



CL-350

Bombardier
CHALLENGER 350



CL-350 SUPPLEMENTAL MANUAL

SUPPLEMENTS

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CONTAMINATED – GENERAL**CONTAMINATED RUNWAY PERFORMANCE DATA****GENERAL**

This supplement contains information and procedures for operation of the Challenger 350 BD-100-1A10 airplane, fitted with two AS907-2-1A engines, on contaminated runways. The following information and procedures have been prepared by the manufacturer for use when operating on runway surfaces contaminated by standing water, slush, dry snow, wet snow, compacted snow or ice.

- This information has been prepared by the manufacturer and approved as guidance material to assist operators in developing suitable guidance, recommendations or instructions for use by their flight crews when operating on contaminated runway surface conditions.
- The data have been prepared using industry accepted calculations to determine the effects of contaminated runway surfaces on the accelerating ground roll and braking ground roll. **The effects of actual conditions may differ from those used to establish this data.**
- The level of safety is decreased when operating on contaminated runways, therefore, every effort should be made to ensure that the runway surface is cleared adequately of any significant precipitation.
- Contaminated runway performance data were calculated assuming that the runway is completely contaminated, with the contaminant (standing water, slush, or snow) to be of uniform depth and density.
- When operating on contaminated runways, ground handling characteristics will not be as good as can be achieved on dry runways. In particular, this is applicable in crosswind conditions and when using thrust reversers.

Performance calculations in the Computerized Airplane Flight Manual (CAFM) automatically take into account the runway surface condition as required, based upon the selection made in the drop-down list of the Runway Surface Condition section under the Runway Data pane of the CAFM calculator.

The performance data in Chapter 6 – PERFORMANCE (CAFM) are applicable.

DEFINITION OF RUNWAY CONDITIONS**SPECIFIC GRAVITY**

Specific gravity is defined as the density of the runway contaminant divided by the density of water.

STANDING WATER OR SLUSH

A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not), within the required length and width being used, is covered by more than 1/8 inch (3 mm) of standing water or its equivalent in slush (see table below).

**CONTAMINATED – GENERAL**

DEPTH OF STANDING WATER	EQUIVALENT DEPTH
	SLUSH
0.125 in (3.2 mm)	0.125 in (3.2 mm)
0.250 in (6.4 mm)	0.250 in (6.4 mm)

Standing water is accumulated water on the runway surface caused by heavy rainfall or by poor drainage.

Slush is partly melted snow or ice with high water content, from which water can readily flow, with an assumed specific gravity of 0.85. Slush is normally a transient condition found only at temperatures close to 0 °C (32 °F).

WET SNOW

A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not), within the required length and width being used, is covered by wet snow.

Wet snow is snow that will stick together when compressed, but will not readily allow water to flow from it when squeezed, with an assumed specific gravity of 0.5.

COMPACTED SNOW

A runway is considered to be contaminated by compacted snow when covered by snow which has been compacted into a solid mass such that the airplane wheels, at representative operating pressures and loading, will run on the surface without causing significant rutting (i.e. resists further compression).

Compacted snow will hold together or break into lumps if picked up by hand.

DRY SNOW

A runway is considered to be contaminated by dry snow when more than 25% of the runway surface area (whether in isolated areas or not), within the required length and width being used, is covered by dry snow.

Dry snow is fresh snow that can be blown, or, if compacted by hand, will fall apart upon release (also commonly referred to as loose snow), with an assumed specific gravity of 0.2.

ICE

A runway surface condition where braking action is expected to be very low, due to the presence of ice.

Ice is water which has frozen on the runway surface, including the condition where compacted snow transitions to a polished ice surface.

CONTAMINATED – GENERAL**MAXIMUM CONTAMINANT DEPTHS**

The maximum depths of runway contaminants covering an appreciable part of the runway are:

MAXIMUM CONTAMINANT DEPTHS		
CONTAMINANT	TAKEOFF	LANDING
STANDING WATER	0.25 in (6.4 mm)	0.50 in (12.7 mm)
SLUSH	0.25 in (6.4 mm)	0.50 in (12.7 mm)
WET SNOW	0.50 in (12.7 mm)	1.00 in (25.4 mm)
DRY SNOW	2.00 in (50.8 mm)	3.00 in (76.2 mm)

TAKEOFF FROM CONTAMINATED RUNWAYS

The use of takeoff distance on a contaminated runway that is shorter than the takeoff distance on a dry runway is prohibited.

Distances for runways contaminated with standing water, slush, wet snow, dry snow, compacted snow or ice are calculated by the CAFM assuming that the runway is completely contaminated. However, selection of the type and amount of contaminant should be based on the runway conditions where the high speed portion of the takeoff will occur and, in the case of an ice covered runway, where braking would be used during a rejected takeoff.

STANDARD PERFORMANCE CONDITIONS

All contaminated runway takeoff performance is based on the following performance conditions:

- Braking – Maximum until full stop
- APR – ARMED
- Automatic Ground Lift Dumping – ARMED
- Thrust Reversers – Maximum Reverse down to 40 KIAS, then set to Reverse Idle until full stop.

CONTAMINATED RUNWAY TAKEOFF DATA

NOTE: Dispatch with only one thrust reverser available is not recommended on a ice covered runway.

CAFM calculators provide the following runway contaminants for takeoff:

- Ice
- Compacted Snow
- 2 in (50.8 mm) Dry Snow
- 0.125 in (3.2 mm) Standing Water or equivalent
- 0.250 in (6.4 mm) Standing Water or equivalent



CONTAMINATED – GENERAL

- 0.250 in (6.4 mm) Wet Snow
- 0.500 in (12.7 mm) Wet Snow.

If the runway is covered by less than 2 in (50.8 mm) of Dry Snow, the performance data for 2 in (50.8 mm) of Dry Snow shall be used. If the runway is covered by less than 0.25 in (6.4 mm) of Wet Snow, the performance data for 0.25 in (6.4 mm) of Wet Snow shall be used.

When a contaminated runway is selected as the runway surface condition, the CAFM calculator presents the 'Thrust Reversers' drop-down menu (when applicable). The CAFM user can then select the number of thrust reversers available at dispatch, as permitted by the applicable MEL (Minimum Equipment List)

The CAFM calculators input checking ensures that the proper anti-ice system is selected for the specified runway contaminant and ambient temperature. It is verified that the anti-ice requirements on contaminated runways are applied (see the Basic Limitations 'Operation in Icing Conditions' Section, Limitations Chapter 2).

The takeoff performance on a contaminated runway is determined using the same methodology as described for the dry and wet runway conditions in Chapter 6 of the AFM.

ACTUAL LANDING DISTANCE ON CONTAMINATED RUNWAYS

The use of actual landing distance on contaminated runways that is shorter than the dry runway factored landing distance is prohibited.

The Landing Performance Module of the CAFM calculates the actual landing distance on a contaminated runway. The data are provided for the following runway contaminants:

- Ice
- Compacted Snow
- Dry Snow
- Slush or Standing Water
- Wet Snow.

The actual landing distances presented are based on:

- Automatic Ground Lift Dumping – ARMED
- Braking – Maximum until full stop
- Thrust Reversers – Maximum Reverse down to 40 KIAS, then set to Reverse Idle until full stop.

When a contaminated runway is selected as the runway surface condition, the CAFM calculator presents the 'Thrust Reversers' drop-down menu. The CAFM user can then select the number of thrust reversers available at dispatch, as permitted by the applicable MEL (Minimum Equipment List).

CONTAMINATED – GENERAL

The actual landing distance calculations on contaminated runways with both engines operating, are predicated upon speeds at the runway threshold from V_{REF} to $V_{REF} + 10$ KIAS, corrected for the effects of wind and usage of thrust reversers.

The operator can also specify a Landing Distance Factor to be applied on the Actual Landing Distance determined by the CAFM.

Effectivity:

For EASA registered aircraft

NOTE: The landing distance on contaminated runways must be factored by 1.15 and this is accomplished in the CAFM by entering the factor in the Ldg Dist Factor field within the Landing Distance and Speed Calculator. This factored landing distance output must then be compared with the corresponding factored landing distance output for wet runways and the longer of the two utilized.

NOTE: ROAAS (if installed) may not provide timely alerts to reduce the risk of overrun on contaminated runways with braking reports less than RCC 5.

NORMAL PROCEDURES

The normal procedures in Chapter 4 are applicable, except as modified by the following:

If landing on a contaminated runway:

1. ROAAS RCC 5 switch (if installed) ON

NOTE: ROAAS may not provide timely alerts to reduce the risk of overrun on contaminated runways with braking reports less than RCC 5.

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INTRODUCTION

This supplement is only applicable when used in conjunction with a Minimum Equipment List (MEL) approved by the appropriate authority.

The performance corrections to be applied when dispatching with airplane systems inoperative as allowed by the MEL, are calculated automatically in the CAFM when specified in the MMEL/CDL section of the CAFM calculator. In order for the effect of these inoperative equipment to be taken into account in the calculation, the MMEL/CDL extension of the CAFM calculator dialog must be open or activated **and the check box appropriate for the MEL item selected**.

The following data must be used in conjunction with the basic Airplane Flight Manual (AFM), its supplements and the CAFM.

LIMITATIONS

The limitations established in Chapter 2 are applicable, except as modified by the following:

FLIGHT WITH LANDING GEAR DOWN

Category II Operations are prohibited.

NOSEWHEEL STEERING INOPERATIVE

The maximum crosswind is 15 knots.

EMERGENCY PROCEDURES

The emergency procedures in Chapter 3 are applicable.

NORMAL PROCEDURES

The normal procedures in Chapter 4 are applicable.

NON-NORMAL PROCEDURES

The non-normal procedures in Chapter 5 are applicable.

PERFORMANCE

The performance data in Chapter 6 PERFORMANCE, the CAFM **and Chapter 7 – SUPPLEMENTS** are applicable, with the addition of the following:

- Activate the MMEL/CDL extension of the CAFM calculator and toggle the check box for the appropriate item(s) in the MMEL listing of inoperative systems.

NOTE: The provision of performance information for inoperative equipment in the CAFM does not imply approval for dispatch in the MMEL/MEL. The MMEL/MEL must be consulted to ensure that dispatch with inoperative equipment is permitted



FLIGHT DIRECTOR GUIDANCE OR TOGA SWITCHES INOPERATIVE

Dispatch with one or both flight directors inoperative and/or with TOGA switches inoperative is conducted following the normal takeoff procedure using the target pitch attitude for takeoff specified in the following tables. The ΔV between V_2 and V_R for the specified conditions is used to find the target pitch attitude. Different pitch attitudes are provided depending on takeoff flap setting, V_R value and the number of engines operating. Go-around procedure with one or both flight directors inoperative is conducted using a fixed target pitch attitude of 8 degrees.

