172.5	172.5	172.5	180	172.5	180
-- Non-Instrument Runways	115	107.5	107.5	107.5	107.5	115	107.5	115
Taxiway - Taxiway Centerline Separation (m)	91	76	76	76	76	91	76	91
Taxilane - Taxilane Centerline Separation (m)	87.5	72.5	72.5	72.5	72.5	87.5	72.5	87.5
Taxiway Centerline - Object Separation (m)	51	43.5	43.5	43.5	43.5	51	43.5	51
Taxilane Centerline – Object Separation (m)	47.5	40	40	40	40	47.5	40	47.5
Clearance Distance on Aircraft Stands (m)	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5



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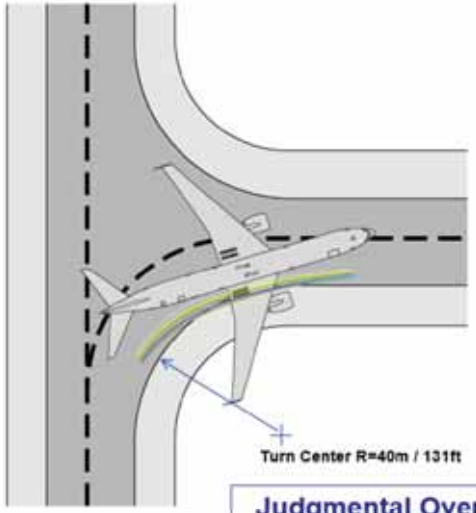
Physical Characteristics

❑ Maneuvering Capabilities

- **Ground Maneuvering**



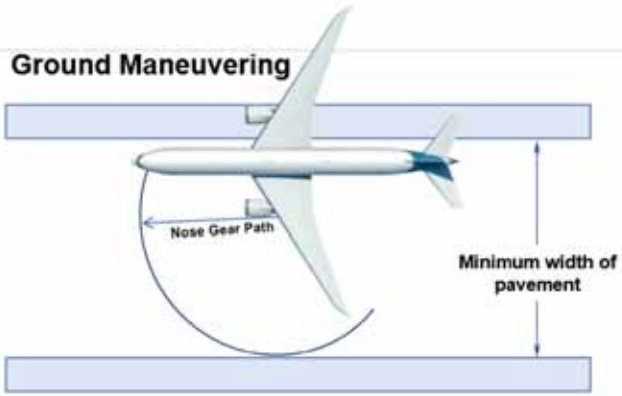
Model	ICAO design code	Tire edge to turn center (m)
A340-600	E	38.4
A350-1000*	E	38.7
A380	F	39.0
777-9*	E**	39.0
777-300ER	E	39.3
747-8	F	39.9
787-10*	E	40.8
747-400	E	41.8

Less Critical

* Preliminary
** Code E after exiting the runway
777-8 fillet requirement will be less critical than the 777-300ER

Judgmental Over-steering permits adequate tire edge clearance on most existing fillets

- **Ground Maneuvering**



- U-turn width can be reduced by using differential braking and/or asymmetrical thrust
- Minimum widths are calculated based on data from available airport planning manuals – values may vary during operations

	747-400	787-10 [1]	747-8	777-300ER	777-9 [1]	A340-600	A380-800 [2]
ICAO Airplane Design Code	E	E	F	E	F/E	E	F
180° turn width (m) max steering angle [3]	51 m	53 m	52 m	57 m	58 m	57 m	57 m

1. Preliminary
2. Boeing calculation using no differential braking, asymmetric thrust – current Airbus A380 planning manual value 50.91m (167 ft) includes differential braking and asymmetric thrust
3. Minimum widths do not take into account tire-edge clearance of 15 ft (4.5m) at both pavement edges, nor differential braking or asymmetrical thrust
4. 777-8 turn width will be less than the 777-300ER

ICAO Standards and Recommendations (ICAO Annex 14 Vol. I 8th edition)	777-9	777-300ER	787-9	747-400	747-8	A350-1000	A380
Min. Runway Width (m)	45	45	45	45	45	45	45
Min. Runway + Shoulder Width (m)	60	60	60	60	60	60	75
Min. Taxiway Width (m)	23	23	23	23	23	23	23
Min. Taxiway + Shoulder Width (m)	44 for Code F (FWT extended) 38 for Code E (FWT folded)	38	38	38	44	38	44
Outer tire edge to pavement edge clearance (m)	4	4	4	4	4	4	4
Outer Main Gear Wheel Span (OMGWS) (m)	12.8	12.9	11.9	12.6	12.7	12.5	14.3

Physical Characteristics

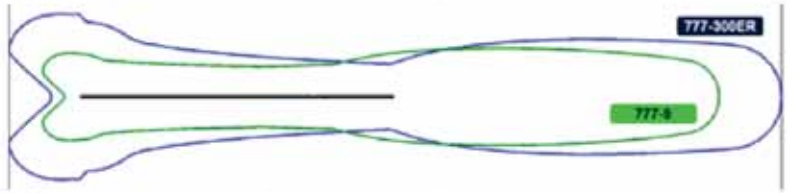
❑ Airport Community Noise

BIGGER, BETTER ENGINE

Like Boeing's other 737 MAX models, the MAX 10 incorporates the latest technology CFM International LEAP-1B engines. Advances in engine and winglet design technologies deliver reductions in noise, carbon and NOx emissions. All of which demonstrate our mutual respect in driving positive change for the environment.

777-9

- 85dBA Takeoff Noise Contours, MTOW mission



85dBA Approach Noise Contours at MLW

- 777-300ER levels are based on Certified Noise Database
- 777-9 levels are predicted levels based on the noise model
- Examples above depict a runway length of 10,000feet (3048 meter) long.

Physical Characteristics

❑ Aircraft Rescue and Firefighting Classification

- ❑ ICAO Annex 14 Vol. I 8th Edition - Rescue and Firefighting Categories

	777-9	777-300ER	787-9	747-400	747-8	A350-1000	A380
Fuselage Width (m)	6.2	6.2	5.8	6.5	6.5	5.9	8.4
Overall Length (m)	76.7	73.1	62.8	70.7	76.4	73.8	72.7
ICAO Rescue and Fire Fighting (RFF) Category	10*	9	9	9	10	9	10

* Airports with RFF Cat 9 can accommodate airplane RFF Cat 10, based on ICAO RFF Remission factor.

Table 9-1. Aerodrome category for rescue and firefighting

Aerodrome category (1)	Aeroplane overall length (2)	Maximum fuselage width (3)
1	0 m up to but not including 9 m	2 m
2	9 m up to but not including 12 m	2 m
3	12 m up to but not including 18 m	3 m
4	18 m up to but not including 24 m	4 m
5	24 m up to but not including 28 m	4 m
6	28 m up to but not including 39 m	5 m
7	39 m up to but not including 49 m	5 m
8	49 m up to but not including 61 m	7 m
9	61 m up to but not including 76 m	7 m
10	76 m up to but not including 90 m	8 m

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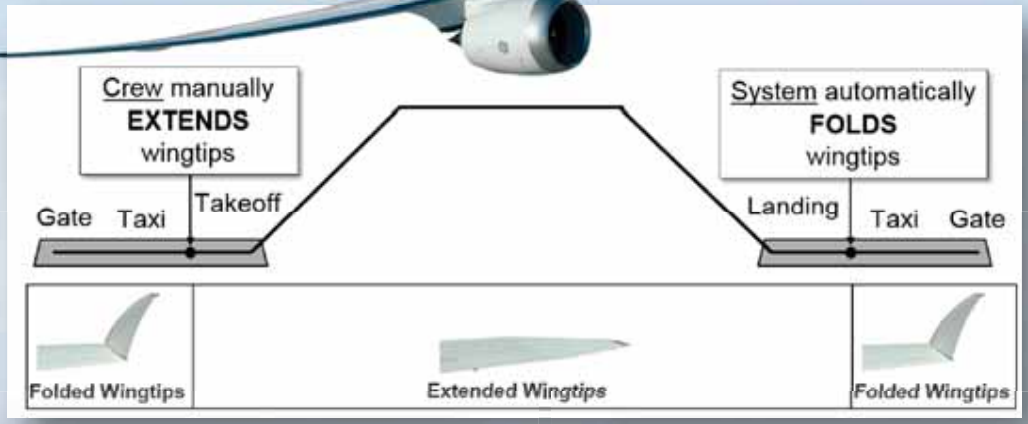
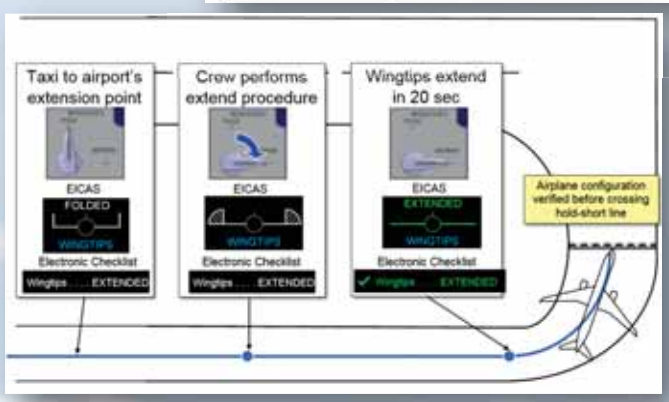
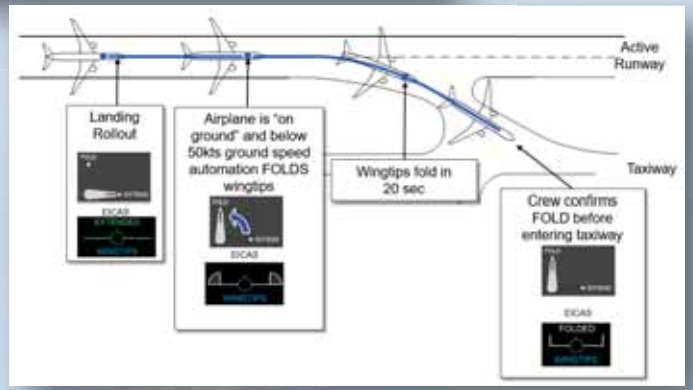
777X FWT Operations at Airports

