Runway FAA Strength Rating Conversions

A number of airlines and airports have requested Boeing guidance concerning the use of FAA and US Military pavement strength rating systems with Boeing airplanes. The FAA and US military are shifting to the use of the pavement classification number (PCN) for each runway supporting operations by aircraft weighing greater than 12,500 pounds (5,700 kgs), but this transition has been slow and does not have a set completion date. The following conversions were developed by Boeing's Airport Technology organization to provide an interim process until the airports establish the PCN for their runway(s).

A method was developed by our Pavement Team which allows the conversion of FAA ratings into allowable airplane weights for other than standard gear types. In the past it was quite simple, since most aircraft were somewhat close to the FAA standard, but the current models are mostly large wide body aircraft or larger military types with landing gears that do not conform to the FAA types. This has made it difficult to know how one of these aircraft would fit into an airport that had only FAA pavement ratings. Since there is a lengthy list of aircraft that do not fit the FAA rating mold, and since each has unique aircraft classification numbers (ACN's), a method was devised to relate between the two by converting the ACN into the appropriate equivalent FAA rating. The Boeing solution is based on comparative calculations to determine equivalency. Establishing equivalencies is a time honored tradition in pavement analysis. We used model DC-8-63 at 358k as the standard or reference airplane. We chose this model as this airplane was the basis for the FAA airplane weight choice of 350k as their representative airplane.

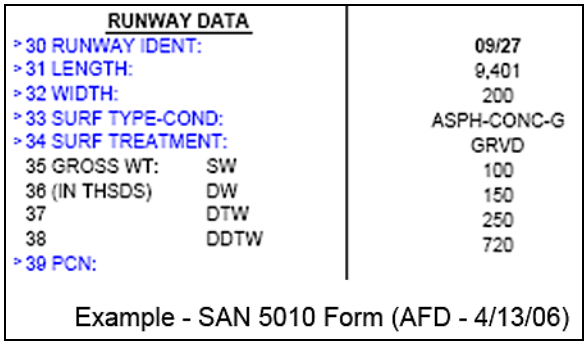
Table1. Naming Convention with Historical FAA, U.S. Air Force, and U.S. Navy Nomenclatures

		Historic FAA Designations					U.S. Air Force Designations				U.S. NAVY Designations			
PROPOSED NOMENCLATURE	Reference Figure	FAA Name	Main Gear	Belly Gear	# Belly Gear	Total # Wheels, Excluding Nose	Air Force Designation	Air Force Types	Air Force Name	NOSE GEAR	Navy Name	Navy Designation	DOD Flight Information	Typical Aircraft
S	3	Single Wheel	SW			2	S	A	Single, Tricycle	Single Wheel	Single Tricycle	ST	S	F-14, F15
S	4	Single Wheel	SW			2	S	B	Single, Tricycle	Dual wheel				
D	5	Dual wheel	DW			4	T	C	Twin, Tricycle	Single Wheel				Beech 1900
D	6	Dual wheel	DW			4	T	D	Twin, Tricycle	Dual wheel	Dual Tricycle	DT	T	B-737, P3 (C-9)
2S	7	Single Tandem				4	S-TA	E	Single, Tandem Tricycle	Dual wheel	Single Tandem Tricycle	STT	ST	C-130
2T	8					12	TR-TA	L	Twin-Tandem, Tricycle	Dual wheel	Triple Tandem	TRT	TRT	C-17
2D	9	Dual Tandem	DT			8	T-TA	F	Twin-Tandem, Tricycle	Dual wheel	Dual Tandem Tricycle	DTT	TT	B757, KC135, C141
2D/D1	10	Dual tandem	DT	DW	1	10	T-TA	H	Twin-Tandem, Tricycle	Dual wheel	Single Belly Twin Tandem	SBTT	SBTT	L1011, DC-10
2D/2D1	11	Dual Tandem	DT	DT	1	12				Dual wheel				A340-600
2D/2D2	12	Double Dual Tandem	DT	DT	2	16	T-TA	J	Twin-Tandem, Tricycle	Dual wheel	Double Dual Tandem	DDT	DDT	B-747, (E-4)
3D	13	Triple dual Tandem	TDT			12				Dual wheel				B-777
5D	14					20				4 across				An-124
7D	15					28				4 across				An-225
2D/3D2	16		DT	TDT	2	20				Dual wheel				A380
C5	17					24	T-D-TA	K	Twin-Delta-Tandem, Tricycle	4 across	Twin Delta Tandem	TDT	TDT	C-5
D2	18					8	T-T	G	Twin-Twin, Bicycle	No Nose Gear - single outrigger	Twin Twin Tricycle	TT	TT	B-52
Q	19					8								HS-121 Trident
Q2	20					16								IL-76

(Source – FAA Order 5300.7/Table 3)

The FAA ratings which are published in places such as the Airport Facility Directory (AFD) or the Airport Master Record (FAA Form 5010) are the following: S – Single Wheel (e.g., DC-3), D – Dual Wheel (e.g.,737), DT – Dual Tandem Wheel (e.g., 767), and DDT – Double Dual Tandem (747). The US Military has a similar but different naming convention as shown in Table 1. The FAA is in the process of transitioning to a new naming system as published in FAA Order 5300.7, "Standard Naming Convention for Aircraft Landing Gear Configurations," effective October 6, 2005. This Order establishes a standard convention for naming and characterizing aircraft landing gear configurations. Although this order is primarily directed at fixed wing airplanes, it is applicable to any aircraft using wheels for landing purposes. Table 1 shows both the proposed and the historical FAA, U.S. Air Force, and U.S. Navy naming convention nomenclatures.

