Takeoff Performance Chart Description

- **Chart Heading** – The chart heading specifies the performance criteria that were used in the Runway Analysis. Items included are Aircraft Type, Engine Type, Airplane Flight Manual Revision Number, Flap Setting, Airport IATA/ICAO identifier, Airport Name, Airport City/State/Territory, Airport Elevation, and Obstacle Criteria.

- **Configuration** – This section provides a list of variables that affect aircraft performance. A few examples of configuration items are Bleeds On/Off, APR On/Off, Anti-Skid Inoperative, Runway Contaminants, etc. These options are selectable when computing a new analysis.

- **Runway Notes** – This section provides information about the selected runways, including intersection information, temporary runway details, etc.

- **Temperature** – The surface temperature upon which the performance data is based. The maximum temperature shown on the chart corresponds to the maximum operational temperature for airport elevation.

- **Takeoff Power Setting** – The takeoff thrust power setting, whether in torque, EPR, or N1, for airport surface temperature and elevation.

- **Runway/Obstacle Weight Limits** – The zero wind, standard atmospheric pressure weight limit which takes into account the following limitations: Accel-Go, Accel-Stop, Minimum Control Speeds, All-Engines Operating Go, Brake Energy, Tire Speed, Obstacle Clearance, and Flight Path/ Level-Off Altitude Limitations. Corrections are given for wind and non-standard pressure.

- **V_1** – V_1 will be listed for optimized calculations only. This speed is presented for use at the zero-wind, standard pressure limit weight. This speed is optimized for the corresponding takeoff weight limit and may be used for lower weights provided that V_1 does not exceed V_r for the actual takeoff weight. The V_1 displayed should not be used for non-standard conditions.

- **Climb Limit** – The climb limit is a weight that meets the minimum climb gradients required for each takeoff flight path segment as defined in the certification regulations. The climb limit is based on reported surface temperature and airport elevation only. The Climb Limit is INDEPENDENT of runway in use or any obstruction/terrain clearance criteria.

Limit Codes

- **ST** = Structurally Limited – the maximum certified structural weight limit*
- **FL** = Field Length Limited – the maximum weight at which an aircraft complies with the appropriate airworthiness rules governing runway length, runway gradient (slope), airport elevation, temperature, wind, pressure altitude (QNH), and runway contamination.
- **O** = Obstacle Limited – the maximum weight at which obstacle clearance is acheived in compliance with the appropriate airworthiness standards.
- **TS** = Tire Speed Limited – the maximum weight at which an aircraft will not exceed maximum tire speed ratings.
- **BE** = Brake Energy Limited – the maximum weight at which the brakes are still able to absorb the amount of energy required to stop the aircraft.
- **FP** = Flight Path/Level-Off Altitude Limited – the maximum weight at which an aircraft will complete those portions of the flight path profile that require takeoff thrust within the takeoff thrust time limits.
- **NA –** Takeoff/Landing is Not Authorized.

** Structural weight limits are aircraft-specific and must always be followed. In some circumstances APG may provide takeoff or landing weights that exceed those allowed for the operator's individual aircraft. It is up to the operator to ensure that structural weight limitations are always followed.*

Runway Identifiers

- Full-length runways are indicated by the basic identifier, i.e. 34L
- Intersection departures include the intersection identifier, i.e. 34L-A
- Temporary/construction runway lengths are designated by the letters "TMP" or "TP", i.e. 34LTMP
- Special Departure Procedures include the text "DP", i.e. 34LDP
- Runways designated with the letters "SHP" are for use when a ship is present on the departure end
- Non-standard runway identifiers, such as intersections, temporary runways, etc. will be accompanied by a "Runway Note" on the report page. These notes help to further clarify what is being taken into account for that particular runway.
    - Intersections will list the intersection identifier and available runway length
        - i.e. RWY 34L-K INTXN T/O FROM K - 9341 FT
    - Temporary runways will include what temporary considerations are taken
        - i.e. RWY 34LTMP FOR USE WHEN SOUTH 370 FT CLOSED

NOTE: *Some runways/airports require a "Special Departure Procedure" in order to optimize takeoff weight in terrain/obstacle sensitive areas. The specific description of the Special Departure Procedure is outlined on a separate page attached to the takeoff airport analysis. These procedures describe the non-standard, one engine inoperative, departure flight path. The maximum allowable takeoff weights presented in the subsequent analyses are based upon the specific procedure(s) outlined. If there is no "DP" attached to the runway identifier, the takeoff weights are predicated upon a STRAIGHT OUT departure.*

Definitions/Abbreviations

Obstacle Criteria – Obstacle clearance criteria including horizontal and vertical obstacle clearance requirements. The available options are FAA_CIRC, ICAO, AUS, and HKG.