Target Pitch Attitude for Takeoff Flaps 10

$\Delta V = (V_2 - V_R)$ (KIAS)	$V_R \leq 121$ KIAS		$V_R > 121$ KIAS	
	Single Engine Pitch Guidance (Degrees)	All Engine Pitch Guidance (Degrees)	Single Engine Pitch Guidance (Degrees)	All Engine Pitch Guidance (Degrees)
0	8.5	13.4	7.5	9.8
1	8.8	14.0	8.0	11.1
2	9.2	14.7	8.6	12.4
3	9.5	15.3	9.2	13.7
4	9.9	16.0	9.8	15.0
5	10.3	16.6	10.4	16.3
6	10.6	17.2	11.0	17.6
7	11.0	17.9	11.6	18.9
8	11.3	18.5	12.2	20.2
9	11.7	19.2	12.8	21.5
10	12.0	19.8	13.4	22.8
11	12.4	20.5	14.0	22.8
12	12.7	21.1	14.0	22.8
13	13.1	21.7	14.0	22.8
14	13.4	22.4	14.0	22.8
15 or more	13.8	23.0	14.0	22.8

Target Pitch Attitude for Takeoff Flaps 20

$\Delta V = (V_2 - V_R)$ (KIAS)	$V_R \leq 120$ KIAS		$V_R > 120$ KIAS	
	Single Engine Pitch Guidance (Degrees)	All Engine Pitch Guidance (Degrees)	Single Engine Pitch Guidance (Degrees)	All Engine Pitch Guidance (Degrees)
0	5.9	11.3	6.9	10.8
1	6.3	11.9	7.5	11.9
2	6.7	12.5	8.2	13.0
3	7.0	13.1	8.9	14.1
4	7.4	13.7	9.6	15.2
5	7.8	14.3	10.3	16.3
6	8.2	14.9	10.9	17.4
7	8.5	15.5	11.6	18.5
8	8.9	16.1	12.3	19.6
9	9.3	16.7	12.3	19.6
10	9.6	17.3	12.3	19.6
11	10.0	17.9	12.3	19.6
12	10.4	18.5	12.3	19.6
13	10.8	19.1	12.3	19.6
14	11.1	19.7	12.3	19.6
15 or more	11.5	19.7	12.3	19.6

PITCH_C350_04APR14

Figure 07-02-01-1



FLIGHT WITH LANDING GEAR DOWN

The performance data in Chapter 6 are applicable, with the addition of the following:

- Activate the MMEL/CDL extension of the CAFM calculator and toggle the check box for Flight with Landing Gear Down in the MMEL listing of inoperative systems.

Alternatively, apply the following performance corrections to the data determined using the CAFM without activation of any MMEL item.

TAKEOFF FIELD PERFORMANCE

Table 1 presents the takeoff performance corrections to be applied to the basic CAFM Takeoff data.

TABLE 1: TAKEOFF PERFORMANCE CORRECTIONS – LANDING GEAR DOWN	
AFFECTED CAFM DATA	EFFECT OF FLIGHT WITH LANDING GEAR DOWN
Dry (or Wet or Contaminated) Runway Takeoff Data – Flaps 10 or 20 – All Bleeds – All Altitudes	Increase the V_1 , V_R and V_2 from basic CAFM data by 3 KIAS. Increase the Takeoff Field Length obtained from the basic CAFM data by 6.0%. Reduce the takeoff weight limited by tire speed from basic CAFM data by 1600 lb.

NOTE: V_1 limited by maximum brake energy (V_{1MBE}) is unaffected by this MMEL item. Hence, when the correction from Table 1 is applied to V_1 , the operator must make sure the corrected value still respects the V_{1MBE} limit.

TAKEOFF AND LANDING WEIGHT LIMITED BY CLIMB REQUIREMENTS

The alternative performance penalty for dispatch with landing gear down is calculated as a weight decrement to be applied to the basic CAFM data and is presented in Table 2.

TABLE 2: TAKEOFF AND LANDING WEIGHT LIMITED BY CLIMB REQUIREMENTS CORRECTIONS – LANDING GEAR DOWN	
AFFECTED CAFM DATA	EFFECT OF FLIGHT WITH LANDING GEAR DOWN
Takeoff Weight Limit – Flap 10	Reduce the takeoff weight limited by climb requirements from basic CAFM data by 9000 lb.
Takeoff Weight Limit – Flap 20	Reduce the takeoff weight limited by climb requirements from basic CAFM data by 6500 lb.
Landing Weight Limit	Reduce the landing weight limited by climb requirements from basic CAFM data by 7500 lb.

TAKEOFF FLIGHT PATH

The following takeoff flight path related items are affected by the landing gear being down:

- Second segment gradient
- Maximum level-off height
- Net acceleration distance from V_2 to V_{FTO}
- Final segment gradient.

The following paragraphs provide a simplified alternative to consider the above flight path effects for flight with landing gear down. There are two possible cases depending on the location of the obstacles:

Case 1:

Obstacles are present in the takeoff flight path and they are all cleared by the required margin when the aircraft reaches the level-off height (i.e. the acceleration distance and the final segment climb are not limiting):

- Flap 10 and Flap 20: Reduce the normal performance limited takeoff weight by 7000 lb.

Case 2:

For far away obstacles which are cleared in the level acceleration segment or in the final segment, use the CAFM to calculate performance with landing gear down.



ENROUTE

Table 3 presents the corrections to be applied to the basic CAFM enroute data. The corrections are valid for all engine bleed configurations.

TABLE 3: ENROUTE GRADIENT CORRECTION – LANDING GEAR DOWN	
AFFECTED CAFM DATA	EFFECT OF FLIGHT WITH LANDING GEAR DOWN
Net Enroute Climb Gradient – All Bleeds	Reduce the Net Enroute Climb Gradient from basic CAFM data by 5.0%.

LANDING

Table 4 presents the corrections to be applied to the basic CAFM landing data. The corrections are valid for all engine bleed configurations.

TABLE 4: GRADIENT CORRECTION AND APPROACH CLIMB SPEED – LANDING GEAR DOWN	
AFFECTED CAFM DATA	EFFECT OF FLIGHT WITH LANDING GEAR DOWN
Approach Climb Gradient – All Bleeds	Reduce the Approach Climb Gradient from basic CAFM data by 2.7%.
Approach Climb Speed	Increase the Approach Climb Speed, V_{2GA} , from basic CAFM data by 3 KIAS.

FLAP 0 STALL SPEEDS WITH LANDING GEAR DOWN

The Flap 0 Stall Speeds presented on Figure 06–01–12 (Chapter 6 Performance) supersede the corresponding speeds determined with the General Module, Stall Speeds calculator of the CAFM.

The landing gear down stall speeds presented on the chart are given as a function of gross weight and are valid for any altitude from Sea Level to 18000 ft.

NOSEWHEEL STEERING INOPERATIVE

The performance data in Chapter 6 are applicable, with the addition of the following:

- Activate the MMEL/CDL extension of the CAFM calculator and toggle the check box for Nosewheel Steering Inoperative in the MMEL listing of inoperative systems.

Alternatively calculations can be performed using the distance penalty for Nosewheel Steering Inoperative as presented in Table 5 and can be applied to previously calculated CAFM performance data (with the Nosewheel Steering Inoperative MMEL item not selected).

TAKEOFF

The performance corrections are summarized in Table 5.

TABLE 5: TAKEOFF WEIGHT CORRECTION – NOSEWHEEL STEERING INOPERATIVE	
AFFECTED CAFM DATA	EFFECT OF NOSEWHEEL STEERING INOPERATIVE
Dry (or Wet) Takeoff Data – Flaps 10 or 20 – All Bleeds – All Altitudes	Increase the Takeoff Field Length obtained from the basic CAFM data by 1.0%.

RADIO ALTIMETER INOPERATIVE**LANDING DATA**

Performance corrections must be applied to the corrected Landing Distance for dry, wet, or contaminated runway operations as follows:

AFFECTED CAFM OUTPUT	EFFECT OF RADIO ALTIMETER INOPERATIVE
Dry and Wet Runway Landing Data, Contaminated Runway Actual Landing Distance	Increase the Actual (ALD), Factored (FLD) and Wet Factored (FLD WET) Landing Distances, when using the applicable CAFM data, by 10.0%.



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INTRODUCTION

NOTE: This Airplane Flight Manual supplement does not constitute approval to conduct Category II operations.

The Bombardier Challenger 350 has been shown to meet the airworthiness requirements for Category II Operations contained in Appendix 1 of AC 120-29 and Subpart 2 of CS-AWO. The data in this supplement must be used when conducting Category II operations.

These data complement or supersede data contained in the basic Airplane Flight Manual. This supplement must therefore be read in conjunction with the basic Airplane Flight Manual.

The effect of this supplement on the basic Airplane Flight Manual is given below.

LIMITATIONS

The limitations in the Aircraft Flight Manual are applicable with the addition of the following:

1. Flaps must be at 30°.
2. The minimum decision height is 100 ft AGL.
3. Single engine Cat II AP coupled approaches are prohibited.
4. FD only Cat II operations are prohibited.
5. Cat II approaches with autothrottle engaged are prohibited.
6. Cat II approaches must be flown with the Autopilot coupled.
7. YD must be selected on.
8. Use of FMS computed approach speeds is prohibited.
9. Cat II approaches are prohibited if one or more of the following messages are displayed:
 - AFCS MESSAGES FAIL Caution
 - EFIS COMPARATOR INOP Caution
 - EFIS MISCOMPARE Caution.
10. The maximum ILS glidepath angle for Category II approaches is 3.5 degrees.

An ILS approach to Category II minima must not be commenced or continued unless all required airborne equipment (specified in the Category II Required Equipment List below), and their ground installations are operating satisfactorily.

**CATEGORY II REQUIRED EQUIPMENT LIST**

EQUIPMENT	REQUIREMENT
YD	Must be operational
Autopilot	Must be operational
VHF NAV 1 & 2	Both must be operational and displayed onside
L/R PFD	One PFD available and operational for each side
PRI STAB Trim	Must be operational
Radio Altimeter*	Must be operational, with display on both sides
IRS 1 & 2	Both must be operational
ADC 1 & 2	Both must be operational
FD 1 & 2	Both must be operational
Hydraulics	L, R, & Aux systems must be operational
Electrical	Two generators on and sharing load, (Two engine generators, or one engine generator and the APU generator)

EMERGENCY PROCEDURES

The emergency procedures in chapter 3 are applicable, except as modified by the following:

If RA is displayed on the PFD:

1. Do not conduct Cat II approaches.
2. Normal actual landing distance Multiply by:
1.20 without thrust reversers
1.15 with thrust reversers

NORMAL PROCEDURES

APPROACH

A category II monitor is enabled when specific conditions have been met. When the category II monitor is enabled, deviations beyond 1/3 dot localizer or 1 dot glideslope will result in the respective pointer flashing amber.