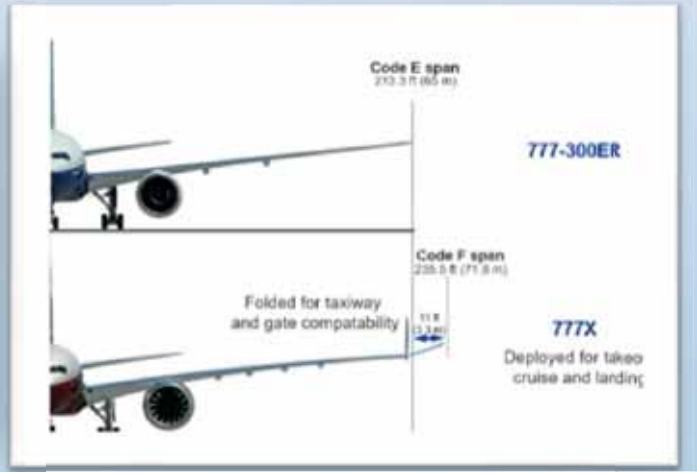
❑ Physical Characteristics

	777-300ER	777-8F	777-9
MTW	352,441 kg (777,000 lb.)	366,049 kg (807,000 lb.)	352,441 kg (777,000 lb.)









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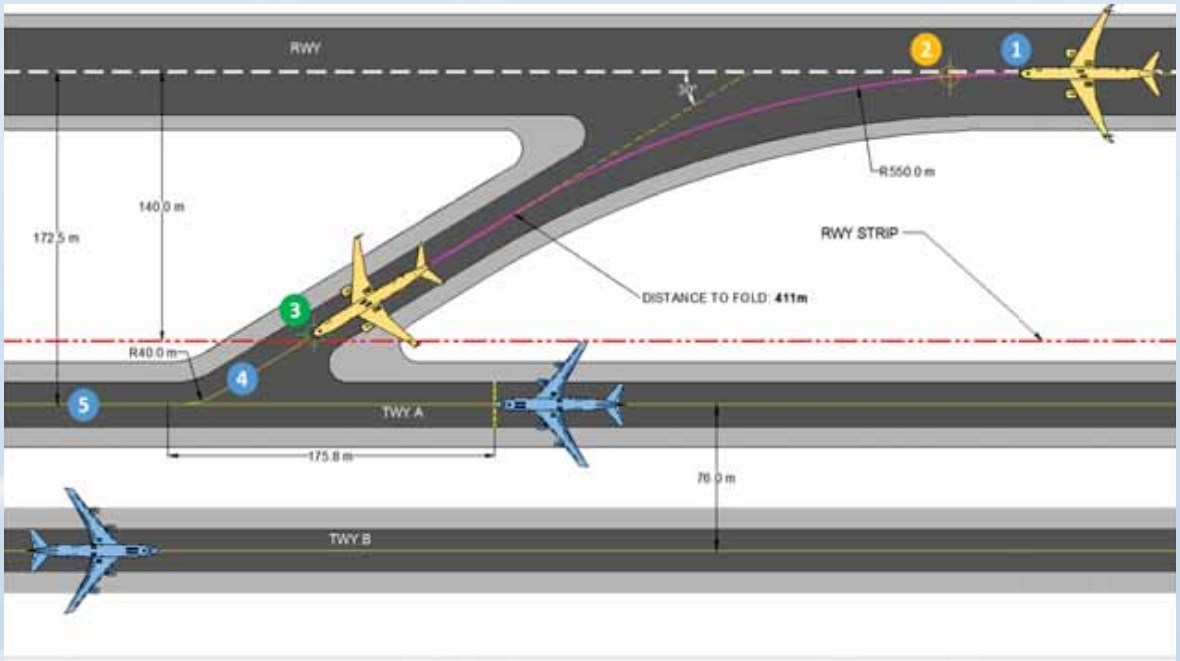
777X FWT Operations at Airports

❑ 777X Folding Wingtip Operational – Rapid Exit Taxiway

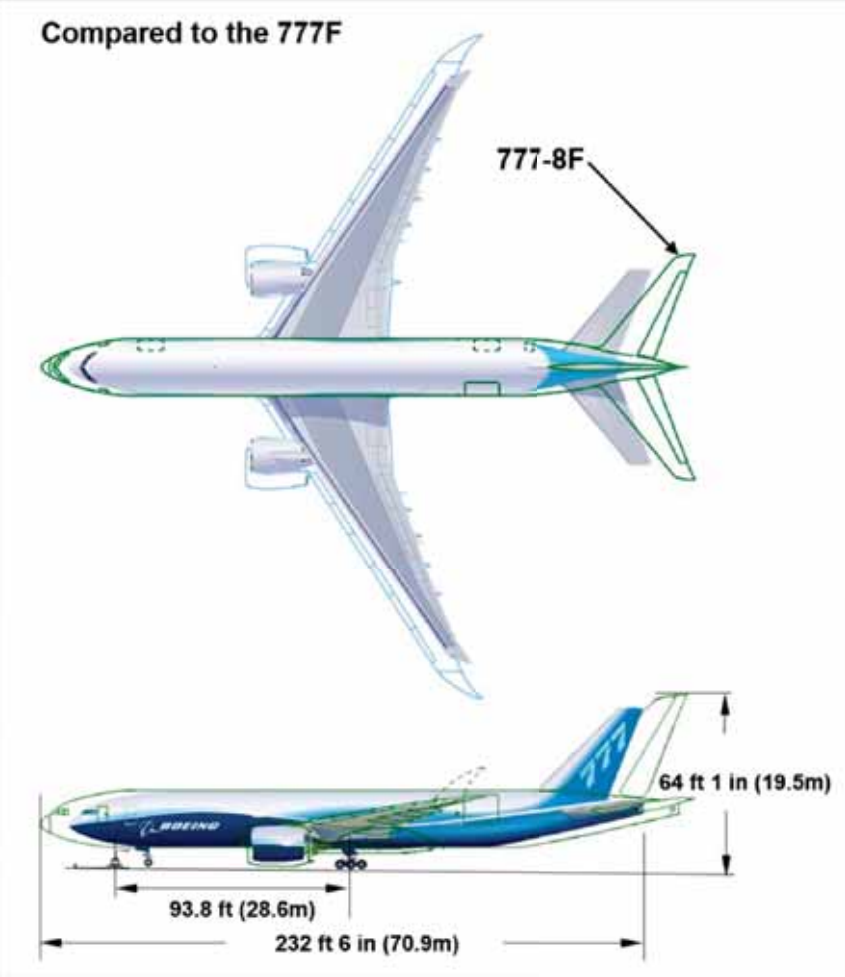
- **Rapid exit taxiway (RET) considered in FWT operational procedure development**
  - Boeing performed studies to confirm that the timing as part of the design will ensure that the FWT will be folded prior to entering the parallel taxiway.
  - These studies considered high speed exits to rapid-exit taxiways designed to both ICAO and FAA separation standards
  - Simulation of the 777-8/9 taking an ICAO rapid-exit taxiway (RET) to ICAO Annex 14 and Aerodrome Design Manual parameters conducted (below)
  - Simulation confirms wing tips folded prior to entering parallel taxiway

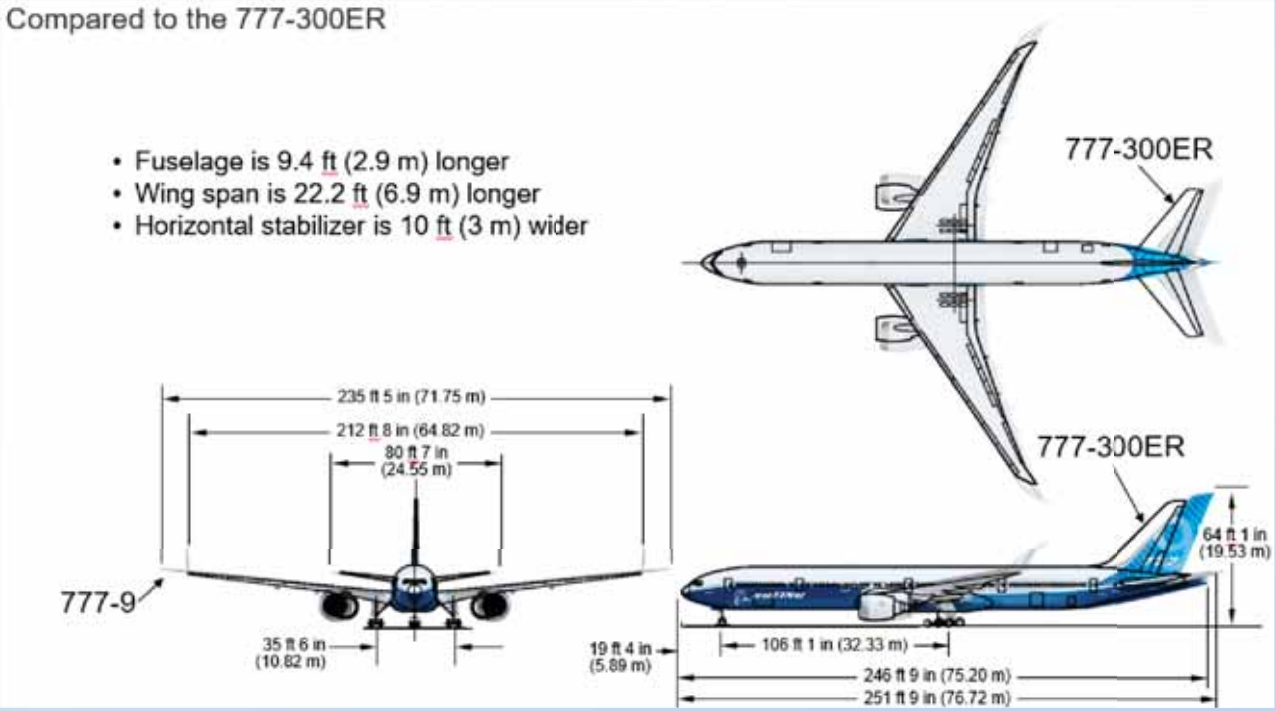


1. Initial point where aircraft enters the RET
2. Transition of FWT to fold begins at 50 kt ground speed.
3. FWT are folded prior to entering the parallel taxiway—777-8/9 is Code E.
4. FWT are folded, 777-8/9 reaches 14 kt ground speed and maintains it throughout the remainder of the RET
5. FWT are folded.