- **FAA_CIRC** – Obstacle clearance criteria as outlined in FAA AC 120-91 "Area Analysis Method"
- **ICAO** - Obstacle clearance criteria as outlined in EASA-OPS 1.495
- **AUS** - Obstacle clearance criteria as outlined in CASA CAO Section 20.7.1B
- **HKG** - Obstacle clearance criteria as outlined in CAD Cap 448C Schedule 15.

TORA – Takeoff Run Available – the runway length declared available and suitable for the ground run of an aircraft taking off

TODA – Takeoff Distance Available - the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA

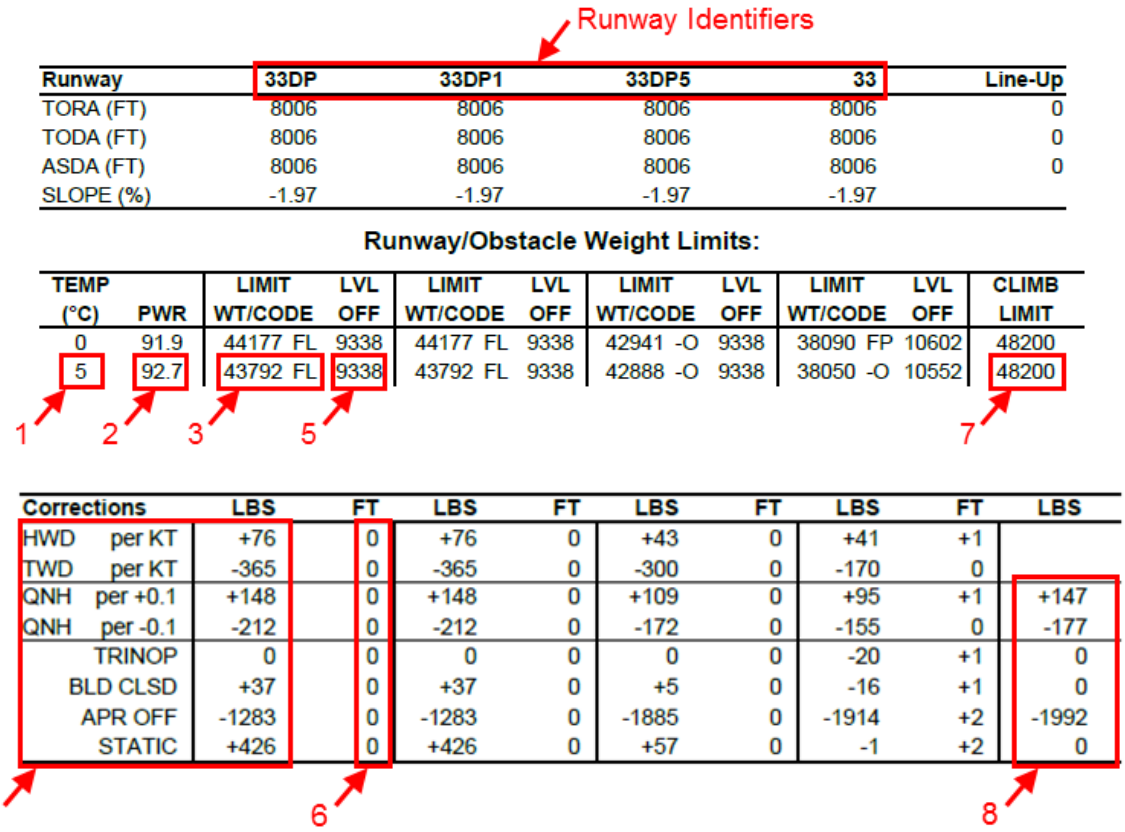
ASDA – Accelerate Stop Distance Available – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft aborting a takeoff

LDA – Landing Distance Available – the runway length declared available and suitable for landing an aircraft

LVL OFF – The level-off altitude/acceleration altitude in Height above Mean Sea Level (AMSL) to be used with the Runway Analysis. This altitude must be used in accordance with the flight path profile in the aircraft's AFM. Leveling off above or below the APG provided level-off altitude may result in obstacle clearance violations or exceed engine takeoff thrust time limits. Customers may have APG set a minimum level-off height of at least 400 ft. Depending on aircraft type, this height may be increased to allow for an extended second segment climb for obstacle clearance requirements.