The category II monitor is enabled when:

- The glideslope is captured
- The radio altitude is less than 600 ft (Lateral deviation indicator expands at 600 feet AGL)
- The radio altitude is greater than RA MIN or 100 ft (whichever is greater)
- RA MIN is less than 200 ft and selected for display
- MIN ALERT is set to RA.

NON-NORMAL PROCEDURES

Engine Failure During Approach:

1. Autopilot Disconnect
2. Operating Engine Thrust Lever Increase as required
3. Rudder Trim As required
4. Conduct approach to Category I minima or go-around.
5. Refer to the following procedures as applicable:
 - a. Engine Shutdown in Flight, NON-NORMAL Chapter
 - b. Single Engine Landing, NON-NORMAL Chapter
 - c. Single Engine Go-Around, NON-NORMAL Chapter.

PERFORMANCE

The performance data in the PERFORMANCE Chapter of the AFM are applicable, except as modified by the following:

MAXIMUM DEMONSTRATED WIND COMPONENTS

The maximum demonstrated wind components, measured at 10 meters (33 ft) tower height, for Category II operations are as follows:

Headwind	19 kts
Crosswind	20 kts
Tailwind	10 kts



MAXIMUM ALLOWABLE LANDING WEIGHT

The maximum allowable landing weight is limited by the most restrictive of the following:

- Maximum certified landing weight of 34,150 lb (15,490 kg)
- Runway length available
- Climb requirements or brake energy limits.

MAXIMUM LANDING WEIGHT LIMITED BY CLIMB REQUIREMENTS OR BRAKE ENERGY

The maximum allowable landing weight limited by climb requirements for Category II operations is determined from the Approach and Landing Performance Module, using the calculation scenario Landing Weight Limited by Climb Requirements. In order for the CAFM calculator to take into account the Category II climb requirements, the CAT II field in the Aircraft Data pane must be selected to Yes.

The Maximum permissible quick turn-around landing weight limited by brake energy must be based on the data presented in the PERFORMANCE Chapter of the AFM.

SUPPLEMENTS

The supplementary data in Chapter 7 are applicable.

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GENERAL

This Supplement provides data for the operational capabilities and the applicable standards of certain airplane systems.

NOTE: Compliance with the standards noted below does not constitute an operational approval.

The effect of this Supplement on the basic Airplane Flight Manual is given below:

INTRODUCTION

The general information in Chapter 1 is applicable.

LIMITATIONS

The limitations in Chapter 2 are applicable.

EMERGENCY PROCEDURES

The emergency procedures in Chapter 3 are applicable.

NORMAL PROCEDURES

The normal procedures in Chapter 4 are applicable.

ABNORMAL PROCEDURES

The abnormal procedures in Chapter 5 are applicable.

PERFORMANCE

The performance data in Chapter 6 is applicable.

SUPPLEMENTS

The supplements in Chapter 7 are applicable.

NAVIGATION

RVSM

This airplane complies with the Airworthiness Requirements specified in "Interim Guidance Material on the Approval of Operators / Aircraft for RVSM Operations", 91-RVSM dated June 30, 1999, or with AC 91-85 dated August 21/2009, and with JAA Temporary Guidance Leaflet, TGL No. 6, revision 1, RVSM. Airworthiness approval does not constitute operational approval for flight in RVSM airspace. Operational approval for flight in RVSM airspace must be obtained from the appropriate regulatory authority.

RVSM operations must not be commenced or continued unless all of the required equipment specified below is operational:

RVSM REQUIRED EQUIPMENT LIST	
EQUIPMENT	REQUIREMENTS FOR RVSM
Autopilot (FGC, FGP, Elevator servo)	Must be operational
Altitude Alerting System	Two AFDs must be operational displaying 2 primary altimeters
Altitude Reporting Transponder / Traffic Surveillance System	One must be operational
Air Data Computers	Two must be operational

FLIGHT MANAGEMENT SYSTEM (FMS)

Approval Status

Provided the FMS is receiving adequate usable signals, the FMS has been demonstrated capable of and has been shown to meet the performance requirements for the following operations:

Lateral Navigation

- 1) VFR/IFR en route oceanic and remote, en route domestic, terminal operation, and instrument approach using WGS84 (or NAD83) coordinate reference datum in accordance with the performance/accuracy requirements of AC 20–138D.
- 2) Global Navigation Satellite System (GNSS) TSO C145a B3/AC 20–138D and Flight Management System (FMS) TSO–C115b and TSO–C146c D4/AC 20–138D: The installed equipment complies with AC 20–138D, AMC 20–27A and AMC 20–28; for navigation using GNSS and GNSS/SBAS (within the coverage of a satellite-based augmentation system complying with ICAO Annex 10) for enroute, terminal area, non-precision approach, and approach procedures with vertical guidance operations. Non-precision approach operations include those based on conventional navigation aids with or without GNSS in the title and those with GNSS and RNAV (GNSS) in the title to LNAV minimums. Approach procedures with vertical guidance include RNAV (GNSS) and LNAV/VNAV minimums as well as LPV approaches.

The installed system is compatible with the WAAS (North America), EGNOS (Europe), GAGAN (India) and MSAS (Japan) SBAS Service Providers, complying with ICAO Annex 10 and developed per RTCA DO–229().



RNP Operations

RNP 10 (RNAV 10) – In accordance with AC 90–105A Appendix G, ICAO Doc 9613 PBN Volume II, Part B, Chapter 1, and AMC 20–12 the FMS installation with the IRS has been demonstrated to meet the criteria as a primary means of navigation for flight up to 6.2 hours in duration without updating. The determination of flight duration starts when the airplane first begins to move after the system is placed in navigation mode.

– In accordance with AC 90–105A Appendix G, ICAO Doc 9613 PBN Volume II, Part B, Chapter 1, and AMC 20–12 the FMS installation with the GNSS with RAIM has been demonstrated to meet the criteria as a means of navigation for flights without time limitations.

RNP AR – Refer to Supplement 7 – RNP Authorization Required Approach Operations.

RNP–2 – In accordance with ICAO Doc 9613 PBN Volume II, Part C, Chapter 2, the FMS has been demonstrated capable of primary navigation for RNP–2 Enroute area operations provided that the FMS is receiving information from a GNSS sensor and operating in GNSS navigation mode.

RNP–4 – In accordance with ICAO Doc 9613 PBN Volume II, Part C, Chapter 1 and AC 90–105A Appendix F, the FMS has been demonstrated capable of primary navigation for RNP–4 Oceanic and remote area operations provided that two FMS systems are available and receiving information from two independent GNSS sensors and operating in GNSS navigation mode.

Basic RNP–1 – In accordance with ICAO Doc 9613 PBN Volume II, Part C, Chapter 3 and AC 20–138D Chap 9 for FAA RNP 1 (Terminal) operations, the FMS has been demonstrated capable of primary navigation for RNP–1 operations provided that the FMS is receiving information from a GNSS sensor and operating in GNSS navigation mode.

Effectivity:

On airplanes 20664 and subsequent and airplanes 20501–20663 incorporating SB 350–34–012.

RF Legs – In accordance with AC20–138D Appendix 3, the FMS has been demonstrated capable of performing RF Legs in the initial, intermediate, and missed approach segments of instrument approaches, RNP departure procedures (dP) and RNP STARS provided that:

- Autopilot is engaged or Flight Director is selected; and
- The FMS is receiving information from a GNSS sensor and operating in GNSS navigation mode.

RNP APCH – The FMS has been demonstrated capable of primary navigation for RNP APCH operations in accordance with ICAO Doc 9613 PBN Volume II, Part C, Chapter 5, AC 20–138D for FAA RNP instrument approach with Baro–VNAV and AMC 20–27A for RNP APCH with Baro–VNAV Provided FMS is receiving information from a GNSS sensor and operating in:

- GNSS navigation mode; and
- RNP APPR annunciation is displayed at the Final Approach Fix.

LPV Approaches The FMS and GNSS have been demonstrated capable of primary navigation for LPV operations in accordance with ICAO Doc 9613 PBN Volume II, Part B, Chapter 5, AC 20–138D for FAA LPV and AMC 20–28 for EASA LPV.

NOTE: LP approaches cannot be performed.

Baro–VNAV – Provided at least a single FMS, a single GNSS and dual ADC are installed and operational and the NO APPR (on PFD) messages are NOT posted, this FMS installation has been demonstrated to meet the requirements of AC 20–138D for performing Baro–VNAV.

Vertical Navigation (VNAV) – The FMS has been demonstrated capable of and has been shown to meet the accuracy requirements of: VFR/IFR en route, terminal and approach VNAV operation within the contiguous United States and Alaska in accordance with the criteria of AC 20–138D. VNAV Temperature Compensation meets the requirements of TCCA AC 500.020 FMS Barometric VNAV Temperature Compensation and RTCA DO–236B MASPS RNP for Area Navigation, Appendix H.

Primary Means Oceanic and Remote – Use of the FMS with GNSS has been found to comply with the requirements of AC 20–138D, Appendix 1 for GNSS primary means of navigation in oceanic and remote airspace, with two operational GNSS receivers and with two operational FMS systems.

NAT MNPS – Provided dual FMS and any two independent long range navigation systems, consisting of any combination of GNSS or IRS are installed and operating, the FMS with GNSS inputs has been demonstrated capable of flight into North Atlantic (NAT) minimum navigation performance specification (MNPS) and has been shown to meet the accuracy specification in accordance with AC 120–33.

RNAV–2 – In accordance with AC90–100A, the FMS has been demonstrated capable of primary navigation in RNAV–2 airspace provided that the FMS is operating in GNSS or DME/DME navigation mode.

RNAV–5 / BRNAV – This FMS installation has been demonstrated to meet the BRNAV requirements of AC 90–96A and JAA AMJ 20X2 Leaflet 2, Revision 1.

RNAV–1 / PRNAV – The FMS installation has been demonstrated to meet the PRNAV requirements of JAA TGL 10.



Compliance With AC 90–100A – When equipped with an operating FMS and GNSS, the airplane meets the functional and the ± 1 nm accuracy requirements of AC 90–100A, U.S. Terminal and En Route Area Navigation (RNAV) Operations.

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)

Pilots are authorized to deviate from their Air Traffic Control (ATC) clearance in order to comply with a resolution advisory (RA) command.