777X FWT Operations at Airports

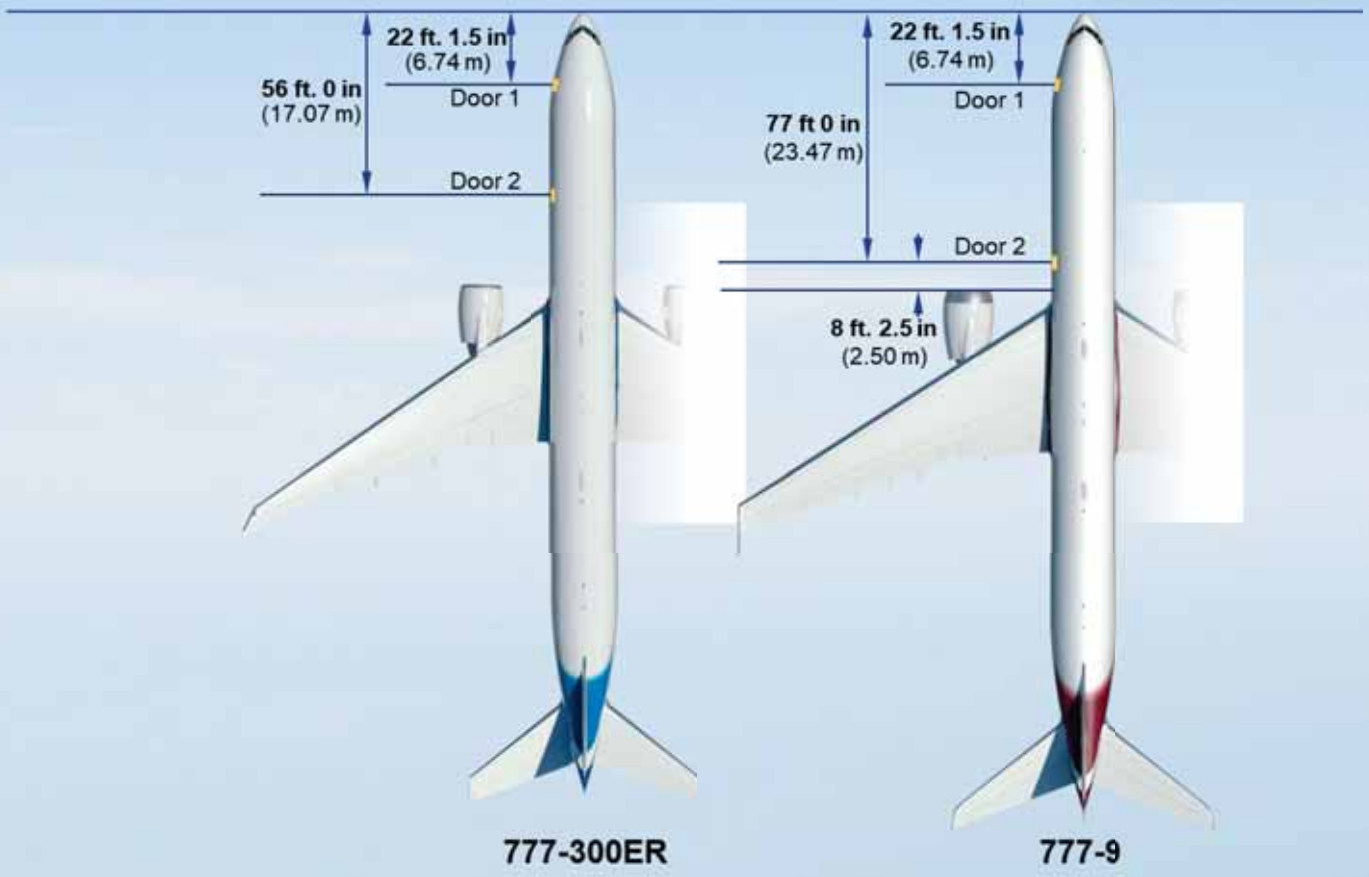
- **Physical Characteristics – 777-9 Parking at a 777-300ER Gate**





777X FWT Operations at Airports

- **Physical Characteristics – 777-9 Parking at a 777-300ER Gate**



Door distance is measured from the nose to to the centerline of the door

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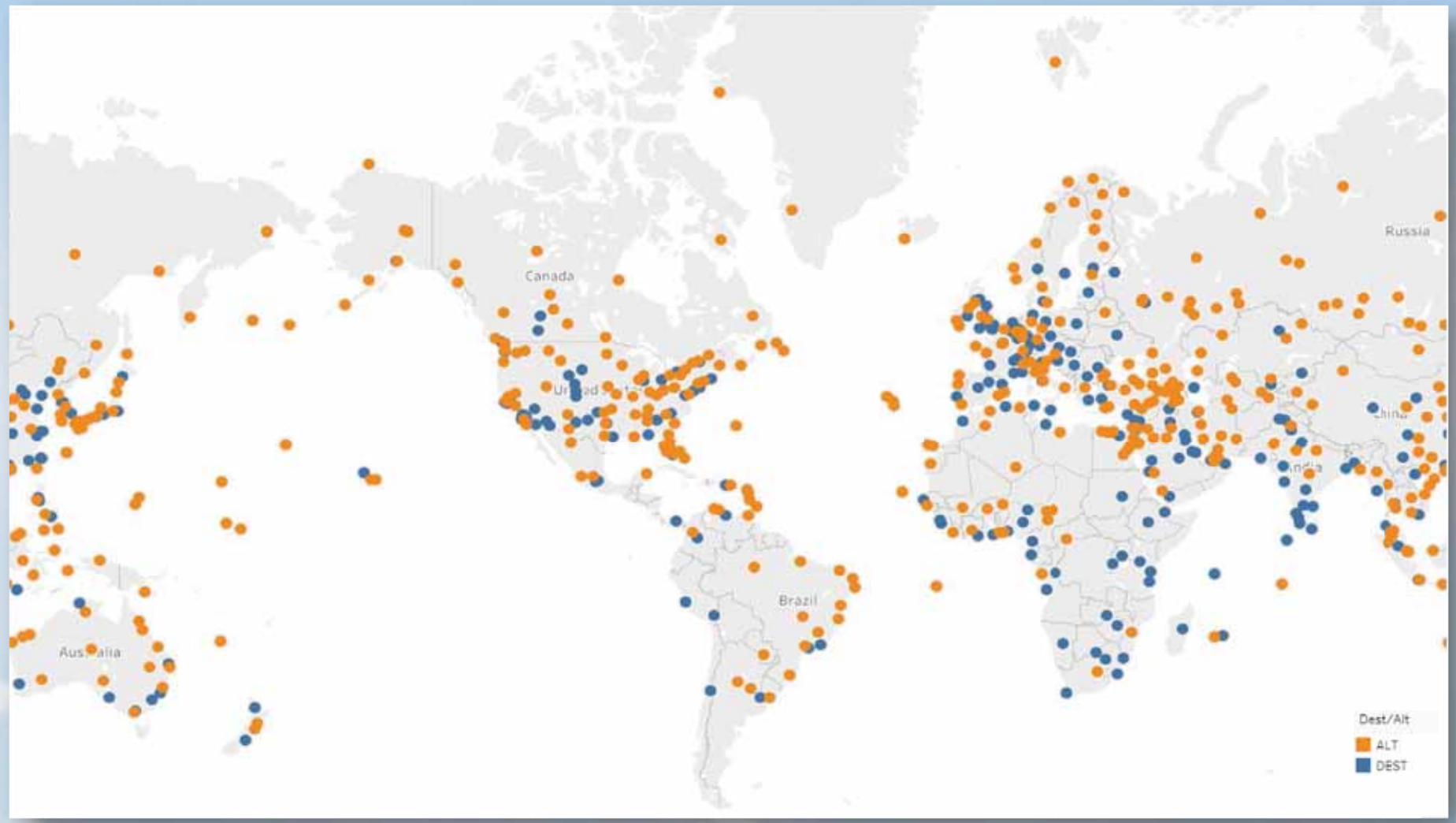
777X Airports

- **Customer Airlines have identified over 600 airports to support 777X operations**



