



Introduction to ACR-PCR

Drew Dutton, MASc, EIT

Aerodrome Standards



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What is ACR-PCR?

- Aircraft Classification Rating – Pavement Classification Rating
- Will replace the ACN-PCN system
- $ACR \leq PCR$
 - Provisions exist for overloading operations
- Effective July 2020
- Applicability Nov 2024

Concept

- ACR-PCR method is for publication of pavement strength – NOT for pavement design
- Based on Cumulative Damage Factor (CDF) concept

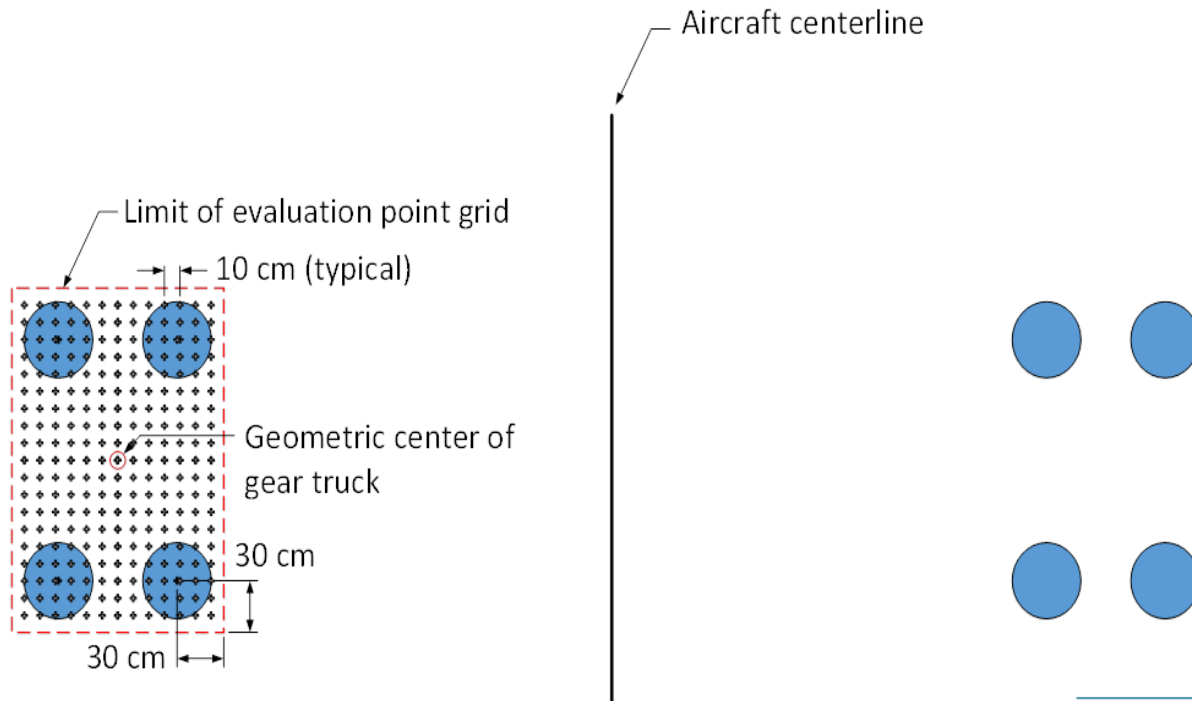
- Continuous scale:
0 on lower end,
unbound on upper
end
- Aircraft
manufacturers
publish ACRs
calculated at two
different masses:
 - Max apron mass
 - Empty operating
mass



- ACRs provided for both flexible and rigid pavements
- Four values reported for each type, based on the four standard subgrade categories

Subgrade Strength Category	Code A	Code B	Code C	Code D
Subgrade Strength (MPa)	200	120	80	50

- ICAO-ACR software will provide further ACR information, including values at any mass and centre of gravity



Reporting strength of pavements

Pavements used by
Aircraft \leq 5700 kg

Pavements used by
Aircraft $>$ 5700 kg

Reporting strength of pavements

Pavements used by Aircraft ≤ 5700 kg

Pavements used by Aircraft > 5700 kg

Maximum allowable aircraft mass

Maximum allowable tire pressure

Reporting strength of pavements

Pavements used by Aircraft ≤ 5700 kg

Maximum allowable aircraft mass

Maximum allowable tire pressure

Pavements used by Aircraft > 5700 kg

Numerical Value

Pavement Type

Subgrade Strength Category

Tire Pressure Category

Evaluation Method

Computation

- ACR-PCR method uses the layered elastic analysis (LEA) model
- Computation of ACR can be performed using the ICAO-ACR software developed by the US FAA
- Computation of PCR will require use of a pavement design software based on LEA