Procedure for Determining Maximum Allowable Weight – Takeoff

1. Locate the row that corresponds with the desired temperature
2. Read the Power Setting to be used at this temperature
3. Determine the Uncorrected Runway/Obstacle Weight Limit for the desired runway



Runway	33DP	33DP1	33DP5	33	Line-Up
TORA (FT)	8006	8006	8006	8006	0
TODA (FT)	8006	8006	8006	8006	0
ASDA (FT)	8006	8006	8006	8006	0
SLOPE (%)	-1.97	-1.97	-1.97	-1.97	

Runway/Obstacle Weight Limits:

TEMP (°C)	PWR	LIMIT WT/CODE	LVL OFF	LIMIT WT/CODE	LVL OFF	LIMIT WT/CODE	LVL OFF	LIMIT WT/CODE	LVL OFF	CLIMB LIMIT
0	91.9	44177 FL	9338	44177 FL	9338	42941 -O	9338	38090 FP	10602	48200
5	92.7	43792 FL	9338	43792 FL	9338	42888 -O	9338	38050 -O	10552	48200

Corrections	LBS	FT	LBS	FT	LBS	FT	LBS	FT	LBS
HWD per KT	+76	0	+76	0	+43	0	+41	+1	
TWD per KT	-365	0	-365	0	-300	0	-170	0	
QNH per +0.1	+148	0	+148	0	+109	0	+95	+1	+147
QNH per -0.1	-212	0	-212	0	-172	0	-155	0	-177
TRINOP	0	0	0	0	0	0	-20	+1	0
BLD CLSD	+37	0	+37	0	+5	0	-16	+1	0
APR OFF	-1283	0	-1283	0	-1885	0	-1914	+2	-1992
STATIC	+426	0	+426	0	+57	0	-1	+2	0

4. Make the appropriate corrections for wind, QNH, and/or Bleeds and other options. This is the Corrected Runway/Obstacle Weight Limit
5. Determine the Uncorrected Level-Off Height
6. Make the appropriate corrections for wind, QNH, and/or Bleeds and other options. This is the Corrected Level Off Height
7. Determine the Uncorrected Climb Weight Limit for the given temperature
8. Make the appropriate corrections for QNH and/or Anti-Ice. This is the Corrected Climb Weight Limit

The Maximum Takeoff Weight is the lowest of the Corrected Runway/Obstacle Weight Limit, the Corrected Climb Weight Limit, and the Structural Takeoff Weight Limit.

(Example calculation on next page)

Procedure for Determining Maximum Allowable Weight – Takeoff (Continued)

EXAMPLE:
Runway 33DP
Temperature = 5 degrees
Wind = 4 kt headwind
QNH = 29.75 in Hg

Power Setting = 92.7
Uncorrected Runway/Obstacle Weight Limit = 43,792 lbs
Wind Correction = 76 lbs * 4 kts = 304 lbs
QNH Correction = 29.92 - 29.75 = 0.17 * -212 lbs per 0.1 = 1.7 * -212 lbs = -360.4 lbs
Corrected Runway/Obstacle Weight Limit = 43,792 + 304 -360.4 = **43,745 lbs**

Uncorrected Level-Off Height = 9,338 ft MSL
No correction required for Wind or QNH in this scenario
Corrected Level Off Height = **9,338 ft MSL**

Uncorrected Climb Limit = 48,200 lbs
QNH Correction = 29.92 – 29.75 = 0.17 * -177 lbs per 0.1 = 1.7 * -177 lbs = -300.9 lbs
Corrected Climb Weight Limit = 48,200 lbs – 300.9 lbs = **47,899 lbs**

Structural Takeoff Weight Limit = 48,200 lbs

Maximum Takeoff Weight is the lowest of the Runway/Obstacle, Climb, and Structural Limit Weights. **Therefore, the Maximum Takeoff Weight for this example is 43,745 lbs**

Landing Performance Chart Description

- **Chart Heading** – The chart heading specifies the performance criteria that were used in the Runway Analysis. Items included are Aircraft Type, Engine Type, Airplane Flight Manual Revision Number, Flap Setting, Airport IATA/ICAO identifier, Airport Name, Airport City/State/Territory, and Airport Elevation.