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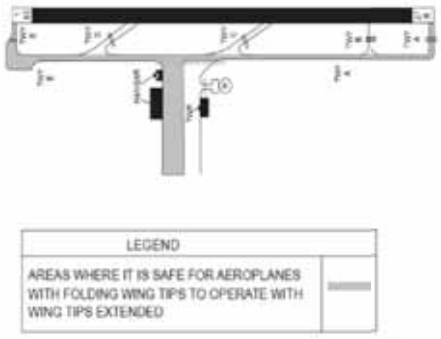
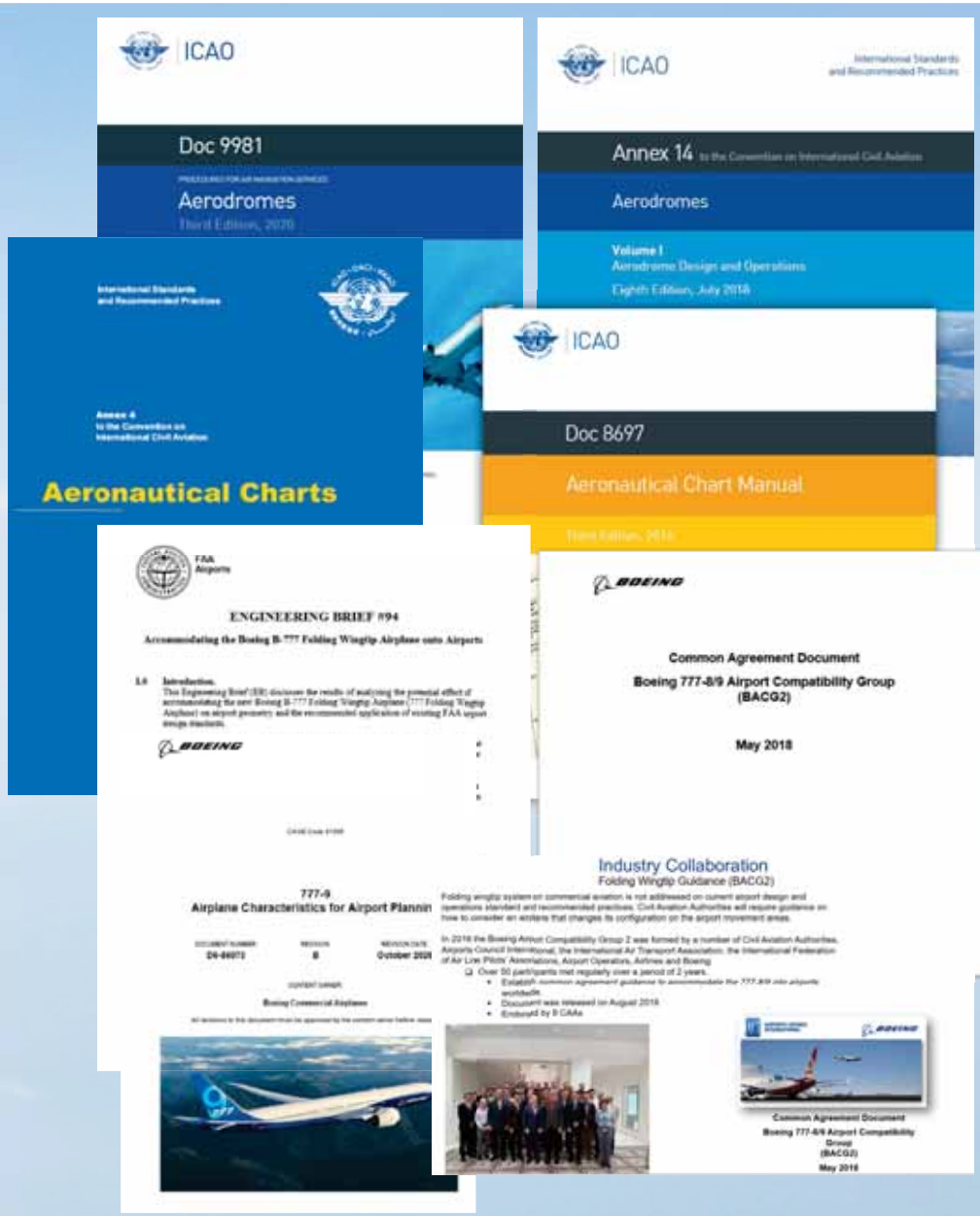
FWT Airport Design/operation Standards

- ❑ Annex 14 Volume I – Updated 11/05/20
- ❑ Annex 4 Aeronautical Charts – Updated 2020
- ❑ Doc 8697 Aeronautical Chart Manual – Updated 2021
- ❑ Doc 9981 Procedures for Air Navigation Aerodromes – Updated 2020
- ❑ FAA Engineering Brief 94
- ❑ 777X Boeing Airport Compatibility Group – Common Agreement Document – 2018
- ❑ 777X Boeing Airport Planning Manual

14.6.2 **Recommendation.**— *For aerodromes accommodating aeroplanes with folding wing tips, the location where the wing tips may be safely extended should be shown on the chart.*

Details	*Illustration*
where established, locations and all ground areas where it is safe for aeroplanes with folding wing tips to operate with wing tips extended.	



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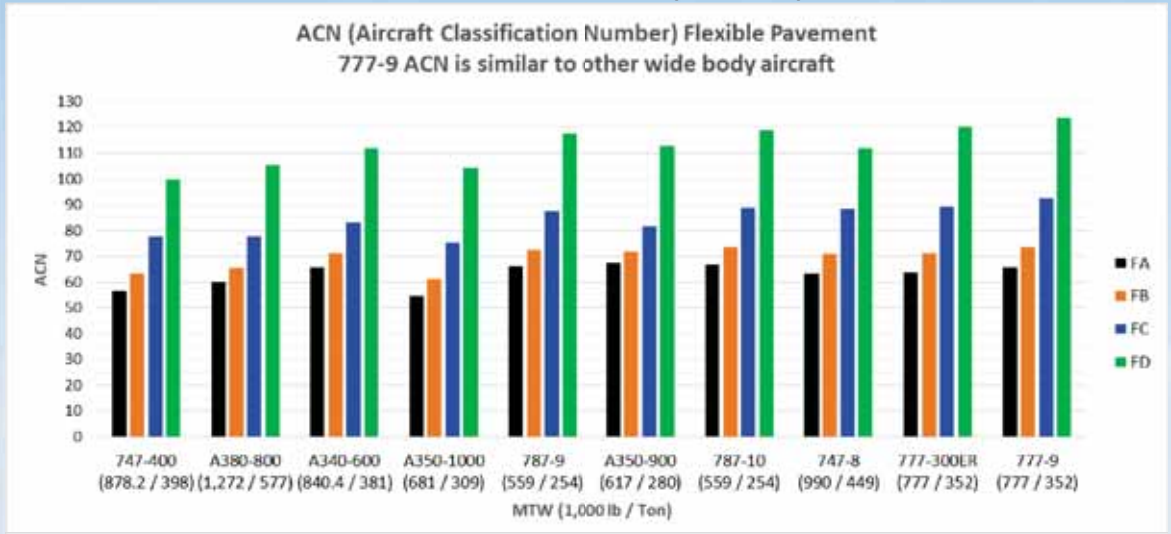
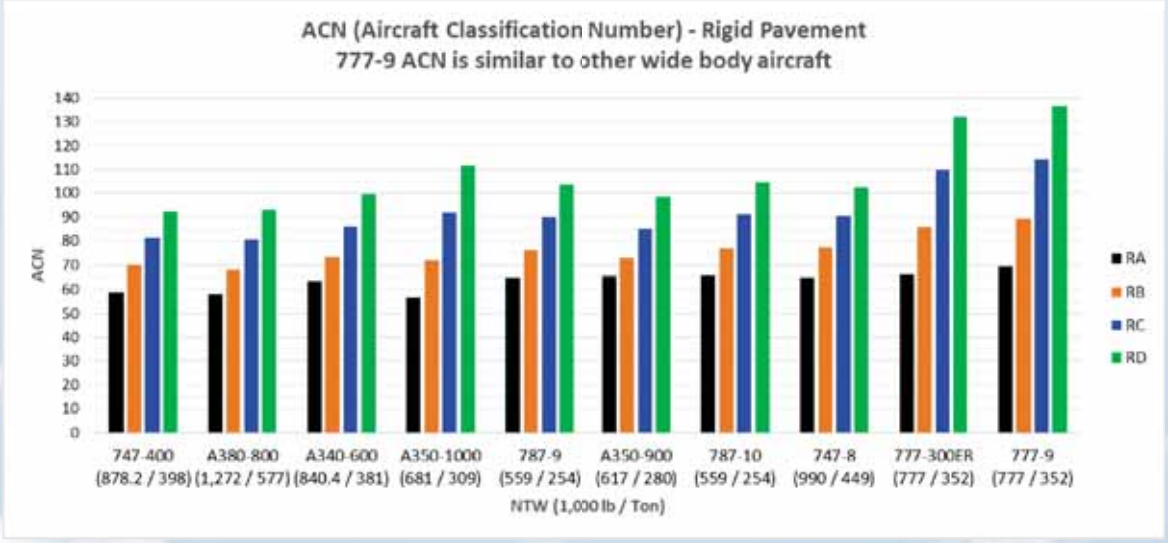
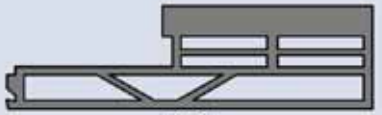
Pavement Loading

❑ Aircraft Classification Number (ACNs)





- **ACN (Aircraft Classification Number):** Describes the relative load intensity of an aircraft on a pavement for a specified standard subgrade strength.
- **PCN (Pavement Classification Number):** Describes the bearing strength of a pavement for unrestricted operations.



PCN

ACN

ACN ≤ PCN means unrestricted* operations at MTW.

*: The term unrestricted operations in the definition of PCN does not mean unlimited operations. Unrestricted refers to the relationship of PCN to the aircraft ACN, and it is permissible for an aircraft to operate without weight restriction (subject to tire pressure limitations) when the PCN is greater than or equal to the ACN. The term unlimited operations does not take into account pavement life. The PCN to be reported is such that, the pavement strength is sufficient for the current and future traffic analyzed, and should be re-evaluated if traffic changes significantly. A significant change in traffic would be indicated by the introduction of a new aircraft type or an increase in current aircraft traffic levels not accounted for in the original PCN analysis.