SURVEILLANCE**MODE S – ENHANCED SURVEILLANCE**

The Mode-S Transponder satisfies the data requirements of ICAO Doc 7030/4, Regional Supplementary Procedures for SSR Mode S Enhanced Surveillance in designated European airspace. The capability to transmit parameters is shown in the following table:

PARAMETER	AVAILABLE
Magnetic Heading	Yes
Indicated Airspeed	Yes
Mach Number	Yes
Vertical Rate	Yes (see note 1)
Roll Angle	Yes
Track Angle Rate	No (see note 2)
True Track Angle	Yes (see note 3)
Groundspeed	Yes (see note 3)
Selected Altitude	Yes
Barometric Pressure Setting	Yes

- NOTE:**
1. The rate of climb/descent is generated from a barometric source (not inertial).
 2. True Airspeed is transmitted in lieu of Track Angle Rate.
 3. Airplane must be equipped with at least one functioning Flight Management Computer and FMS Control Display Unit.

Effectivity:

For airplanes 20501–20594 not incorporating SB 350–34–011.

ADS-B OUT

The installed ADS-B Out system meets Section 8 of EASA AMC 20–24, dated 2 May 2008.

ADS-B operations in Non-Radar Areas (ADS-B NRA) cannot be commenced or continued unless the required equipment specified below is operational:



ADS-B OUT EQUIPMENT LIST	
EQUIPMENT	REQUIREMENT
Transponder / Traffic Surveillance System	One must be operational.
Air Data Computers (2)	One must be operational.
Global Positioning System receivers (2)	One must be operational.

Effectivity:

For airplanes 20595–22999 and airplanes incorporating SB 350–34–011.

ADS-B OUT

The installed ADS-B Out system has been certified in accordance with the guidance provided in the FAA AC 20–165A, the EASA CS.ACNS.D.ADS and the Australian AC 21–45 and meets the equipment requirements of FAA 14 CFR 91.227 and those of CASA CAO 20.18.

ADS-B operations cannot be commenced or continued unless the required equipment specified below is operational:

ADS-B OUT EQUIPMENT LIST	
EQUIPMENT	REQUIREMENT
Transponder / Traffic Surveillance System	One must be operational.
Air Data Computers (2)	One must be operational.
Global Positioning System receivers (2)	One must be operational.

NOTE: This Supplement does not constitute an operational approval for the ADS-B Out capability.

COMMUNICATIONS**DATALINK*****Effectivity:***

Applicable to airplanes incorporating SB 350-23-010.

ATN B1 CPDLC (LINK 2000+)

The system has been demonstrated to comply with the applicable safety, performance and interoperability requirements for continental ATN B1 Data Link using VDL Mode-2.

The airplane ATC Data Link system does support multi-frequency operation as defined in ARINC Spec. 631-5.

Effectivity:

Applicable to airplanes incorporating SB 350-23-011.

FANS 1/A+

The system enables CPDLC and ADS-C capabilities in support of reduced airplane separations in remote and oceanic areas, by using Satellite Communications and ACARS ground networks. The system complies with the interoperability requirements of RTCA DO-258A and the guidelines of ICAO GOLD.

The system adopts FAA AC 20-140A as an acceptable means of compliance for the following datalink capabilities:

Interoperability Designators:

- FANS 1/A+ with automation (including "push to load")
- ATN B1
- ACARS ATS

ATS Subnetworks:

- VDL Mode A
- VDL Mode 2
- SATCOM Inmarsat Classic Aero
- SATCOM Iridium Short Burst Data (SBD)

Aircraft-Allocated performance:

- CPDLC: RCP 240
- ADS-C: RSP 180



VHF

VHF COM and VHF NAV radios installed comply with FM immunity requirements per ICAO Annex 10, and:

- ED-22B / DO-196 for VOR receivers
- ED-46B / DO-195 for LOC receivers
- ED-23B / DO-186 for VHF communication receivers.

Effectivity:

For airplanes on the Russian Federation (RF) and Commonwealth of Independent States (CIS) countries' registry:

NOTE: Referenced North American or European regulatory material is in compliance with its RF and CIS countries' equivalent.

Flight in polar regions outside VHF coverage shall be allowed provided forecast is favorable for HF radio waves propagation.

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INTRODUCTION

- NOTE:**
- This Airplane Flight Manual Supplement is only applicable to airplanes incorporating Service Bulletin 350–34–008: Installation and Activation of TAWS Smart Runway and Smart Landing (C34–500).
 - These data complement or supersede data contained in the basic Airplane Flight Manual. This supplement therefore must be read in conjunction with the basic Airplane Flight Manual.
 - The effect on the basic Airplane Flight Manual is given below.

FUNCTIONAL OVERVIEW

The Runway Awareness Advisory System (RAAS) is a software enhancement hosted in the Enhanced Ground Proximity Warning System (EGPWS) unit, which provides aural and visual advisories to supplement flight crew awareness of position during ground and flight operations. RAAS uses existing EGPWS inputs to generate aural advisories in the flight deck. RAAS advisories are annunciated over the same audio system as the EGPWS. Unique voices are used for RAAS advisories to allow adequate differentiation from the current EGPWS Mode 1 – 7 and Terrain / Obstacle Awareness voice call outs. RAAS advisories are succinct by design. RAAS is designed to be fully compatible with normal aircraft operations. There is no requirement for pilot input to the system.

RAAS is configurable (during installation / activation) for voice gender, units (feet or meters) and most advisories may be configured ON or OFF. This generic flight manual supplement is arranged so that each configurable advisory is maintained in its own sub-section. This allows an operator to utilize this supplement by choosing each section that applies to them.

RAAS IMPLEMENTATION AND CONFIGURATION

RAAS may be configured for a variety of advisory callout options via the RAAS Configuration Database (RCD).

The Table below provides the settings of alert options certified on the aircraft. These options and configurations are set during installation and activation of RAAS on the aircraft, and are NOT pilot selectable.

The only customer selectable options are:

- Voice gender: Female/Male
- Units of measurement: Feet/Meter
- Altimeter Setting callout: ON/OFF.

A RAAS inhibit switch is installed on the TAWS WARN panel. It allows the crew to inhibit all Runway Awareness and Advisory System Visual Indications and Aural Alerts. The white OFF illuminates when switch is selected.

ADVISORY GROUP	ADVISORY/ ALERT	ENABLED YES/NO	SETTINGS	AUDIO	VISUAL
	GPS Antenna Location		15 feet	–	–
	Advisory Suppress Window	YES	450–550 ft	–	–
RAAS	Approaching Runway – In Air/On Ground	YES		“Approaching XX” “Approaching Runways” (if more than one runway meets the qualifying condition)	APP XX (in green) APP RWYS (in green) (if more than one runway meets the qualifying condition)
RAAS	On Runway	YES		“On Runway XX” “On Runways” (if more than one runway meets the qualifying condition)	ON XX (in green) ON RWYS (in green) (if more than one runway meets the qualifying condition)
RAAS	Distance Remaining (Landing & Rollout)	YES	2000 feet max	“ZZ Remaining”	NONE
RAAS	Runway End (< 100 feet)	YES		“One Hundred Remaining” (in feet) “Thirty Remaining” (in meters)	NONE
RAAS	Insufficient Runway Length (In Air)	YES	5000 feet	“Approaching Runway XX, ZZ available”	APP XX ZZ (in amber)
RAAS	Short Runway Landing	NO			



ADVISORY GROUP	ADVISORY/ ALERT	ENABLED YES/NO	SETTINGS	AUDIO	VISUAL
RAAS	Insufficient Runway Length (On Ground)	YES	6000 feet	"On Runway XX, ZZ remaining"	ON XX ZZ (in amber)
RAAS	Short Runway Takeoff	NO			
RAAS	Extended Hold On Runway Initial/ Repeats	YES	180 sec/ 180 sec	"On Runway XX – On Runway XX"	ON XX (in amber)
RAAS	Taxiway Takeoff	YES		"Caution, On Taxiway! On Taxiway"	ON TAXIWAY (in amber) GND PROX alert on PFD also illuminated
RAAS	Distance Remaining (Rejected Takeoff)	YES	50% of Runway	"ZZ Remaining"	NONE
RAAS	Taxiway Landing	YES		"Caution, Taxiway! Caution, Taxiway!"	TAXIWAY (in amber) GND PROX alert on PFD also illuminated
RAAS	Takeoff Flaps	YES	Min: 6°; Max: 24°	"On Runway XX, Flaps– Flaps"	FLAPS (in amber) GND PROX alert on PFD also illuminated

ADVISORY GROUP	ADVISORY/ ALERT	ENABLED YES/NO	SETTINGS	AUDIO	VISUAL
Stability Approach Monitor	Landing Flaps (Not Aligned With Runway)	NO			
	Landing Flaps (Aligned With Runway)	YES	700 feet	"Flaps–Flaps"	FLAPS (in amber)
	Too High (During Approach)	YES		"Too High–Too High"	TOO HIGH (in amber)
	Too Fast (During Approach)	YES		"Too Fast–Too Fast"	TOO FAST (in amber)
	Unstable (During Approach)	YES		"Unstable–Unstable"	UNSTABLE (in amber) GND PROX alert on PFD also illuminated
Long Landing	Long Landing Distance	YES	2000 ft past approach end	"Long Landing – Long Landing"	LONG LANDING (in amber) GND PROX alert on PFD also illuminated
	Long Landing Percentage	YES	67% remaining	"Long Landing – Long Landing"	LONG LANDING (in amber) GND PROX alert on PFD also illuminated
	Long Landing Distance Remaining	YES	3000 ft past approach end	"ZZ Remaining"	
	Long Landing Distance Remaining Percentage	YES	60% remaining	"ZZ Remaining"	



ADVISORY GROUP	ADVISORY/ ALERT	ENABLED YES/NO	SETTINGS	AUDIO	VISUAL
Corrected Altitude Monitor	Altimeter Setting (Below Transition Altitude)	YES		"Altimeter Setting"	ALTM SETTING (in amber)
	Altimeter Setting (Above Transition Altitude)	YES		"Altimeter Setting"	ALTM SETTING (in amber)

XX = Runway Identifier

ZZ = Available runway distance in feet or meters

LIMITATIONS

The limitations in the Airplane Flight Manual are applicable with the addition of the following:

- RAAS advisories are not intended for navigation purposes.
- Pilots should not deviate from ATC clearances or otherwise correct aircraft position based solely on RAAS advisories.
- Pilots may not use Runway Awareness and Advisory System advisories as a replacement for NOTAM or Automatic Terminal Information Service (ATIS) information.
- RAAS Short and Insufficient Runway functions do not take into account aircraft performance factors such as aircraft weight, wind, runway conditions, slope, air temperature and altitude of airport. The runway length settings for these functions were determined from a review of takeoff and landing performance and are considered to be acceptable guidelines for RAAS purposes. This information is intended to enhance the flight crew awareness by identifying that the runway length available may be marginal for the current conditions.
- Data on newly constructed runways, changes to length of existing runways, or the rare change of runway identifier may not necessarily be included in the RAAS runway database.
- RAAS does not have knowledge of where painted hold lines are located at airports. In some cases, the RAAS Approaching Runway Advisory may be issued after an aircraft has crossed a hold line.
- The RAAS system is a situational awareness tool to the flight crew and should not be used as the primary source of determining field position, runway length, field performance, etc. The absence of RAAS aural and/or visual messages such as "short runway" or "long landing" does not guarantee that the aircraft can be safely operated from or onto the runway.
- Altimeter Monitor–Below Transition Altitude function, is not available at airports defined as QFE in the EGPWS database.

