Using the Payload/Range and Takeoff Field Length Charts in the Airplane Characteristics for Airport Planning Documents

A question that is common is how to use the data provided in Section 3 - Airplane Performance of the Airplane Characteristics for Airport Planning Document to determine either payload/range of an aircraft or the runway length required for takeoff at a given weight. Note that use of the landing charts is similar to that of the takeoff charts.

Let's look at the attached three pages from the 777-200/300 Airplane Characteristics for Airport Planning document and see how these data tie together. The following examples will provide the basic method for using the charts.

To Determine Payload/Range:

Figure 2-1-1 provides the general characteristics for the 777-200. Look at the 537,000 lbs Max Design Taxi Wt aircraft and go down the column to the Spec Operating Empty Wt (OEW) of 299,550 pounds. We then go to Figure 3-2-1 and subtract the OEW (299,550 lbs) from the weight on the vertical axis to establish Payload (PAX & cargo). If you want to fly ~100,000 lbs of payload 3300nm, then on the left vertical axis you would go to 400,000 lbs (100,000 lbs payload + 299,550 lbs OEW) and then track to the right horizontally until intercepting the range of 3300nm on the horizontal axis. At this point of intercept, you would also be intersecting the diagonal line for the Brake Release Gross Wt, which in this case would be ~520,000 pounds. (I am not trying to be too exact here as we are looking at the usage of the data rather than the end result.)

To Determine Runway Length:

Now that the Brake Release Gross Wt has been established for the aircraft, go to Figure 3-3-1 and locate 520,000 lbs Brake Release Gross Weight on the horizontal axis and trace up until intercepting the sea level curve. Then, trace to the left until intercepting the vertical axis which is the Takeoff Runway Length noting the runway length for this mission is ~6,950 Feet. This would be the runway length required based on the Standard Day temperature (59°F/15°C) without taking into consideration factors such as slope, wind, stopway, clearway or obstacles. This runway length is the balanced field length, meaning that the takeoff run available (TORA), takeoff distance available (TODA), and accelerate-stop distance available (ASDA) are equal in length.

These charts are provided for general planning purposes and we recommend that when the design phase is initiated for a runway length analysis that the airport/consultant either coordinate with the using airline operating the design aircraft, or contact the manufacturer to determine the actual runway requirements based on all of the available criteria: slope, elevation, obstacles, wind, temperature, departure procedures, etc. Boeing can support this work at a nominal fee.