Pavement Loading: Pavement Classification Rating (PCRs)

- ICAO Annex 14 - PCR method applicable November 2024

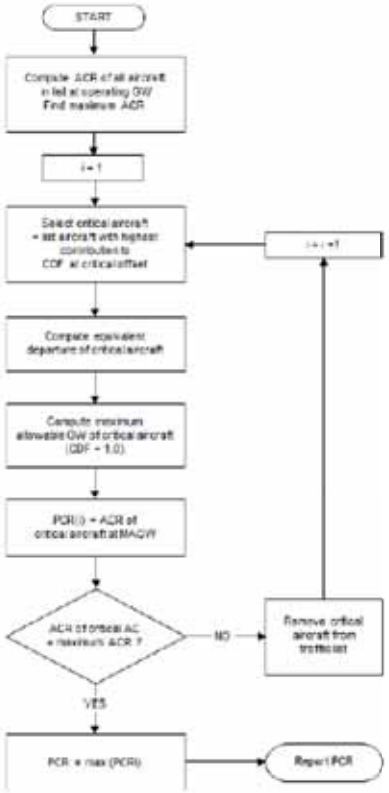


Figure 1-9. Flowchart of recommended PCR computation procedure

20. The aircraft classification rating-pavement classification rating (ACR-PCR) method of reporting pavement strength

Applicable as of 28 November 2024

20.1 Overload operations

20.1.1 Overloading of pavements can result either from loads too large, or from a substantially increased application rate, or both. Loads larger than the defined (design or evaluation) load shorten the design life, whilst smaller loads extend it. With the exception of massive overloading, pavements in their structural behaviour are not subject to a particular limiting load above which they suddenly or catastrophically fail. Behaviour is such that a pavement can sustain a definable load for an expected number of repetitions during its design life. As a result, occasional minor overloading is acceptable, when expedient, with only limited loss in pavement life expectancy and relatively small acceleration of pavement deterioration. For those operations in which magnitude of overload and/or the frequency of use do not justify a detailed analysis, the following criteria are suggested:

a) for flexible and rigid pavements, occasional movements by aircraft with ACR not exceeding 10 per cent above the reported PCR should not adversely affect the pavement; and

b) the annual number of overload movements should not exceed approximately 5 per cent of the total annual movements excluding light aircraft.

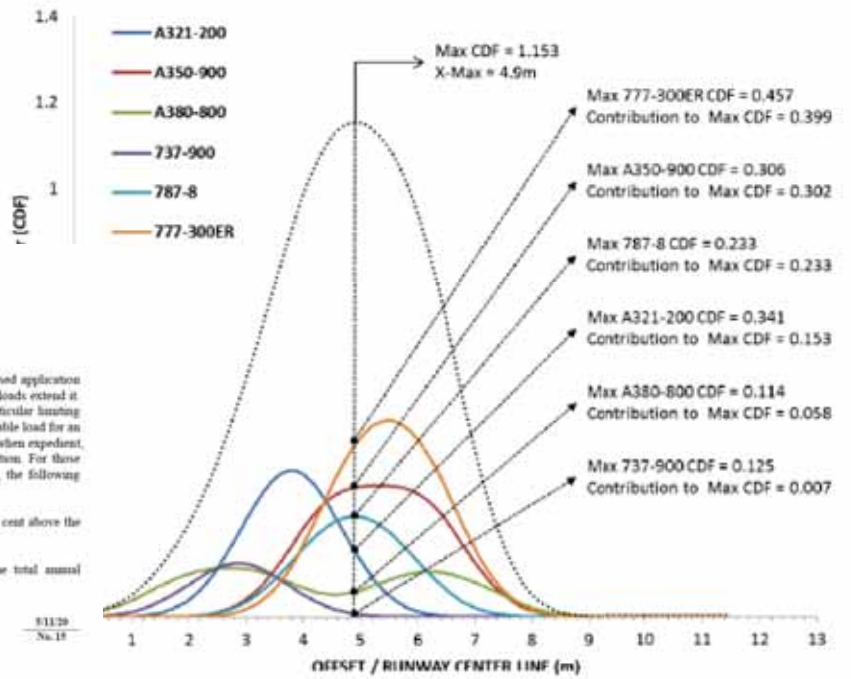


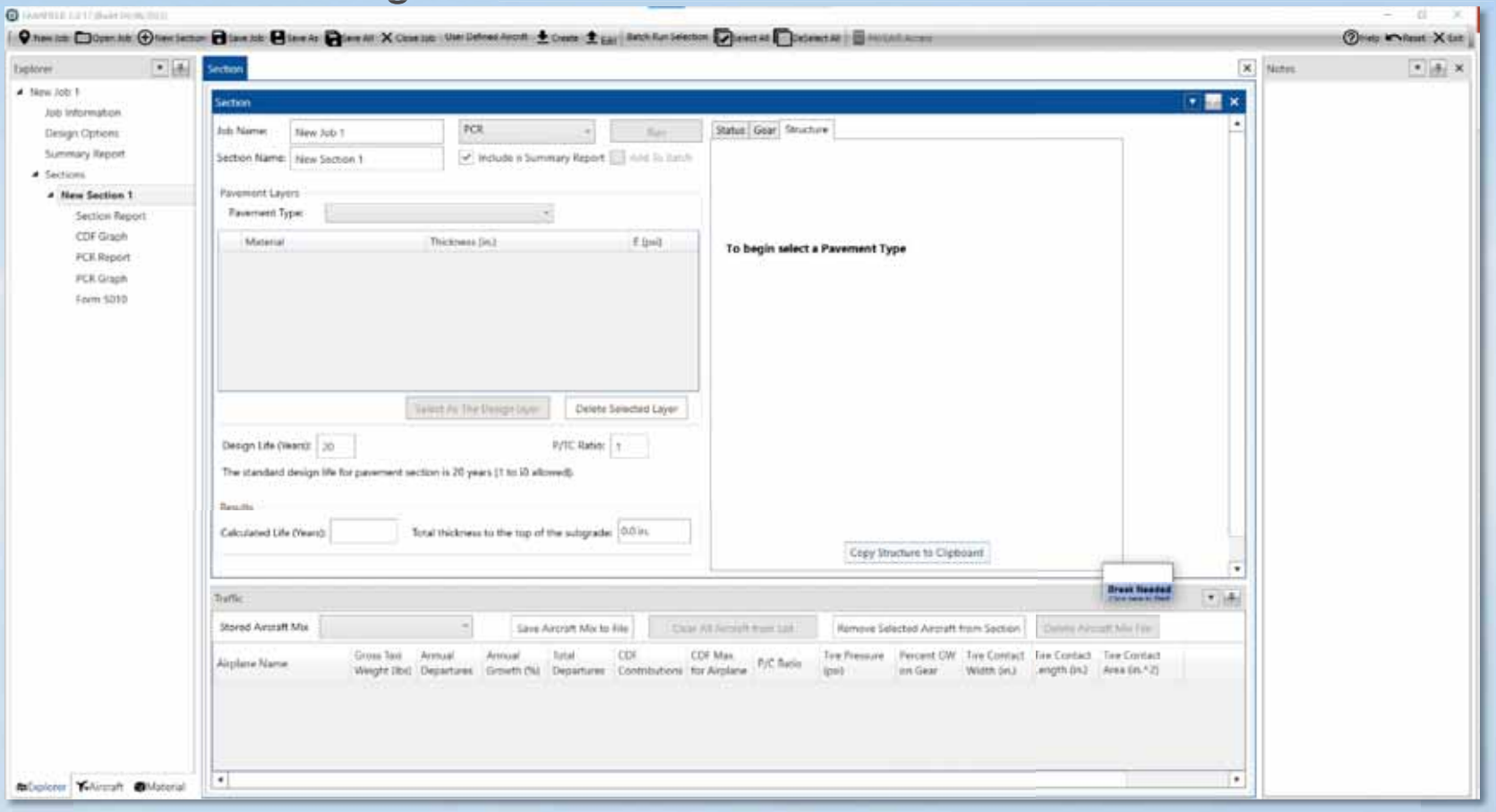
Figure 1-10. Aircraft CDF, total CDF and aircraft contribution to the max CDF

Note.— It is important to distinguish the CDF contributions of each aircraft to the maximum CDF at the critical offset from the maximum damage due to individual aircraft (which may or may not occur at the critical offset). For instance, the A321-200 damage contribution to the maximum CDF at the critical offset is 0.153 while its maximum damage is equal to 0.341. Similarly, the A350-900 produces a max damage of 0.306, lower than the A321, but its contribution to the max CDF is of 0.302, higher than the A321 contribution. The difference is due to different track dimensions (distance of the landing gear from the centreline) of the various aircraft.