EMERGENCY PROCEDURES

The emergency procedures in chapter 3 are applicable with the addition of the following:

All Procedures Requiring TAWS Flaps Aural Warning to be Muted

1. TAWS WARN, RAAS Inhibit switch OFF



NORMAL PROCEDURES

The normal procedures in chapter 4 are applicable with the addition of the following:

Effectivity:

For aircraft 20501 to 20598.

Refer to the Honeywell MK V Enhanced Ground Proximity Warning System (EGPWS) and Runway Awareness Advisory System (RAAS) Pilot Guide, document 060-4241-000 revision G or later appropriate revision for descriptive information.

Refer to Honeywell Pilot's guide for the MKV-A EGPWS, document PDS69000940-801, Rev A or later.

NON-NORMAL PROCEDURES

The non-normal procedures in chapter 5 are applicable with the addition of the following:

All Procedures Requiring TAWS Flaps Aural Warning to be Muted

1. TAWS WARN, RAAS Inhibit switch OFF

RESPONSE TO RAAS ADVISORIES WHILE IN-AIR OR DURING HIGH SPEED OPERATIONS

If the advisory is in conflict with expectations, respond as follows:

1. Verify position and/or distance remaining/distance available.
2. Contact ATC for assistance if necessary.

NOTE: RAAS nuisance aural can be selected off using RAAS Inhibit switch on the TAWS panel.

RESPONSE TO RAAS ADVISORIES WHILE ON THE GROUND DURING LOW SPEED OPERATIONS

If the advisory is in conflict with expectations, respond as follows:

1. Stop.
2. Verify position.
3. Contact ATC for assistance if necessary.

NOTE: RAAS nuisance aural can be selected off using RAAS Inhibit switch on the TAWS panel.

RAAS ADVISORIES OPERATION STATUS**Effectivity:**

For aircraft 20501–21047.

The following Runway Awareness and Advisory System messages can be verified on the ground only, by selecting Terrain for display and changing the display range:

1. **RAAS–OK–XX** (green): Runway Awareness and Advisory System is enabled, functioning, has good position information, and is at a validated airport. Distances enunciated in Feet or Meters. (XX=FT or M).
2. **RAAS–N/AVBL** (amber): Runway Awareness and Advisory System is enabled, but the system either has no position information, the accuracy of the position information is insufficient to allow Runway Awareness and Advisory System to function, or the aircraft is at an airport that has not been validated for Runway Awareness and Advisory System in the EGPWS Terrain Database.
3. **RAAS–INOP** (amber): Runway Awareness and Advisory System is enabled but function is inoperative.
4. **RAAS–RTO** (green): Runway Awareness and Advisory System is enabled and functioning, but Runway Awareness and Advisory System advisories are temporarily inhibited because Runway Awareness and Advisory System has detected a rejected take-off condition. To clear this message and enable Runway Awareness and Advisory System advisories, the aircraft must be taxied off the runway area.
5. **RAAS–INH** (amber): Runway Awareness and Advisory System is enabled but the advisories have been inhibited with the activation of an external discrete.

PERFORMANCE

The performance data in chapter 6 are applicable.

SUPPLEMENTS

The supplements in chapter 7 are applicable.

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INTRODUCTION

NOTE: This Airplane Flight Manual Supplement is only applicable to airplanes incorporating Service Bulletin 350–34–009: Modification – Flight Management System – Activation of the Required Navigation Performance with Authorization Required (RNP AR) Option (C34–501) .

This Supplement contains information and procedures for operation of the BD–100–1A10, for Required Navigation Performance Authorization Required – Approach operations.

This supplement complements and/or supersedes direction contained in the basic Airplane Flight Manual and must be complied with in conjunction with the basic Airplane Flight Manual.

Compliance with these performance standards does not constitute approval to conduct RNP AR Approach operations.

APPROVAL STATUS

The following approvals do not constitute operational approval. Some operations require additional crew qualification, communication and surveillance equipment in order to obtain operational approval from regulatory authorities.

- **Required Navigation Performance – Authorization Required**

- RNP AR Approach with RF Legs for RNP $\geq$ 0.3 Approach and RNP 1.0 Missed Approach:

The FMS has been demonstrated capable of primary navigation for RNP AR Approach operations in accordance with ICAO Doc 9613 PBN Volume II, Part C, Chapter 6; AC 90–101A, Appendix 2; AMC 20–26; and AC 20–138D, Appendix 2.



LIMITATIONS

The limitations in Chapter 2 and the Supplement Operational Capabilities (Page 07-05-01-1) are applicable, except as modified by the following:

An RNP AR approach must not be commenced or continued unless the required equipment, as specified in the RNP AR APPROACH Required Equipment List below, are operating satisfactorily.

RNP AR APPROACH REQUIRED EQUIPMENT LIST	
EQUIPMENT	REQUIREMENT
Yaw Damper and Autopilot	Both must be operational
PFD 1 and 2	One (1) PFD operational for each side
ADC 1, 2	Two (2) ADCs must be operational
GNSS 1 and 2	Two (2) GNSS sensors must be available to commence the approach, one (1) GNSS sensor is required to continue the approach
FMS 1, 2	Two (2) FMSs must be operational
IRS 1, 2 (ATT and HDG)	Two (2) IRSs must be operational
TAWS	TAWS must be operational and displayed
FD 1 and 2	Two (2) Flight Directors must be operational

RNP AR Approach operations beyond the IAF are prohibited unless RNP AR APPR is annunciated on the PFD.

RNP AR Approach operations are approved for RNP AR Approaches greater than or equal to RNP 0.3 in the approach segment and RNP 1.0 in the missed approach segment.

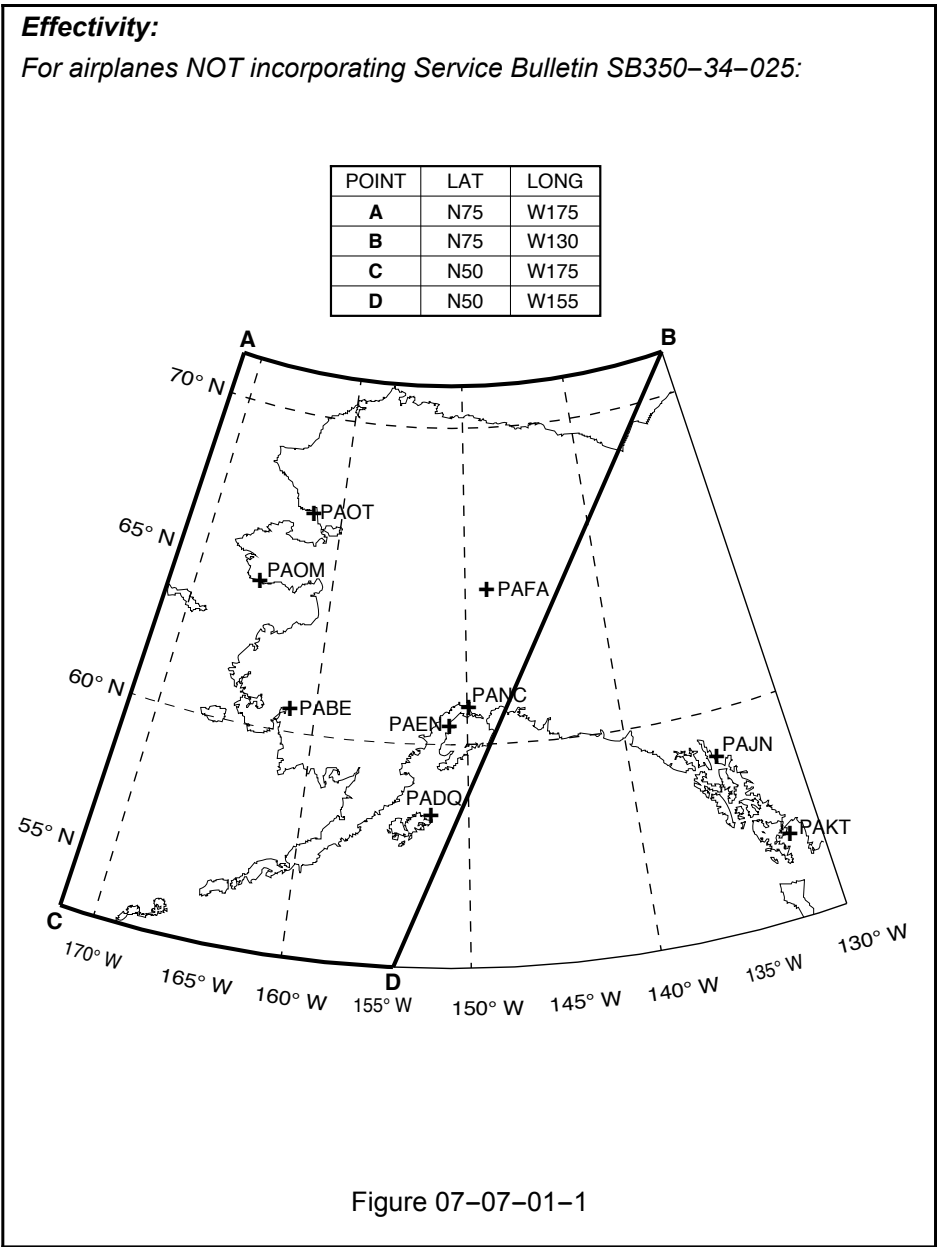
The autopilot must be engaged between the final approach point and the missed approach point on RNP AR approaches.

RNP AR Approach operations are approved with autothrottle engaged or disengaged.

RNP AR Approach operations are approved for any FLAP configuration up to the FAF and FLAP 30 from FAF to MAP.

RNP AR Approach operations must be accomplished in accordance with instrument approach procedures that are retrieved from the FMS navigation database.

RNP AR Approach operations are approved following failure of one engine.
RNP AR approach operations are prohibited in the area defined by A, B, C and D in Fig. 07-07-01-1.





EMERGENCY PROCEDURES

The emergency procedures in Chapter 3 are applicable.

NORMAL PROCEDURES

The normal procedures in Chapter 4 are applicable, except as modified by the following:

Approach

1. FMS Navigation Source Set
independent source on each PFD
2. IRS and ADC Set
independent source on each PFD
3. Flight Director mode APPR FMS
4. RNP AR APPR annunciations Verify
annunciated at IAF

NON-NORMAL PROCEDURES

The non-normal procedures in Chapter 5 are applicable, except as modified by the following:

NO APPR (Amber PFD annunciation)

Loss of GNSS Integrity or loss of GNSS Navigation.