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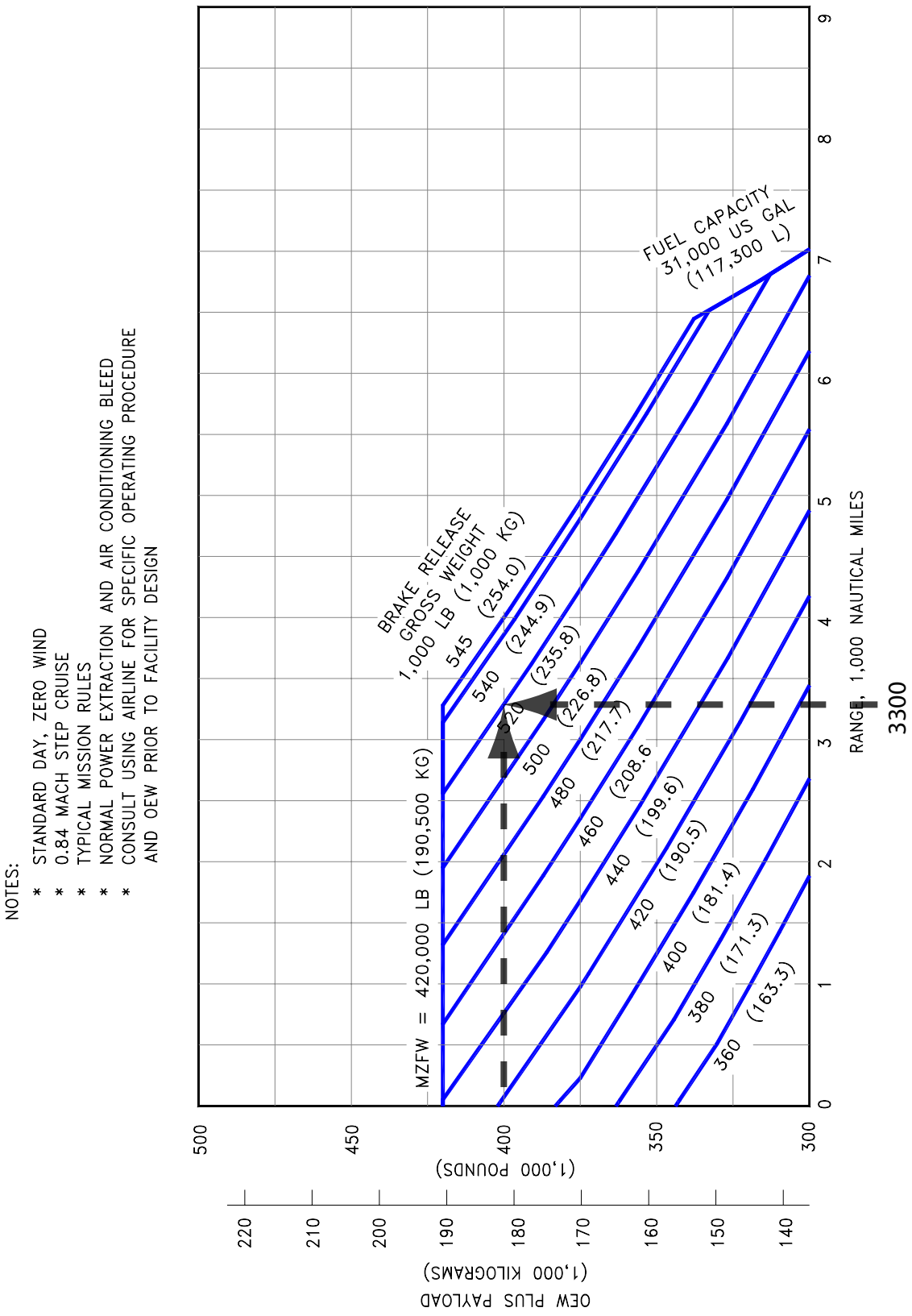
CHARACTERISTICS	UNITS	BASELINE AIRPLANE			HIGH GROSS WEIGHT OPTION		
MAX DESIGN TAXI WEIGHT	POUNDS	508,000	517,000	537,000	582,000	592,000	634,500
	KILOGRAMS	230,450	234,500	243,500	263,640	268,480	287,800
MAX DESIGN TAKEOFF WEIGHT	POUNDS	506,000	515,000	535,000	580,000	590,000	632,500
	KILOGRAMS	229,500	233,600	242,630	263,030	267,500	286,900
MAX DESIGN LANDING WEIGHT	POUNDS	441,000	445,000	445,000	460,000	460,000	460,000
	KILOGRAMS	200,050	201,800	201,800	208,700	208,700	208,700
MAX DESIGN ZERO FUEL WEIGHT	POUNDS	420,000	420,000	420,000	430,000	430,000	430,000
	KILOGRAMS	190,470	190,470	190,470	195,000	195,000	195,000
SPEC OPERATING EMPTY WEIGHT (1)	POUNDS	298,900	298,900	299,550	304,500	304,500	304,500
	KILOGRAMS	135,550	135,550	135,850	138,100	138,100	138,100
MAX STRUCTURAL PAYLOAD	POUNDS	121,100	121,100	120,450	125,550	125,550	125,550
	KILOGRAMS	54,920	54,920	54,620	56,940	56,940	56,940
SEATING CAPACITY (1)	TWO-CLASS	375 - 30 FIRST + 345 ECONOMY					
	THREE-CLASS	305 - 24 FIRST + 54 BUSINESS + 227 ECONOMY					
MAX CARGO - LOWER DECK	CUBIC FEET	5,656(2)	5,656(2)	5,656(2)	5,656(2)	5,656( )	5,656(2)
	CUBIC METERS	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)	160.3 (2)
USABLE FUEL	US GALLONS	31,000	31,000	31,000	45,220	45,220	45,220
	LITERS	117,300	117,300	117,300	171,100	171,100	171,100
	POUNDS	207,700	207,700	207,700	302,270	302,270	302,270
	KILOGRAMS	94,240	94,240	94,240	137,460	137,460	137,460