ICAO Doc 9157 ADM P3, Advance Ed 2022

Pavement Loading: Pavement Classification Rating (PCRs)

- FAARFIELD Software Program



https://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety Detail/ArtMID/3682/ArticleID/2841/FAARFIELD-20

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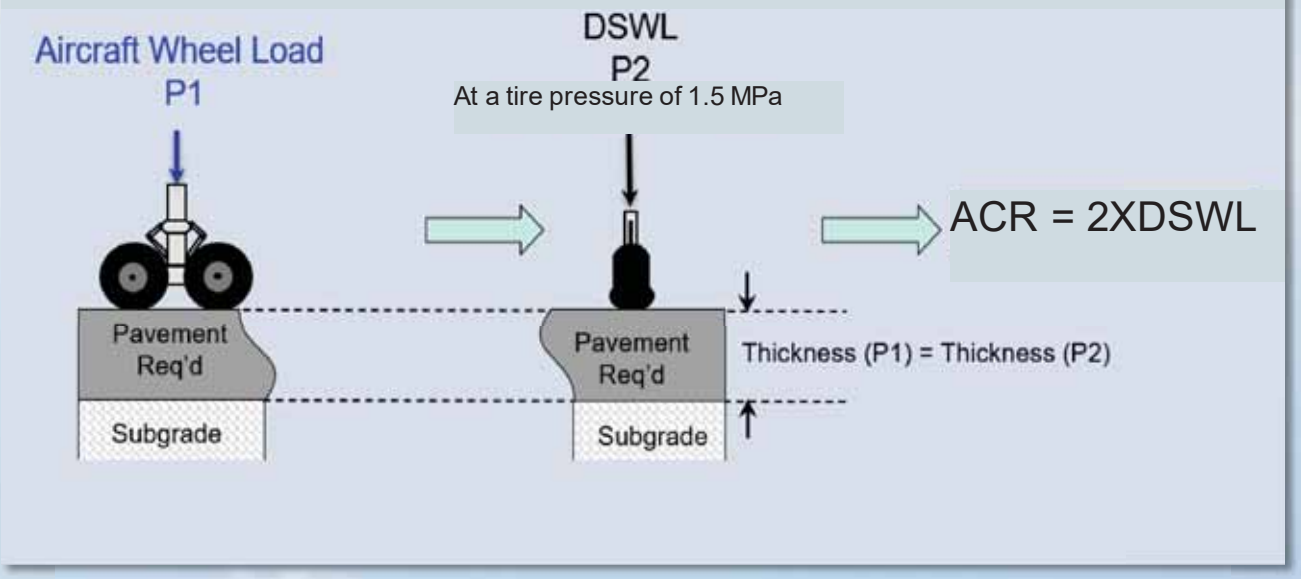
Pavement Loading: Aircraft Classification Rating (ACR)

- The Aircraft Classification Rating (ACR) **is a number expressing** the relative effect on an aircraft on a pavement for **a specified standard subgrade strength.**

- 4 standard subgrade strength categories are defined, common to flexible and rigid pavements.
  - CAT A, E= 200 Mpa
  - CAT B, E= 120 Mpa
  - CAT C, E= 80 Mpa
  - CAT D, E= 50 MPa

ACR is numerically defined as two times the Derived Single Wheel Load (DSWL) in 100 kgs with a standard tire pressure of 1.5 MPa (218 psi) that would require the same thickness as the aircraft to cause CDF=1.0 for 36,500 coverage (Flexible) or to reach 2.75 MPa stress (Rigid).



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Pavement Loading: Aircraft Classification Rating (ACR)

ICAO-ACR Version 1.3 Date March 16, 2020

Input Data

Pavement Type: (•) Flexible ( ) Rigid

Gross Weight (lbs): 877,000

Percent GW: 0.933

Number of Wheels: 16

Tire Pressure (psi): 200.00

Wheel Coordinates (in)

No	X	Y	SW
1	-238.50	179.00	0
2	-238.50	121.00	0
3	-194.50	121.00	0
4	-194.50	179.00	0
5	-97.50	58.00	0

Select Airplane Group: Boeing

Select Airplane: B747-400

Calculate ACR *

☑ Display Select Wheels (SW) ☐ Metric

Subgrade Category	Subgrade Modulus [psi]	Flexible ACR Number	ACR Thickness [in]
D	7,251.89	832.60	37.55
C	11,603.02	606.91	28.54
B	17,404.53	518.20	23.22
A	29,007.55	473.69	18.03

Calculation time: 2.03 sec.

Input Data - Gear 2

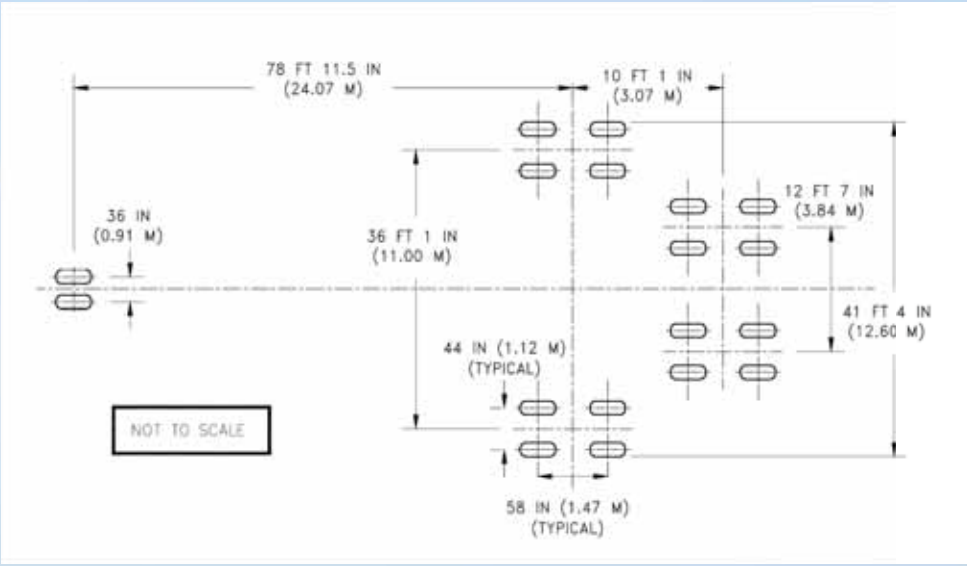
Percent GW 2

Number of Wheels 2

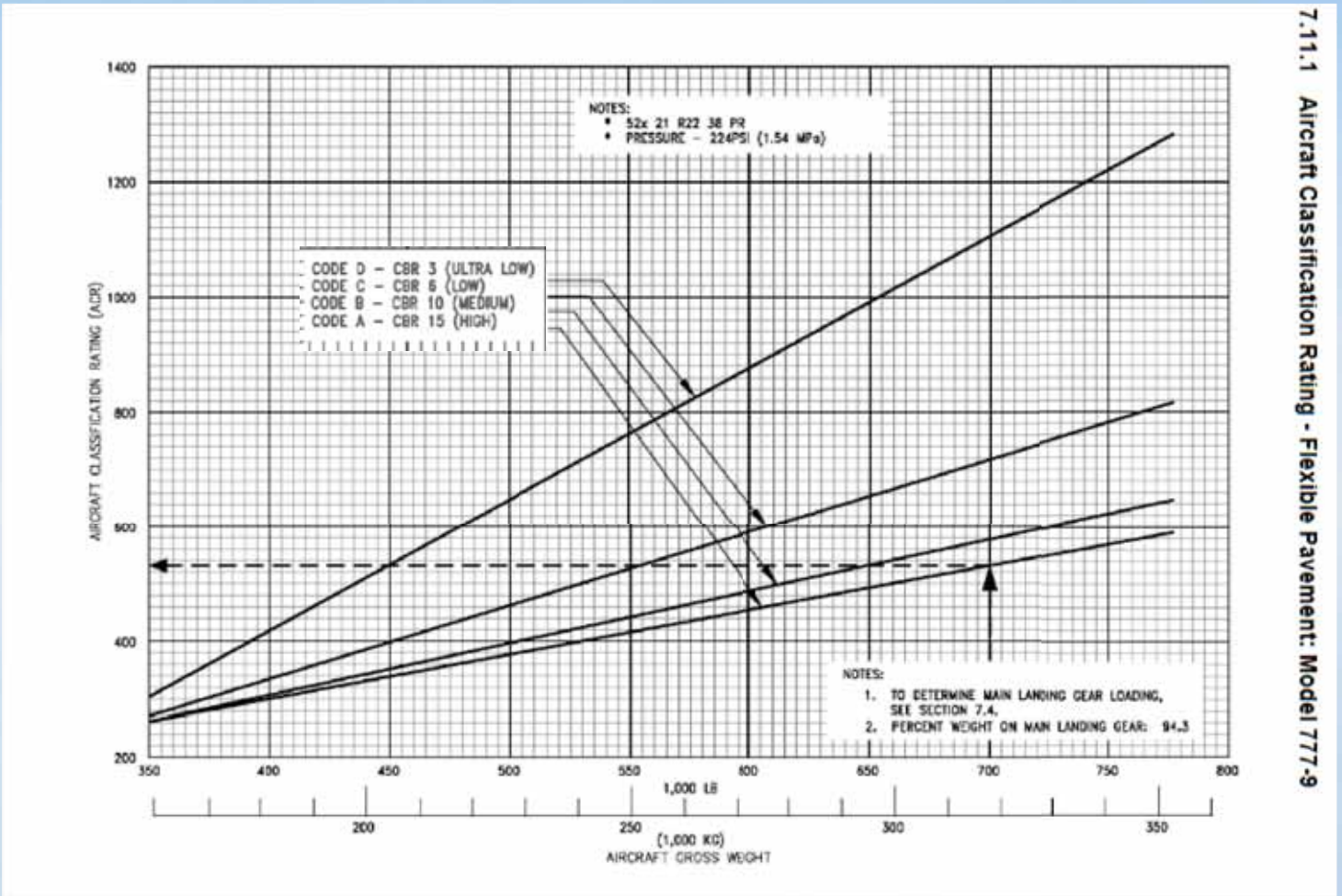
Tire Pressure 2 (psi)

Wheel Coordinates (in)