1. RNP AR approach Perform a Go-Around

– END –

Excess Lateral or Vertical Deviation annunciation (Amber flashing of lateral or vertical deviation indication)

Airplane lateral deviation is beyond 2 dots or vertical deviation is beyond 1 dot deviation.

1. RNP AR approach Perform a Go-Around

– END –

EFIS MISCOMPARE (Caution)

Accompanied by amber ALT annunciation on PFD:

1. RNP AR approach Perform a Go-Around

– END –

PERFORMANCE

The performance data in Chapter 6 and the compatible supplements are applicable.

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INTRODUCTION

GENERAL

This Supplement contains information and procedures for operation of the Challenger 350 Model BD-100-1A10 airplane, fitted with two AS907-2-1A engines, on a wet grooved runway surface.

The information has been prepared by the manufacturer and approved as guidance material, to assist operators in developing suitable guidance, recommendations or instructions for use by their flight crews when operating on wet grooved runways.

The take-off and landing procedures in Chapter 4 and FCOM Vol 1, Chapter 4 have been assumed. The data has been prepared using reasonable estimates of the effects of wet grooved runway surface conditions on the braking ground roll. The effects of actual conditions may differ from those used to establish the data.

When operating on wet grooved runways, ground handling characteristics will not be as good as can be achieved on dry runways. The variability of surface conditions and crosswinds should be taken into consideration.

The use of this AFM Supplement requires that there are no areas of significant rubber deposit in the section where high-speed portion of braking is expected.

RUNWAY CONDITION

- The data is applicable to concrete runway surfaces with transverse grooves constructed and maintained to FAA standard AC 150/5320-12C, or equivalent.
- A grooved runway is considered wet when there is sufficient moisture on the runway surface to cause it to appear partially reflective, but without significant areas of standing water (runway grooves not overflowing).

LIMITATIONS

The limitations in Chapter 2 are applicable, except as modified by the following:

- The data may be used only for wet grooved runway, not contaminated.
- Use of this supplement for landing performance is prohibited if any of the following CAS messages are displayed:
 - SPOILERS FAIL (caution)
 - SPOILERS FAULT (caution)
 - FLT SPOILERS FAIL (caution)
 - FLT SPOILERS FAULT (caution)



- ROLL SPOILERS FAIL (caution)
- ROLL SPOILERS FAULT (caution)
- GND SPOILERS FAIL (caution)
- GND SPLRS NOT ARMED (caution).
- The use of this AFM Supplement for landing distance data requires both thrust reversers to be operational.
- ROAAS (if installed) must be selected OFF when using landing distance data from this supplement.
- This AFM Supplement is applicable only to grooved concrete surfaces.
- The wet grooved landing distance provided in this Supplement may not be shorter than the dry runway factored landing distance (Chapter 6) for the applicable conditions. The dry runway factored landing distance includes a factor for operational rules which require use of 60% of the available runway length. In this situation, the dry runway factored landing distance shall be used for operation on a wet grooved runway.
- If the takeoff weight obtained for a wet grooved runway is higher than the takeoff weight for a dry runway, use the takeoff weight for a dry runway. In this situation, the V_1 speed must be determined for the wet grooved runway condition at the limiting weight.
- Use of this supplement for calculation of corrected wet runway landing distance during emergency or non-normal procedures is prohibited. For these cases, Chapter 6 defined landing distances must be used.

Effectivity:

For EASA registered aircraft:

- This Supplement is approved for use on concrete runways having a grooved surface that has been constructed and maintained to the FAA standard of AC 150/5320-12C or equivalent. Operational approval must be obtained in order to use the performance data presented in this Supplement.

EMERGENCY PROCEDURES

The emergency procedures in Chapter 3 are applicable.

NORMAL PROCEDURES

The normal procedures in Chapter 4 are applicable.

NON-NORMAL PROCEDURES

The non-normal procedures in Chapter 5 are applicable.

PERFORMANCE

The performance data in Chapter 6 are applicable.

TAKEOFF ON WET GROOVED RUNWAYS

Wet grooved runway takeoff performance is estimated assuming that the runway is completely wet but without significant areas of standing water.

Wet grooved runway takeoff performance is available in the Takeoff Performance and Takeoff Path CAFM calculators, when appropriate. Select the Wet Grooved Runway option in the Runway Surface Condition drop-down menu of the Runway Data window. The CAFM calculator also presents the Thrust Reversers drop-down menu (when applicable). The CAFM user can then select the number of thrust reversers available at dispatch, as permitted by the applicable MEL (Minimum Equipment List).

NOTE: If the takeoff weight obtained from the CAFM calculation for a wet grooved runway is higher than the takeoff weight for a dry runway, use the takeoff weight for a dry runway. In this situation, the V_1 speed must be determined for the wet grooved runway condition at the limiting weight.

Refer to Chapter 6, Takeoff Performance Section for more information on the CAFM and on the determination of the takeoff weight limits.

LANDING ON A WET GROOVED RUNWAY

The following charts are used to obtain the landing distance required on wet grooved runways, for a flap 30° landing, for a given value of airplane weight, ambient temperature, airport pressure altitude, reported wind, runway slope and V_{REF} speed increment.

The landing distance required on a wet grooved runway for a flap 30° landing is given by the following:

- Fig. 07-09-01-1 provides the uncorrected landing distance for a wet grooved runway.
- Fig. 07-09-01-2 provides the landing distance for a wet grooved runway, corrected for reported wind, runway gradient and V_{REF} speed increment.



- NOTE:**
1. The wet grooved landing distance from Fig. 07-09-01-2 includes an operational distance factor of 1.15.
 2. The wet grooved landing distance may not be less than the corresponding dry runway Factored Landing Distance (FLD). For the applicable conditions, refer to Chapter 6 Landing Performance Section to determine the dry runway FLD. If the wet grooved landing distance is shorter than the dry runway FLD, then the dry runway FLD shall be used for the wet grooved runway condition.

Effectivity:

For EASA registered aircraft:

3. The wet grooved landing distance determined at dispatch must account for the conditions expected at the time of arrival, including reported wind, runway slope and V_{REF} speed increment. For dispatch purposes, a V_{REF} speed increment of 10 Knots shall be assumed to determine the wet grooved landing distance required. The wet grooved landing distance must be re-assessed during flight for the actual conditions at the time of arrival.

Example:

Associated Conditions:

Runway condition	= wet grooved
Aircraft weight	= 14,000 kg (30,865 lb)
Airport pressure altitude	= 2,000 ft
Ambient temperature	= 11 °C
Reported wind	= -10 knots (tailwind)
Runway gradient	= +1% (up slope)
V _{REF} speed increment	= +5 KIAS

Effectivity:*For EASA registered aircraft:*

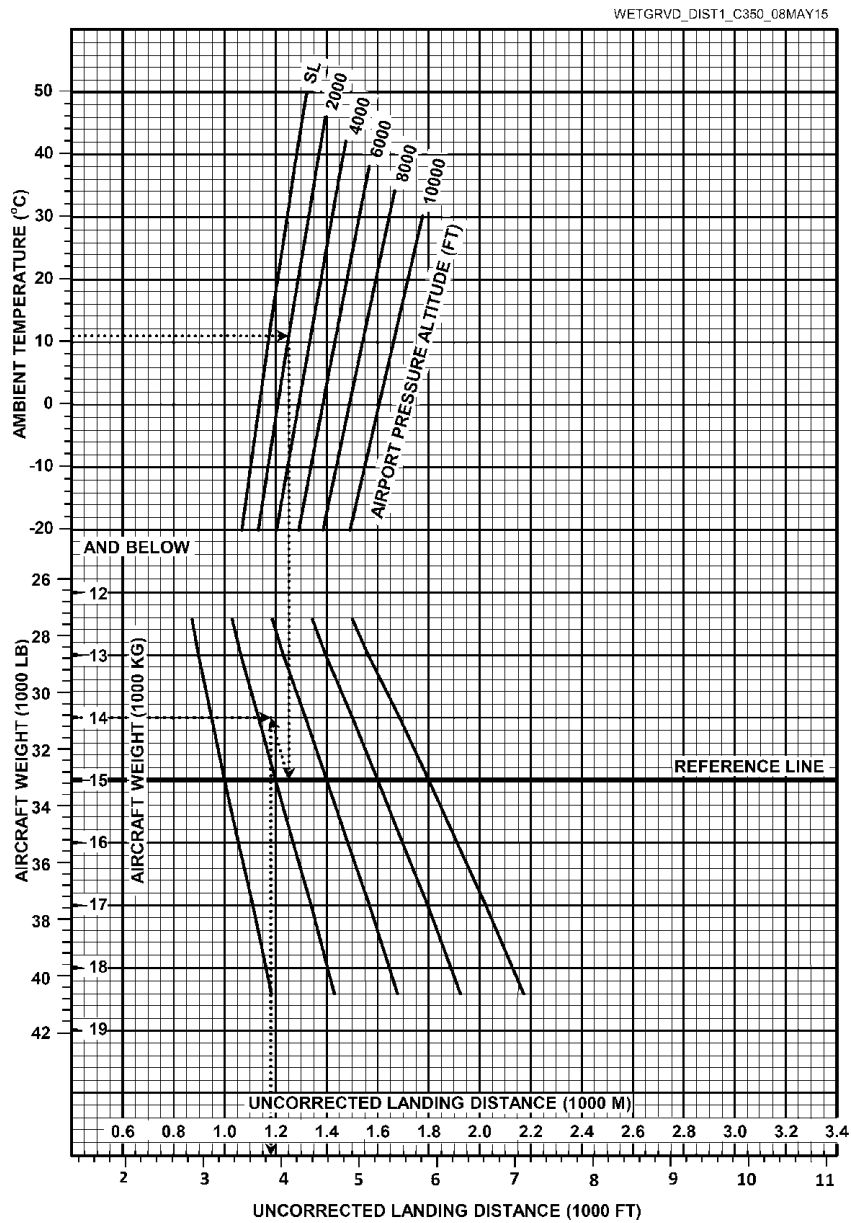
For dispatch, a 10 KIAS V_{REF} speed increment must be used on Fig. 07-09-01-2 to determine the wet grooved corrected landing distance. The actual V_{REF} increment during landing may be less than 10 KIAS. The in-flight wet grooved landing distance assessment is based on the actual V_{REF} increment.

The example in Fig. 07-09-01-1 and shows that for the above associated conditions, the wet grooved corrected landing distance is equal to 1410 meters (4615 feet).

