Attachment 12

to Operational Factors / Human Performance Group Factual Report

DCA11IA047

OPC LANDING PERFORMANCE MODULE

Landing Performance Module

The Landing Performance module computes stop margins, speeds, and power settings for actual conditions.

Computing Landing Performance

1. From the Module Menu screen, select Landing Performance to display the Airport Directory screen.

2. Select the arrival airport, and click OK to display the Runway Directory screen.

3. Select the runways to consider for landing.

4. Enter NOTAM data.

5. Click OK to display the Landing ATIS Input screen.

6. Enter ATIS information (**-300/-500**: Dew Point not displayed/required). Click OK to return to the Landing Input screen.

7. Enter the Landing Weight:

   a. Click the WGTS button to display the Landing Weights Input screen.

   b. Enter the anticipated Landing Weight.

   c. Click OK to return to the Landing Input screen.

8. Select the anticipated runway condition and aircraft configuration.

    Click the appropriate buttons to toggle through options. Any time a toggle button displays anything other than the default configuration, the button is highlighted with hash-marks.

    Runway Condition—toggle to the reported runway condition. No "clutter" selections are available/required for landing.

    Landing Flaps—toggle to the appropriate flap setting (normal or non-normal).

Landing Flaps: 30	Flaps: BETWEEN 1 AND 15
Landing Flaps: 15	Flaps: 15 HYD SYS-A FAILURE
Landing Flaps: 40	Flaps: 30 HYD SYS-A FAILURE
Flaps: 15 SINGLE ENGINE	Flaps: 40 HYD SYS-A FAILURE
Flaps: 15 ASYMMETRICAL or NO LEDs	Flaps: 15 HYD SYS-B FAILURE
Flaps: 1 OR LESS, LEDs NOT FULL EXT	Flaps: MANUAL REVERSION
Flaps: 1 OR LESS, LEDs FULL EXT	Flaps: *15 HYD A OFF GEAR LVR UP

(* 300/500 ONLY)

AIII—click if the HGS AIII mode is used for landing (flare guidance). Hash marks display on the button. When selected, the OPC ensures the Operations Specification increased landing distance requirement (controlled touchdown point) is met. This adds 1000 ft to the landing flare distance, which corresponds to 1000 ft less stop margin. After including the 15 percent landing distance safety margin, this difference becomes 1150 ft.

RVR < 4000—click if the RVR is less than 4000 ft, or visibility is less than 3/4 mile. Hash-marks display on the button. When selected, the OPC ensures the Operations Specification wet runway landing distance requirement is met.

> **Note:** If landing distance requirements cannot be met for the HUD (or RVR), a limit code of "RWY" (or "RVR") displays in lieu of stop margins for the affected runways.

Air Conditioning—toggle to the appropriate setting.

Anti-ice—select the appropriate configuration if enroute icing is encountered and the forecast landing temperature is $\leq 10°C$ (**-300/-500**: 8°C) or if anti-ice use is anticipated at landing. "Anti-ice: Engine On" and "Anti-ice: Engine & Wing On" include the enroute icing penalty in the approach climb limit calculation.

$V_{REF\ ICE}$ (applies only to Flaps 15; **-300/-500**: N/A)—if any anti-ice selection is made, the OPC automatically adds 10 knots to V_{REF} and V_{TARGET} speeds. (This increase must be manually entered in the FMC.)

9. Click the MEL and CDL buttons to access performance related MEL and CDL items. The OPC retains all previously selected items.

10. Click OK to calculate the stop margins for the selected runways and display the Landing Output screen.

Landing Output Screen

The Landing Output screen displays landing parameters for entered conditions. When viewing landing data for multiple runways, select the desired landing runway to display the Quick Turn weight, $V_{TARGET\ SPEED}$ (V_{REF} + wind additives), and Brake Cooling (BRK COOL) button (if applicable).

① Airport Landing Data

Displays pressure altitude, maximum allowable OAT, runway condition, bleeds configuration, and anti-ice configuration.

② ATIS Data

Displays ATIS data entered on the Landing ATIS Input screen.

③ Check Wing Frost if Fuel Temp < __ ° C

Indicates the temperature below which cold-soaked fuel frost may form on the wing **(-300/-500**: N/A**)**.

④ Runway Data

Displays the following for each runway:

• Runway Length—length available for landing. To the right of the length is a two-letter code that indicates the basis for the landing length. Three codes are possible:

RW—available runway length

DT—displaced threshold landing distance

GS—glideslope runway intercept distance plus 1000 ft

If a runway is Quick Turnaround Weight limited, a highlighted "B" prefix displays to the left of the runway identifier.

• Winds—actual wind speed components. If a tailwind or crosswind component exceeds the corresponding limit, the actual component is highlighted and the OPC displays dashes in lieu of a stopping margin. Limits display on the Information Line (IL) if the entered wind exceeds these limits.

  If runway conditions are WET-FAIR, the tailwind and crosswind limits are -10 knots and 15 knots. For WET-POOR, the limits are -5 knots and 10 knots.

• Approximate Stop Margin—based on minimum, medium, and maximum braking and corresponds to three different auto brake settings (2, 3, and MAX). Each stop margin calculation includes 1500 ft air distance from threshold to touchdown and an extra 15 percent distance factor. Stop margin is the distance remaining after the aircraft comes to a complete stop, measured from the nose gear to the end of the available runway. If the estimated landing distance is longer than the available runway length, the approximate stop margin is negative, highlighted, and bracketed "[ ]."

⑤ **Information Line (IL)**

Displays tailwind and crosswind limits, if applicable.

⑥ **Brake Cooling button (displays if Max Quick Turn Weight exceeded)**

Click to display the Brake Cooling Schedule screen for calculating brake cooling requirements. The Brake Cooling Schedule screen defaults to display Brakes on Speed of 80 knots, calculated wind component, and 1.5 NM taxi distance (representing the distance from runway to gate). Changing these values yield new parked cooling times. Parked cooling times are required (FAR) unless the Max Quick Turnaround Weight Alternate Procedure in the *FOM* applies.

⑦ **All Eng Button**

Click to display a table that shows the all engine climb capability to compare aircraft climb performance to charted non-standard obstacle climb gradient requirements (i.e., missed approach).

⑧ **Landing Assumptions**

Displays the thrust reverser level, AIII setting, and RVR setting used in the landing calculations.

⑨ **V-speeds**

Displays all data when viewing a single runway. When viewing multiple runways, it displays V_{REF} and Go-Around power. Select the desired landing runway to display the Quick Turn weight and V_{TARGET} speed (V_{REF} + wind additives). Limits V_{TARGET} speed to flap placard speed minus 5 knots.

⑩ **Landing Data**

Displays the following:

- Landing Weight—displays a flashing "[OVERWGT]" label if the landing weight entered exceeds either the maximum certified landing weight or the Max Approach Climb Weight.
- Landing Flaps—flap setting entered on the Landing Input screen.
- Quick Turn—quick turnaround weight; displays when viewing landing data for a single runway. Each runway is checked for Max Quick Turn limits. If a runway is limited by Max Quick Turn requirements, a highlighted "B" displays to the left of the runway identifier.
- App Clb—Maximum Approach Climb Limit Weight.

Calculating the Landing All-Engine Climb Gradient
The all-engine gradient for landing calculates two different missed approach profiles based on the use of full go-around thrust (double click TO/GA with autothrottle):

1. Normal Climb Profile
2. Flaps Up Maneuver Speed to 10K
3. 280 kt Climb Above 10K

The calculated climb gradients for landing are based on a go-around approach initiated at 50 ft over the runway threshold and calculated with the distance traveled to the designated altitude.