No	X	Y	SW

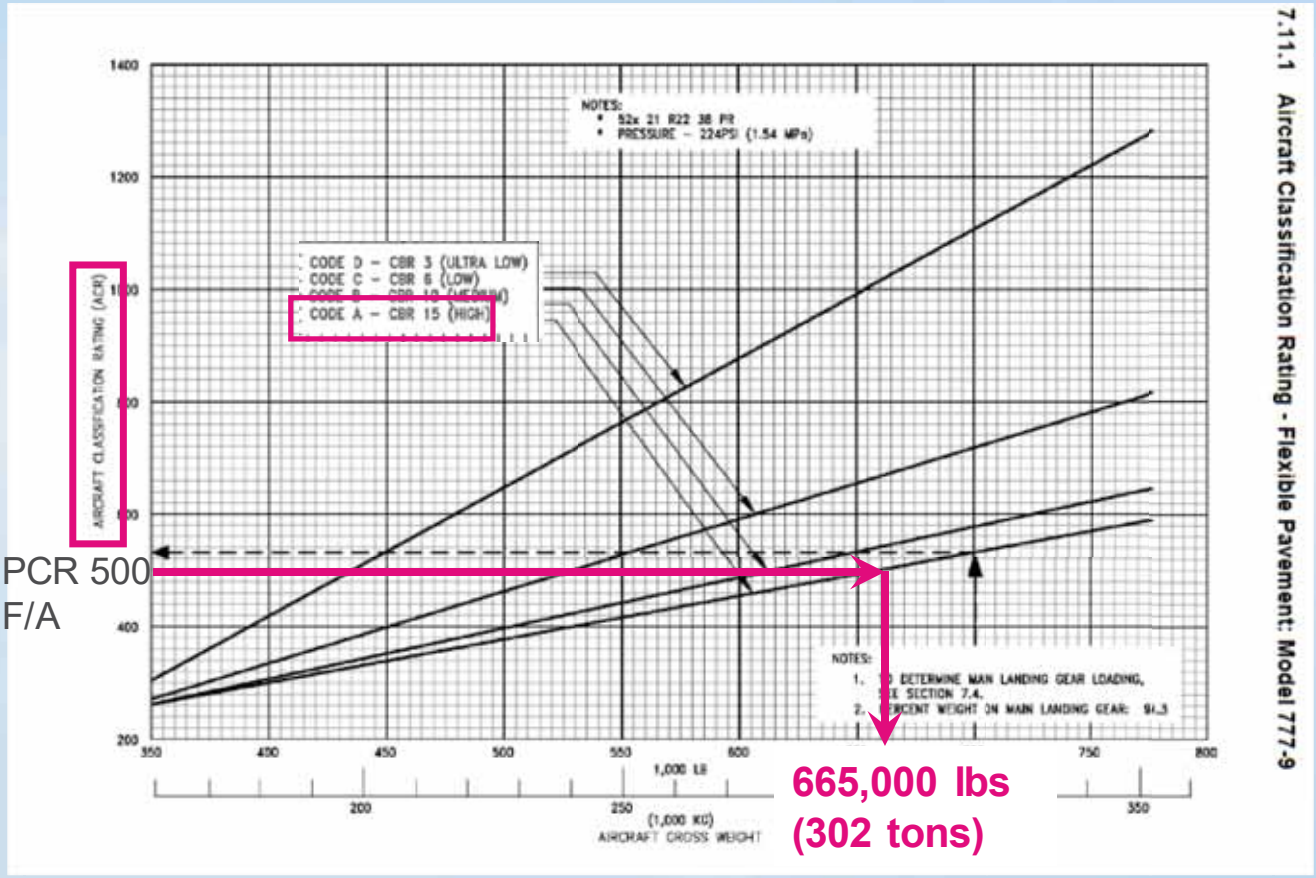


Boeing Airport Operations Engineering: ACR Data in Airport Planning Manual



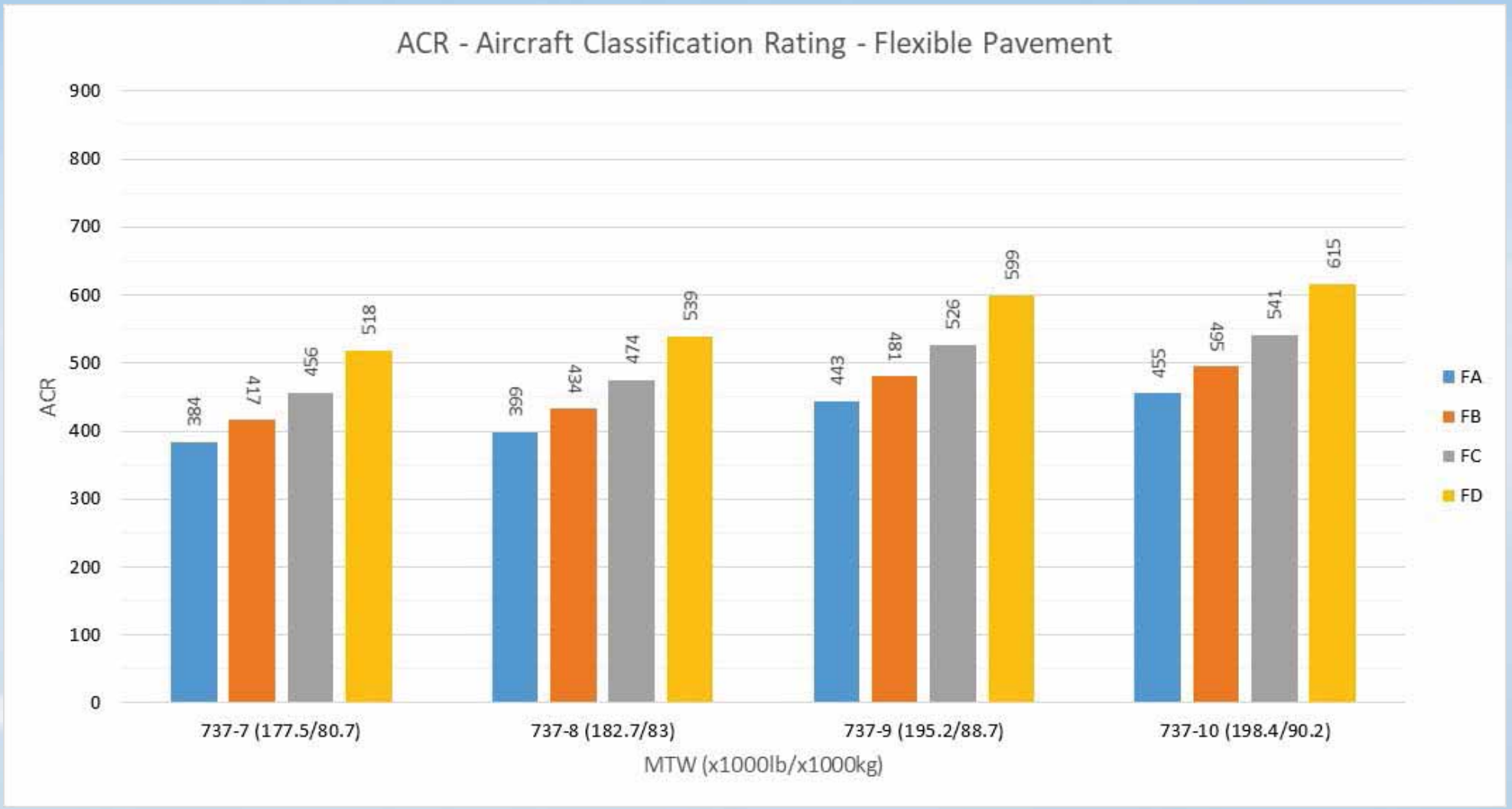
Section 7, Airplane Characteristics for Airport Planning Manuals
www.boeing.com/airports