The dry runway FLD must then be verified for the associated conditions:

Runway condition	= dry
Aircraft weight	= 14,000 kg (30,865 lb)
Airport pressure altitude	= 2,000 ft
Reported wind	= -10 knots (tailwind)

Using the CAFM for the above conditions, the dry runway FLD is equal to 1598 meters (5243 feet). The dry FLD is longer than the wet grooved landing distance in this case. The wet grooved landing distance cannot be less than the dry FLD. Therefore, the landing distance to be used for wet grooved runway operations is equal to 1598 meters (5243 feet).



Uncorrected Landing Distance - Wet, Grooved Runway - Flaps 30 Degrees

Figure 07-09-01-1

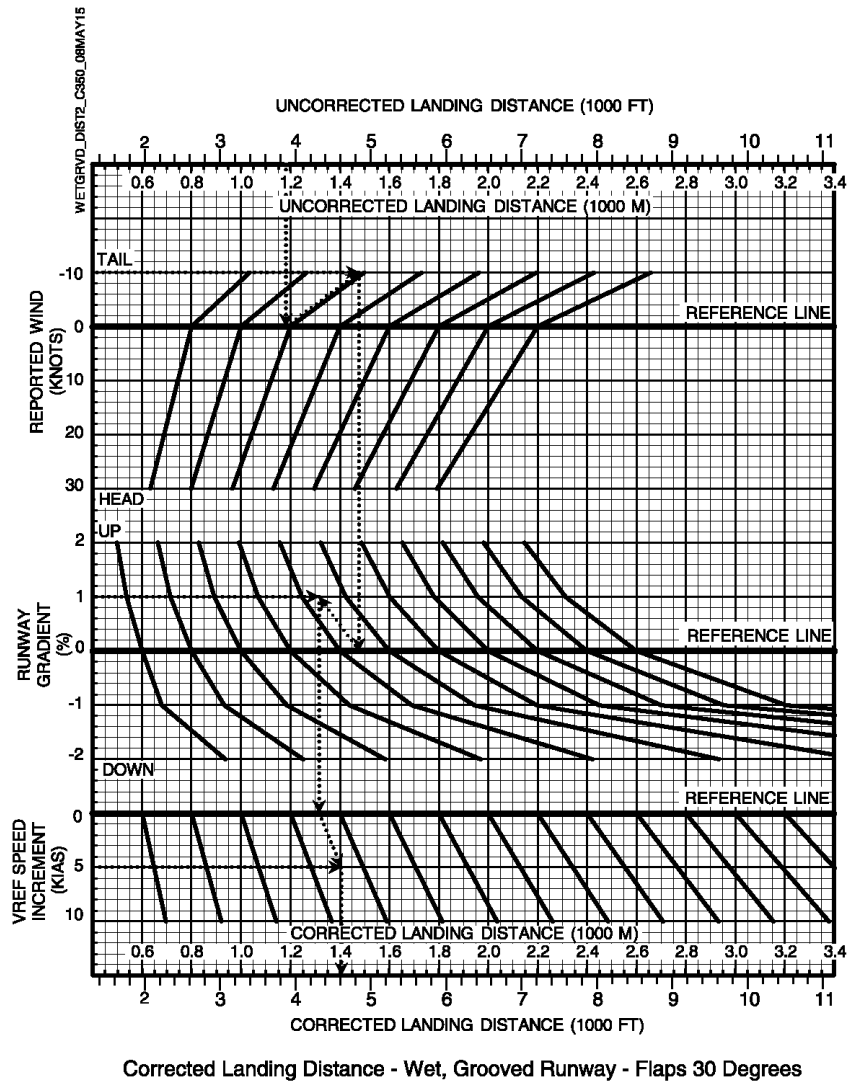


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INTRODUCTION

- NOTE:**
1. This supplement does not constitute operational approval to conduct steep approach operations.
 2. This Airplane Flight Manual Supplement is only applicable to airplanes 20501 to 20758 incorporating Service Bulletin 350-34-018 and airplanes 20759 and subsequent incorporating SB 350-34-017.

This supplement must be used when flying steep approaches with published runway threshold glidepath angles from 4.5 to 5.5 degrees.

This supplement complements and/or supersedes data contained in the basic Airplane Flight Manual and must be complied with in conjunction with the basic Airplane Flight Manual. While on a steep glidepath, steep approaches are flown in the steep approach configuration at a landing reference speed of SV_{REF} .

Steep approach configuration is defined as:

- Flaps – 30 degrees
- Landing Gear – Down
- Spoilers – Max
- STEEP APPR PBA – ON

LIMITATIONS

The limitations in Chapter 2 are applicable, except as modified by the following:

WEIGHT AND C.G. LIMITATIONS

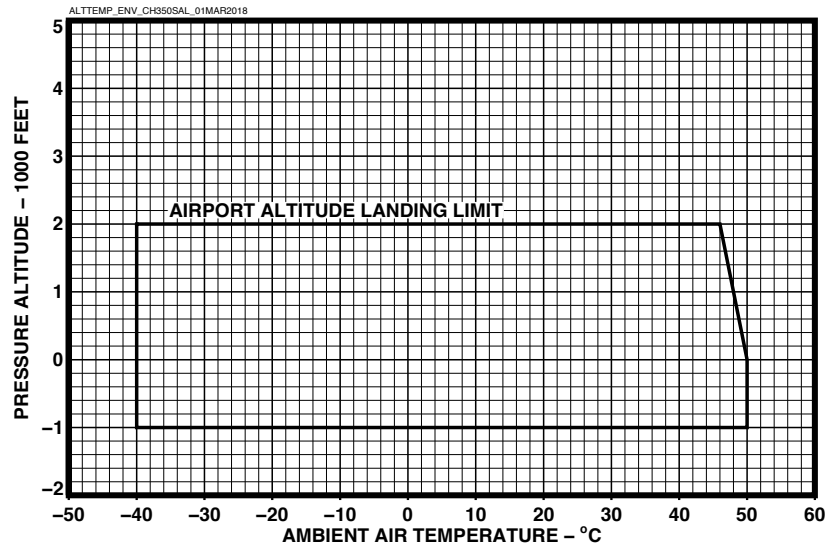
Maximum landing weight is 14,334 kg (31,600 lbs).

OPERATIONAL LIMITATIONS

LANDING AIRPORT LIMITS

Airport pressure altitude and outside air temperature limits are defined in Fig. 07-10-01-1.

ALTITUDE/TEMPERATURE LIMITATIONS



OPERATION IN ICING CONDITIONS

Steep approach in known icing conditions is prohibited.

WIND LIMITS

No tailwind component is permitted for steep approach landings.

Maximum crosswind component for steep approach landings is 20 kts.

Increasing approach landing reference speed for wind gusts is prohibited.

APPROACH

Operation with a glidepath angle that exceeds 5.5 degrees is prohibited.

Performing a steep approach in other than the steep approach configuration is prohibited.

Steep approach operations are approved with autothrottle engaged or disengaged.

Use of autothrottle (if installed) below 200 feet AGL on a steep approach is prohibited.

Steep approach landing on a contaminated runway is prohibited.

Deliberate one engine inoperative steep approach is prohibited.



It is prohibited to have the Autothrottle engaged during a single engine go-around until flaps are retracted and the aircraft has accelerated to en route climb speed.

Steep approach is prohibited unless using:

- ILS Guidance; or,
- Published Visual Approaches with vertical path guidance (e.g. PAPI).

Performing a non-steep approach in steep approach configuration is prohibited.

LANDING DECISION POINT

The minimum height for go-around following an engine failure (Landing Decision Point) is 200 feet AGL.

SYSTEMS LIMITATIONS

AIR CONDITIONING SYSTEM

Use of engine bleed during steep approach is prohibited.

ANTI-ICE SYSTEM

Steep Approach with WING and/or ENGINE ANTI-ICE systems ON is prohibited.

AUTOMATIC FLIGHT CONTROL SYSTEM

Use of autopilot for steep approach is prohibited.

FLIGHT CONTROLS

When conducting a steep approach, flight spoilers may remain extended to MAX below 500 ft AGL, for speeds down to SV_{REF} .

SYSTEMS INOPERATIVE

Steep approaches are prohibited if any of the following systems are not fully operative:

- Flaps,
- Ground Spoilers,
- Nose Wheel Steering,
- Thrust Reverser,
- Hydraulics,
- Flight Controls,
- Brakes,
- Radio altimeter,
- Auxiliary Power Unit.

NAVIGATION SYSTEM LIMITATIONS

FLIGHT MANAGEMENT SYSTEM

Use of the FMS approach performance function for steep approach is prohibited.

EMERGENCY PROCEDURES

The emergency procedures in Chapter 3 are applicable, except as modified by the following:

Discontinue steep approach and divert to the nearest suitable (non-steep approach) runway or airport if any emergency procedure necessitates:

- An approach speed greater than V_{REF} ,
- a landing with gear up or unsafe,
- landing in a configuration other than the defined steep approach configuration,
- an increase in actual landing distance by a factor greater than 1.50, and
- a landing with any of the systems inoperative as listed in the system limitations of this supplement.

Engine Failure (In Flight)

During Steep Approach Prior To Landing Decision Point

1. Perform Single Engine Go-around procedure. Refer to Single Engine Go-Around procedure in the NON-NORMAL PROCEDURES of this supplement.

NOTE: After an engine failure at or below Landing Decision Point, a one engine inoperative approach to landing may be continued.



NORMAL PROCEDURES

The normal procedures in Chapter 4 are applicable with the addition of the following:

- NOTE:**
1. Use of ILS with the flight director is approved.
 2. Use of autothrottle (if installed) down to 200 feet AGL is approved.
 3. For aircraft with ROAAS installed, ROAAS NOT AVAIL will post upon selection of STEEP APPR.

APPROACH

1. APU Start and Release
2. R Bleed OFF
3. APU BLEED ON
4. L Bleed OFF
5. XBLEED OPEN
6. Landing Data (SV_{REF} , V_{GA} , distance) Set
7. Approach setup and crew briefing Complete
8. STEEP APPR Select and verify ARM
illuminated
9. BARO MIN Set
10. MIN ALERT Set
11. L and R HYDRAULIC PUMP AUTO

BEFORE LANDING

- 1. LANDING GEAR switch DN
- 2. L LANDING, N LDG/TAXI and R
LANDING light switches On
- 3. WING and ENGINE ANTI-ICE switches Off
- 4. FLAPS 30
- 5. FLIGHT SPOILERS MAX
- 6. STEEP APPR Verify ON illuminated

NOTE: The airplane should be fully configured for landing and slowed to SV_{REF} prior to glideslope intercept.

Effectivity:

If Autothrottle installed:

CAUTION: Autothrottle will not arm RETARD mode at 200 feet AGL if it remains engaged on a steep approach. AT RETARD INHIBIT (C) will post, and Autothrottle will not retard thrust levers at 50 feet AGL.