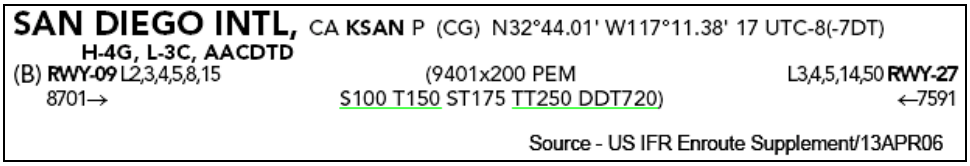
Figure 1 shows the pavement strength rating for San Diego Lindberg (SAN) using the current FAA system as published in the Airport Master Record and the AFD. Figure 2 shows the pavement strength rating data for the same runway, but as published in the IFR Enroute Supplement using the military system. Note that the two systems are publishing the same strength values, 1) SW-100 = S100, 2) DW-150 = T-150, 3) DTW-250 = TT-250, 4) DDTW-720 = DDT720, although the military publishes one additional gear type (ST – C-130). Note that the Airport Master Record (FAA Form 5010) now has a block for PCN, Block 39 shown in Figure 1, and the PCN should be used in precedence over the FAA pavement ratings if it is available.



RUNWAY DATA		
>30 RUNWAY IDENT:		09/27
>31 LENGTH:		9,401
>32 WIDTH:		200
>33 SURF TYPE-COND:		ASPH-CONC-G
>34 SURF TREATMENT:		GRVD
35 GROSS WT:	SW	100
36 (IN THSDS)	DW	150
37	DTW	250
38	DDTW	720
>39 PCN:		

Example - SAN 5010 Form (AFD - 4/13/06)

Figure 1. FAA Pavement Strength Rating System



SAN DIEGO INTL, CA **KSAN** P (CG) N32°44.01' W117°11.38' 17 UTC-8(-7DT)
H-4G, L-3C, AACDTD
(B) **RWY-09** L2,3,4,5,8,15 (9401x200 PEM L3,4,5,14,50 **RWY-27**
8701→ S100 T150 ST175 TT250 DDT720) ←7591

Source - US IFR Enroute Supplement/13APR06

Figure 2. US Military Pavement Strength Rating System

Table 2 provides the conversions that have been developed for Boeing aircraft. If the runway has a published rating that matches the gear configuration of the aircraft, then that conversion factor should be used. (Note - DC/MD-10-30/40 and MD-11 should use DT as the gear configuration.) If a published rating is not available that matches the gear configuration of the aircraft, then use the following example. The 777-200ER in Table 2 shows that the conversion factors are D = 3.07, DT = 1.77, and DDT = 0.82. Based on the runway strength ratings shown in Figure 1, for a runway rating of D150, the allowable gross weight (GW) of the 777-200ER would be 150 x 3.07 = 461k; for a DT rating of DT250, the allowable GW would be 250 x 1.77 = 443k; and for a DDT rating of DDT720, the allowable GW would be 720 x 0.82 = 590k. Since there is a difference between the applied rating allowable GW's, use the rating that results in the highest allowable weight for the 777-200ER.

Table 2. Boeing Gear Conversion Factors

AIRFRAME	D	DT	DDT
707-320C	1.85	1.00	0.46
717-200	1.00	0.53	0.23
720B	1.74	1.00	0.43
727-100	1.00	0.58	0.25
727-200	1.00	0.59	0.25
727-200LP	1.00	0.58	0.25
737-200	1.00	0.57	0.25
737-200LP	1.00	0.60	0.26
737-300	1.00	0.57	0.25
737-300LP	1.00	0.58	0.25
737-400	1.00	0.55	0.24
737-500	1.00	0.56	0.24
737-600	1.00	0.58	0.25
737-700	1.00	0.58	0.25
737-700ER	1.00	0.59	0.29
737-800	1.00	0.57	0.25
737-900ER	1.00	0.55	0.24
737BBJ	1.00	0.58	0.25
737BBJ-2	1.00	0.57	0.25
747-200	4.14	2.39	1.00
747-400	4.02	2.35	1.00
747-400ER	3.93	2.27	1.00
747-8F - Preliminary	3.93	2.27	1.00
747-8PAX - Preliminary	3.93	2.27	1.00
747SP	4.12	2.38	1.00
757-200	1.73	1.00	0.43
757-300	1.70	1.00	0.42
767-200	2.02	1.17	0.54
767-200ER	2.02	1.17	0.54
767-300	2.02	1.17	0.54
767-300ER	2.03	1.17	0.54
767-400ER	1.95	1.13	0.52
777-200	3.07	1.77	0.82
777-200ER	3.07	1.77	0.82
777-200LR	3.06	1.76	0.81
777-300	2.95	1.70	0.78
777-300ER	3.03	1.75	0.80
777F - Preliminary	3.06	1.76	0.81
787-8 - Preliminary	2.11	1.22	0.56
DC10-10	2.22	1.28	0.59
DC10-30/40	2.80	1.62	0.74
DC8-63/73	1.73	1.00	0.43
DC9-32	1.00	0.54	0.23
DC9-51	1.00	0.53	0.23
MD-11	2.59	1.50	0.70
MD-83	1.00	0.53	0.23
MD-87	1.00	0.53	0.23
MD-90-30	1.00	0.52	0.23
C17A	3.11	1.80	0.82
KC-10A	2.72	1.57	0.72
KC-135E	1.81	1.00	0.45
KC-135R	1.83	1.00	0.46

Additional questions concerning this issue can be directed to Boeing's Airport Technology group as follows:

Boeing Airport Technology
P.O. Box 3707, MC 67-KR
Seattle, WA 98124
425-237-0126
AirportTechnology@boeing.com