- **Configuration** – This section provides a list of variables that affect aircraft performance. A few examples of configuration items are Bleeds On/Off, APR On/Off, Anti-Skid Inoperative, Runway Contaminants, etc. These options are selectable when computing a new analysis.

- **Runway Notes** – This section provides information about the selected runways, including intersection information, temporary runway details, etc.

- **Approach Climb Limits** – The approach climb weight limit meets the minimum climb gradients required for the approach climb (go-around) phase of landing as defined in the certification regulations. The approach climb weight limit is based on reported surface temperature and airport altitude only. The approach climb weight limit is independent of runway in use, missed approach procedure to be used, and any obstacle/terrain clearance criteria.

- **Field Length Weight Limits/Distances** – The zero wind runway weight limit corresponding to the runway's landing distance available (LDA). Landing weight limits and distances required are shown for:

  Dry runway and WET runway (note: The WET runway performance data is based upon a factor of 115% as outlined within applicable regulations)
  Regulatory Destination Airport factors of:
  60% (1.67)
  80% (1.43)
  100% - UNFACTORED
  Wind components of -10 Tailwind, 0 wind, 10 and 40 knots of Headwind.
  Destination airport temperature.

Runway Identifiers

- Full-length runways are indicated by the basic identifier, i.e. 34L
- Temporary/construction runway lengths are designated by the letters "TMP" or "TP", i.e. 34LTMP
- Non-standard runway identifiers, such as temporary runways, etc. will be accompanied by a "Runway Note" on the report page. These notes help to further clarify what is being taken into account for that particular runway.
  - Temporary runways will include what temporary considerations are taken
    - i.e. RWY 34LTMP FOR USE WHEN SOUTH 370 FT CLOSED

Procedure for Determining Maximum Allowable Weight – Landing

1. Locate the limit weight for the required Approach Climb Gradient and temperature. This becomes your Approach Climb Weight Limit.

Approach Climb Limits:

GRAD	30	32	34	36	38
2.1%	38000	38000	38000	38000	38000
2.5%	38000	38000	38000	38000	38000

Field Length Weight Limits/Distances:

RWY: 10
LDA: 4800FT
SLOPE: -0.63%
COND: DRY

WIND (KT)	OAT (°C)	60% WEIGHT	60% DIST	70% WEIGHT	70% DIST	80% WEIGHT	80% DIST	UNFACTORED WEIGHT	UNFACTORED DIST
10	30	34107	4800	38000	4458	38000	3901	38000	3121
	32	34107	4800	38000	4458	38000	3901	38000	3121
	34	34107	4800	38000	4458	38000	3901	38000	3121
	36	34107	4800	38000	4458	38000	3901	38000	3121
	38	34107	4800	38000	4458	38000	3901	38000	3121

2. Locate the section under Field Length Weight Limits/Distances that corresponds with the desired runway. LDA, Slope, and Runway Condition are provided for your information.
3. Locate the set of rows that correspond with the actual headwind, reported by ATIS or METAR
4. Locate the row that corresponds with the desired temperature
5. Locate the column that corresponds with the desired landing factor
6. Read the Field Length Weight Limit from the appropriate column/row
7. Read the corresponding Landing Distance Required for that limit weight
    a. This distance already takes into account the landing factor required, NOT the actual landing distance.

The Maximum Landing Weight is the lowest of the Approach Climb Weight Limit, the Field Length Weight Limit, and the Structural Landing Weight Limit.

EXAMPLE:
Runway 10
Temperature = 32 degrees
Wind = 10 kt headwind
Required Approach Climb Gradient = 2.1%
Operational Landing Factor Required = 60%

Approach Climb Weight Limit = 38,000 lbs
Field Length Weight Limit = 34,107 lbs
Landing Distance Required = 4,800 ft
Structural Landing Weight Limit = 38,000 lbs

Maximum Landing Weight is the lowest of the Approach, Field Length, and Structural Landing Weight Limit. **Therefore, the Maximum Landing Weight for this example is 34,107 lbs.**

NOTE: Landing pages only display a limited number of temperatures due to the amount of data presented. If a different landing temperature is desired, use the "Use Temp" feature just prior to clicking "Compute" when running a new analysis. Be sure to specify the desired temperature and ensure the "Use Temp" box is checked before clicking compute. Alternatively, temperature step size can be adjusted for each aircraft by request. Please contact APG for further information.