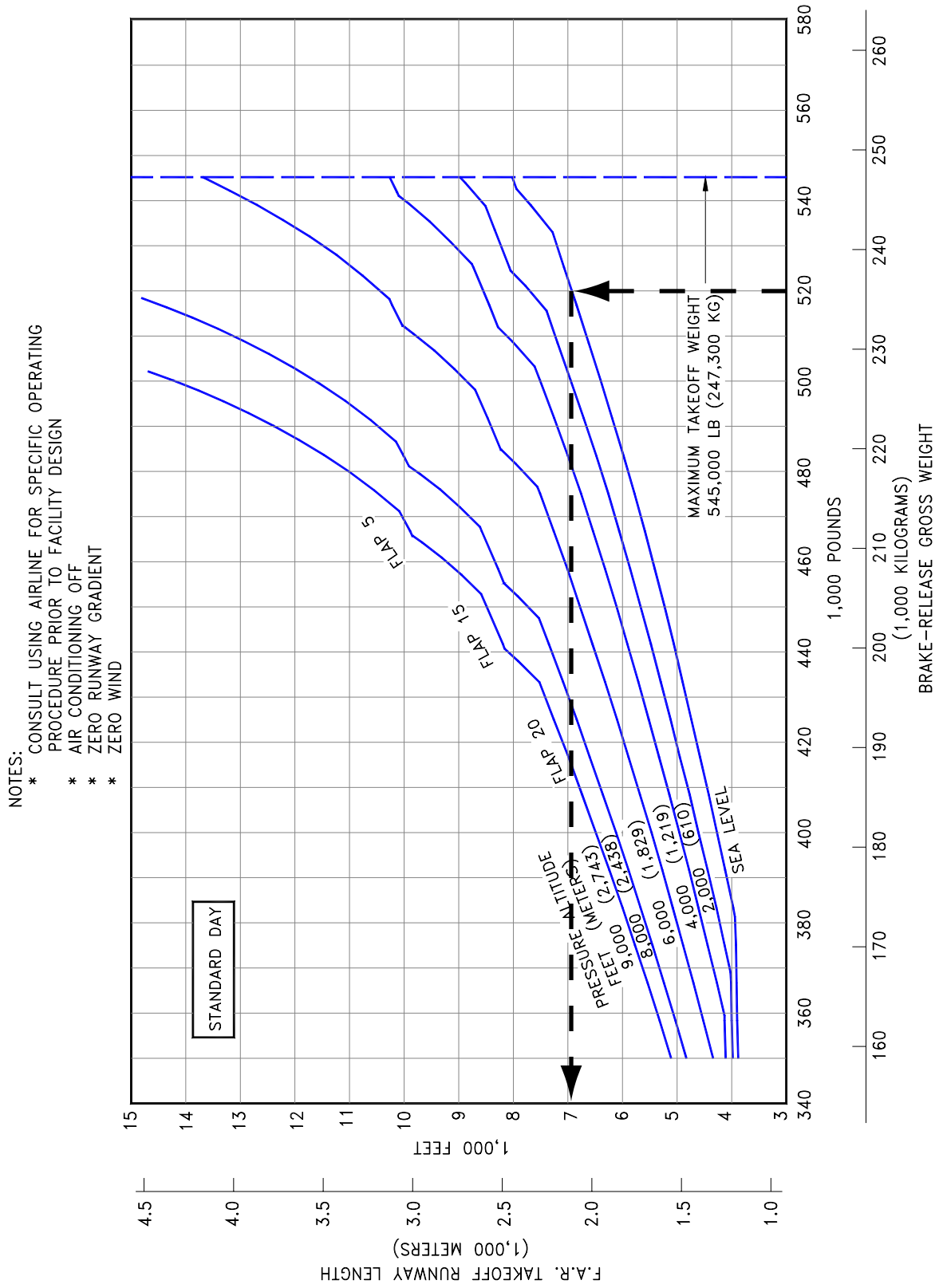
NOTES: (1) SPEC WEIGHT FOR BASELINE CONFIGURATION OF 375 PASSENGERS.
CONSULT WITH AIRLINE FOR SPECIFIC WEIGHTS AND CONFIGURATIONS.

(2) FWD CARGO = 18 LD3'S AT 158 CU FT EACH.
AFT CARGO = 14 LD3'S AT 158 CU FT EACH.
BULK CARGO = 600 CU FT

2.1.1 GENERAL CHARACTERISTICS
MODEL 777-200 (GENERAL ELECTRIC ENGINES)



3.2.1 PAYLOAD/RANGE FOR 0.84 MACH CRUISE
MODEL 777-200 (BASELINE AIRPLANE)



3.3.1 F.A.R. TAKEOFF RUNWAY LENGTH REQUIREMENTS - STANDARD DAY
MODEL 777-200 (BASELINE AIRPLANE)