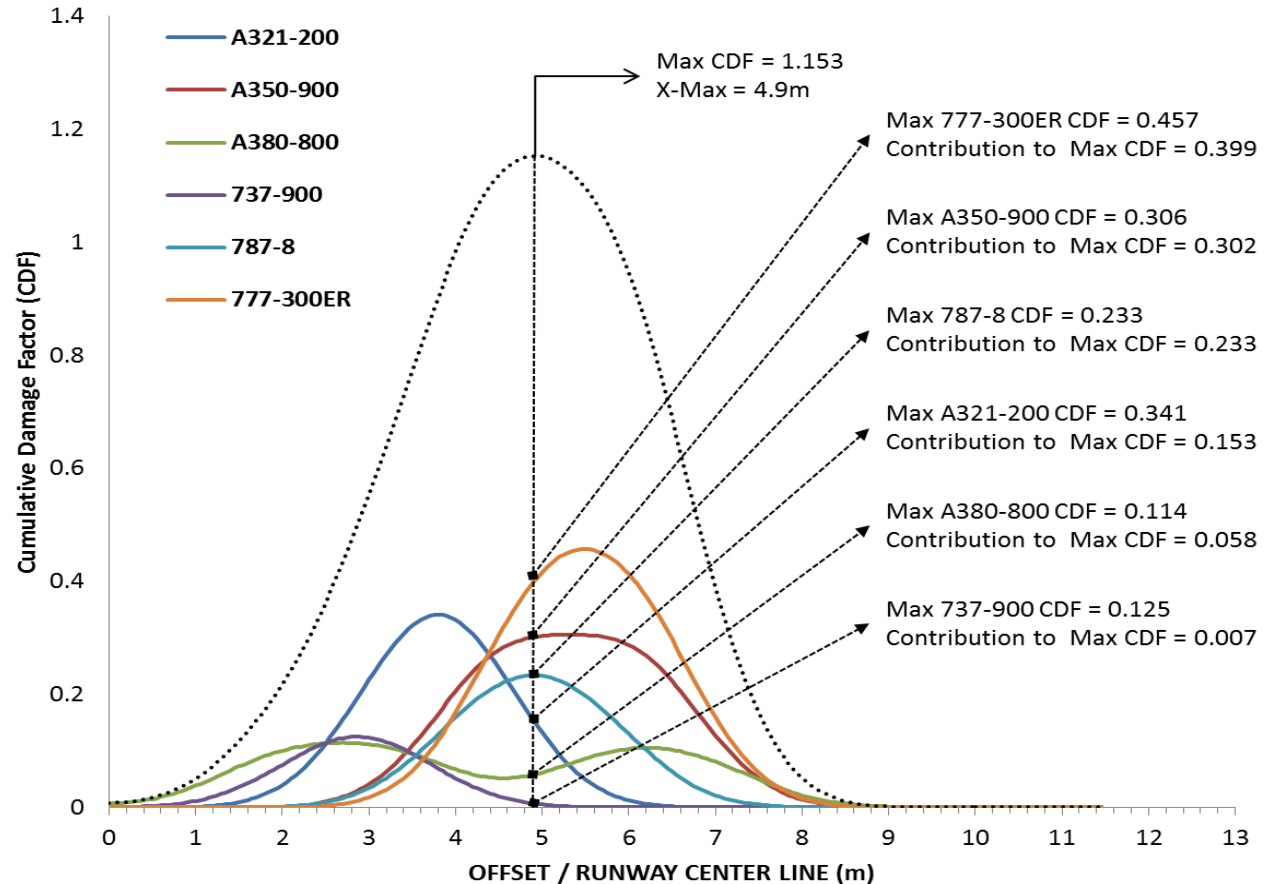
Cumulative Damage Factor

$$CDF = \frac{\textit{Applied coverages}}{\textit{Coverages to failure}}$$

- When $CDF = 1$
 - Pavement subgrade has used fatigue life
- When $CDF < 1$
 - Pavement subgrade has remaining life
 - Value of CDF provides fraction of life used
- When $CDF > 1$
 - Fatigue life exceeded; pavement subgrade will have failed

Cumulative Damage Factor

- Multiple aircraft types are accounted for using Miner's Rule:



$$CDF = CDF_1 + CDF_2 + \dots + CDF_N$$

Cumulative Damage Factor

- ACR-PCR method takes into account fleet mix, including lateral wander
- Standard deviation varies with travel speed

Pavement section	Standard Deviation, s (metres)
High-speed sections (Runway, rapid exit taxiway)	0.75
Moderate-speed sections (Taxiways)	0.5
Aprons and low-speed sections	0

Lateral Wander

- Deviation occurs centred about the runway centreline
- Deviation follows a normal distribution function





2019-09-11

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Questions?