Pavement Loading: ACR-PCR Evaluation, Flexible Pavement



 ECCN: 9E991 – 2022

Pavement Loading: Narrowbody ACRs, Flexible Pavement

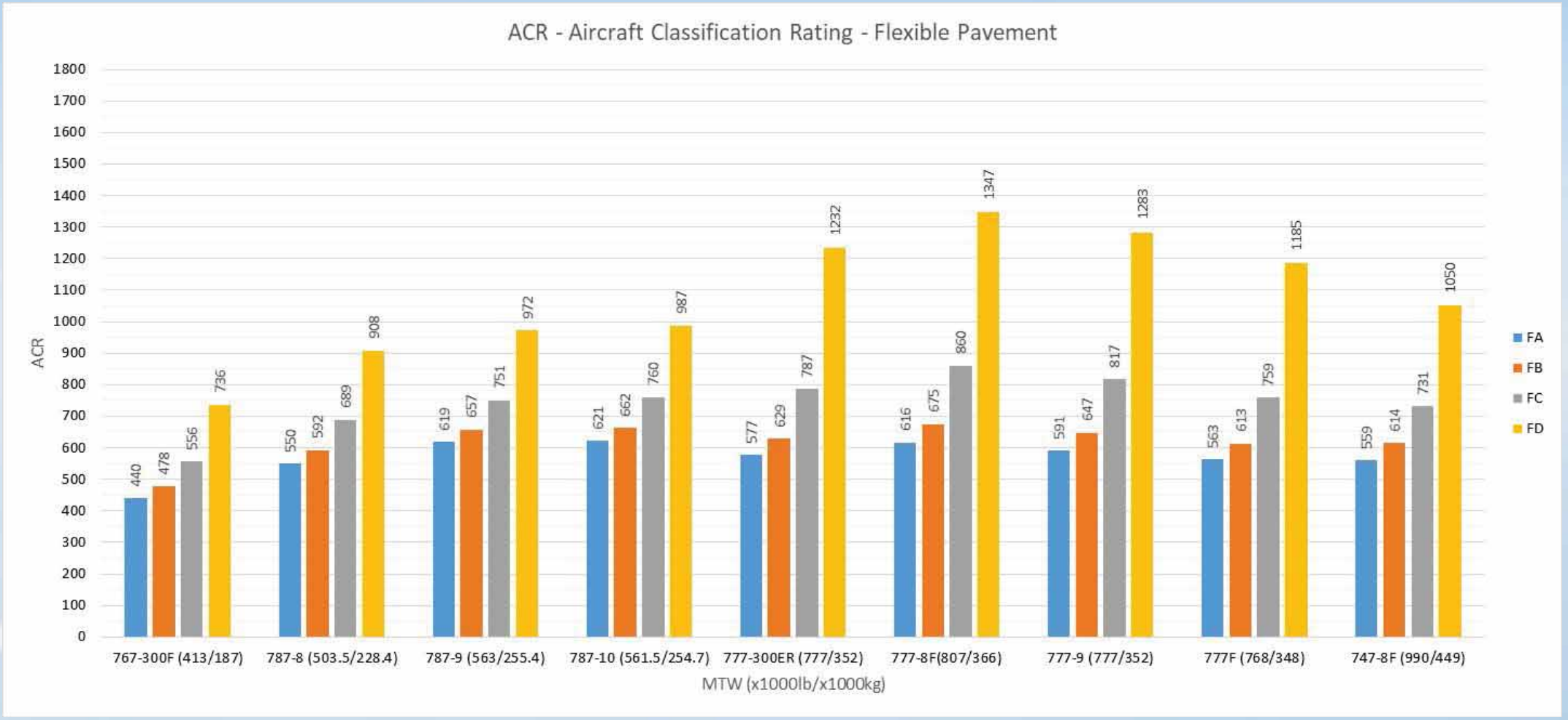


 ECCN: 9E991 – 2022

Pavement Loading: Narrowbody ACRs, Rigid Pavement

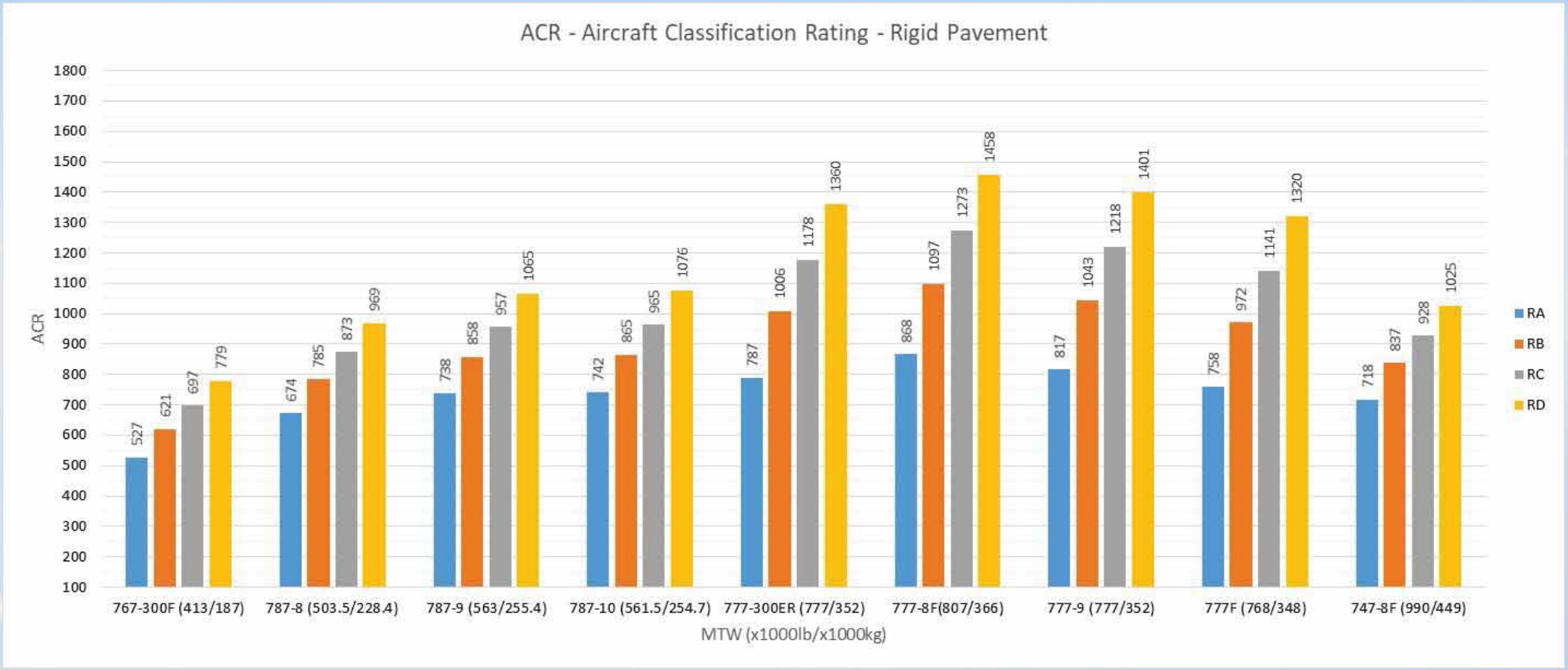
 ECCN: 9E991 – 2022

Pavement Loading: Widebody ACRs, Flexible Pavement



 ECCN: 9E991 – 2022

Pavement Loading: Widebody ACRs, Rigid Pavement



Pavement Loading–Example PCN/PCR

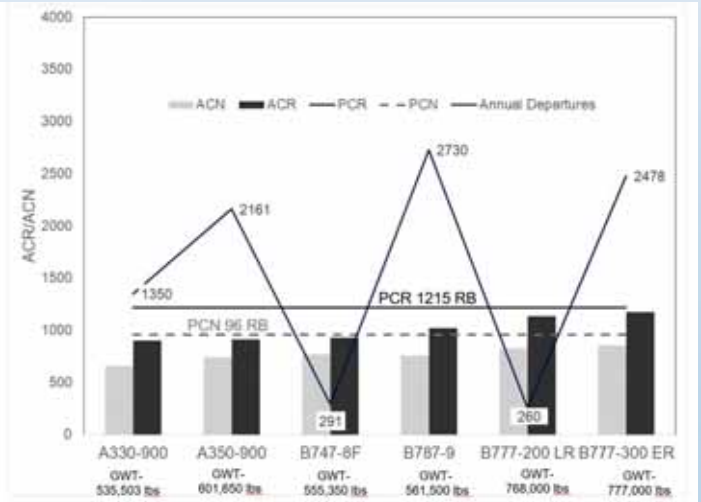
- ACN – PCN / ACR – PCR Comparison
  - Example Airport 1 (ACN/PCN)
    - RWY 16/34 PCN 96 RBWT
    - A/C 777-8F (MTW) – ACN 94
    - Allowable Weight = 370,090 kg > 777-8F MTW (366,049kg)
  - Example Airport 1 (ACR/PCR)
    - RWY 16/34 PCR 1215 RBWT
    - A/C 777-8F (MTW) – ACR 1097
    - Allowable Weight = 389,050 kg > 777-8F MTW (366,049kg)

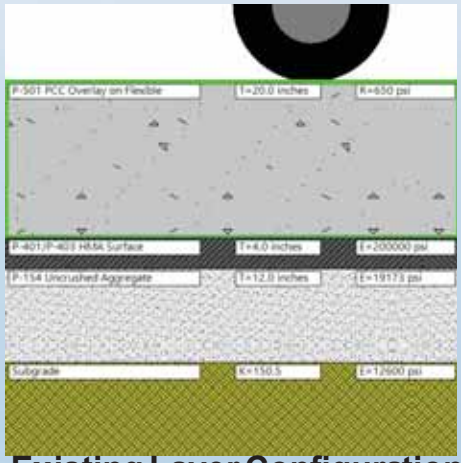
Example Comparison
Report PCN yields to 370,090 kg
Report PCR yields to 389,050 kg

PCR > PCN 18,960 kg

Most Demanding Aircrafts in the Traffic

Aircraft	Operating Wt (lbs)	Annual Departures	ACR @ Operating Wt
A330-900	555,350	1350	900
A350-900	601,650	2161	912
B747-8F	990,000	291	929
B787-9	561,500	2730	1021
B777-200 LR	768,000	260	1132
B777-300 ER	777,000	2478	1175





Existing Layer Configuration

ACR/PCR Timeline

- March 2018 – ACR/PCR Proposal Submitted and adopted bay ICAO ADOP
- November 2018 – Accepted by ICAO ANC.
- June 2019 – Approved by ANC final Review.
- July 2020 – ACR/PCR effective and available for use.
- November 2024 – ACR/PRC Applicable. PCR published to AIPs.

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Impacts of long-term parking on runways/taxiways and non-parking areas

Runways and Taxiways are not meant for parking

- Long term static loads applied to flexible pavement.
- Poor Conditions
- Hot temperatures
- Spillage of fluids (oil, fuel, cleaners, etc.)

Impacts of long-term parking on runways/taxiways and non-parking areas

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Impacts of long-term parking on runways/taxiways and non-parking areas

Findings:

- **RWY PCN 76 FBXT**
  - **Pavement section (15-20 years old):**
    - **9.75” Asphalt**
    - **6” Concrete**
    - **Subgrade (Natural Soil)**
- **Aircraft (787-8, @ 450,000 lbs)**
- **Duration 2 months**
- **Rutting ranging from 1 – 3 inches**

(Source: American Airlines)

Relevant Links:

1. Boeing Aircraft - Airport Planning Manuals:
https://www.boeing.com/commercial/airports/plan_manuals.page
2. Boeing Airport Operations Engineering (Airport Compatibility):
https://www.boeing.com/commercial/airports/
3. Boeing Market Outlook:
https://www.boeing.com/commercial/market/commercial-market-outlook/index.page#/downloads
4. Boeing Sustainability:
https://www.boeing.com/resources/boeingdotcom/principles/sustainability/assets/data/2022_Boeing_Sustainability_Report.pdf
5. FAA Pavement Design software:
https://www.airporttech.tc.faa.gov/Products/Airport-Pavement-Software-Programs
6. Other FAA Airport Design software:
https://www.faa.gov/airports/engineering/design_software
7. FAA Engineering Brief 94 (777X)
https://www.faa.gov/sites/faa.gov/files/airports/engineering/engineering_briefs/EB-94-B-777-9-folding-wingtips.pdf

THANK YOU

Evanicio Costa
Principal Lead Engineer
Airport Operations Engineering
The Boeing Company

+1 (425) 919-8384 Mobile
evanicio.c.costa@boeing.com
2201 Seal Beach Blvd
Seal Beach, CA 90740