- 7. Autothrottle (if installed) Disengage
prior to 200 feet AGL



GO-AROUND

CAUTION: If unreliable airspeed is suspected, disregard all reference to TO/GA. Do not use TO/GA button.

1. TO/GA button Press
2. Thrust levers TO
3. FLIGHT SPOILERS RETRACT
4. Pitch attitude Increase rapidly but smoothly to initial pitch attitude of 8 degrees at a speed of not less than SV_{REF} , then adjust pitch attitude to maintain V_{GA} speed.

NOTE: Go-around speed V_{GA} is the same as the SV_{REF} landing speed.

5. FLAPS 10
6. LANDING GEAR switch UP
after positive rate of climb is established.
7. Climb at V_{GA} , or above

NOTE: The flight director guidance only represents an initial target to rotate toward and does not guarantee that the climb speed will be achieved under all conditions.

When clear of obstacles:

8. Accelerate to $V_{GA} + 15$ and retract flaps.
9. Pressurization LNDG ALT set
10. STEEP APPR Deselect

- NOTE:**
1. Due to the reduced engine idle in steep approach mode, engine acceleration time may be increased during go-around.
 2. Contact with the ground may be unavoidable if go-around is initiated from a low altitude or high sink rate. If the airplane contacts the ground during the go-around, maintain the normal landing attitude or slightly higher. Airplane configuration (landing gear/flaps) should not be changed until the airplane is climbing if ground contact is made or not.

AFTER LANDING / CLEARING RUNWAY

1. L and R PROBES switches OFF
2. WING ANTI-ICE switch As required
3. L and R ENG ANTI-ICE switches As required
4. Lighting As desired
 - a. STROBE switch BCN
5. FLAPS As desired
6. XPDR/TCAS As required
7. FLIGHT SPOILERS RETRACT
8. STEEP APPR Deselect

NON-NORMAL PROCEDURES

The non-normal procedures in Chapter 5 are applicable except as modified by the following:

Discontinue steep approach and divert to the nearest suitable (non-steep approach) runway or airport if any non-normal procedure necessitates:

- An approach speed greater than V_{REF} ,
- landing with gear up or unsafe,
- landing in a configuration other than the defined steep approach configuration,
- an increase in actual landing distance by a factor greater than 1.50, and
- landing with any of the systems inoperative as listed in the system limitations of this supplement.



SINGLE ENGINE GO-AROUND

NOTE: 1. The demonstrated steep approach go-around minimum altitude loss is 150 feet.

2. Due to the reduced engine idle condition in steep approach mode, engine acceleration time may be increased during go-around.

1. TO/GA button Press
2. Autothrottle (if installed) Disengage
3. Thrust Levers TO
4. FLIGHT SPOILERS RETRACT
5. Pitch attitude adjust
as required to maintain V_{GA} .

NOTE: 1. Initially rotate towards flight director pitch guidance command (8 degrees), adjust pitch as required to maintain V_{GA}

2. Go-around speed V_{GA} is the same as the SV_{REF} landing speed.

3. Contact with the ground may be unavoidable if go-around is initiated from a low altitude or high sink rate. If the airplane contacts the ground during the go-around, maintain the normal landing attitude or slightly higher. Airplane configuration (landing gear/flaps) should not be changed until the airplane is climbing if ground contact is made or not.

6. FLAPS 10

7. LANDING GEAR switch UP
after positive rate of climb is established.

8. Climb at V_{GA} , or above.

WARNING: It is prohibited to have the Autothrottle engaged during a single engine go-around until flaps are retracted and the aircraft has accelerated to en route climb speed.

When clear of obstacles:

9. Accelerate to $V_{GA} + 15$ and retract flaps.

10. Climb At en route climb speed

11. STEEP APPR Deselect

12. N LDG / TAXI light switch OFF

MISCELLANEOUS SYSTEMS**Steep Approach Mode****CONFIG STEEP (C)**

Posted prior to decision height:

1. Go-around Perform
2. Select another non-steep approach (less than 4.5 degrees) or divert to a suitable airfield.

NOTE: If CONFIG STEEP (C) was triggered due to passing 1500 ft AGL without being in steep approach configuration, then another steep approach can be attempted after properly configuring the aircraft.

Posted at or below Decision Height:

3. Approach Continue to landing

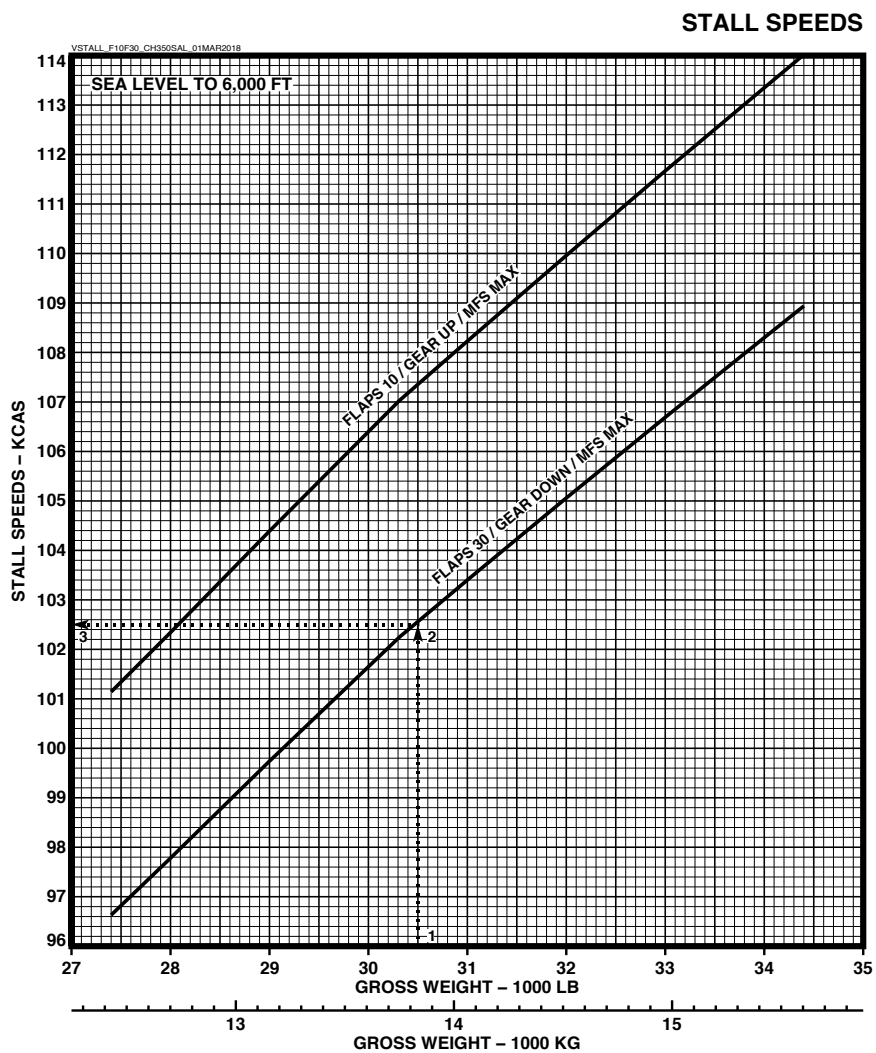
PERFORMANCE

The performance data in Chapter 6 are applicable, except as modified by the following:

- NOTE:**
1. With the limited Steep Approach weight envelope (max 31,600 lbs or 14,334 kg), the maximum landing weight is not limited by minimum climb requirements (2.1% Approach Climb gradient and 3.2% Landing Climb gradient).
 2. The CAFM must not be used for any steep approach performance calculation.

STALL SPEEDS

The stall speeds for the Flaps 10, Flight Spoilers MAX, gear up and for the Flaps 30, Flight Spoilers MAX, gear down configurations at various gross weights are provided in Fig. 07-10-01-2. The chart is based upon the forward center-of-gravity limit.

**EXAMPLE:**

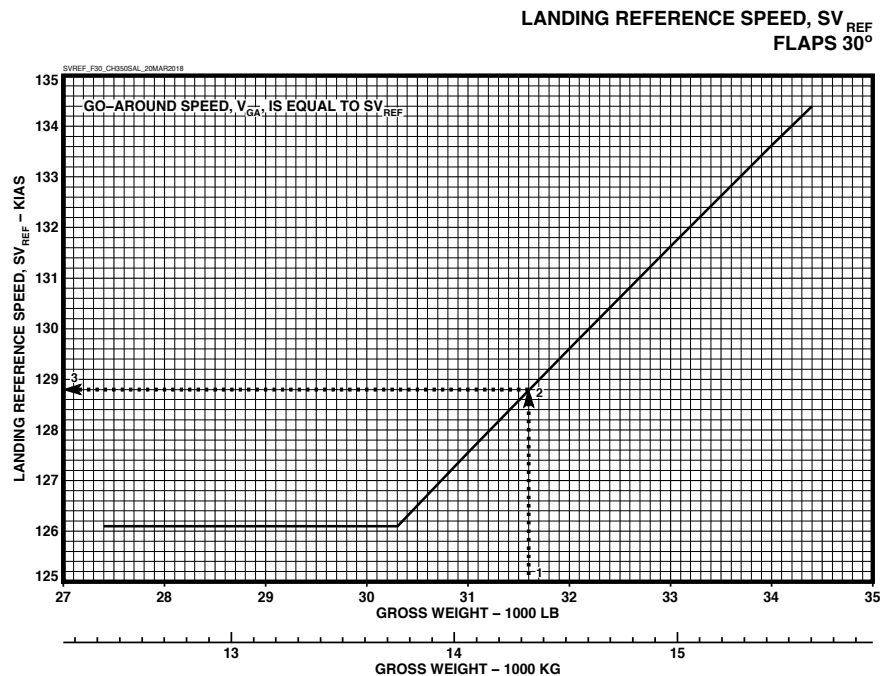
1. Weight..... 30 500 lb (13 835 kg)
2. Flaps Setting..... Flaps 30 / Gear Down / MFS MAX
3. Stall Speed..... 102.5 KCAS

Figure 07-10-01-2

GO-AROUND SPEED (V_{GA}) AND LANDING REFERENCE SPEED (SV_{REF})

The Go-Around Speed (V_{GA}) and the Landing Reference Speed (SV_{REF}) are presented on Fig. 07-10-01-3 for varying conditions of airplane weight. On a Steep Approach, V_{GA} is equal to SV_{REF} .

- NOTE:**
1. Approach Climb gradient performance for Flaps 10, Gear up configuration is based on V_{GA} ;
 2. Landing Climb gradient performance for Flaps 30, Gear Down configuration is based on SV_{REF} ;
 3. Factored Landing Distance for Flaps 30, Gear Down configuration is based on SV_{REF} .



EXAMPLE:

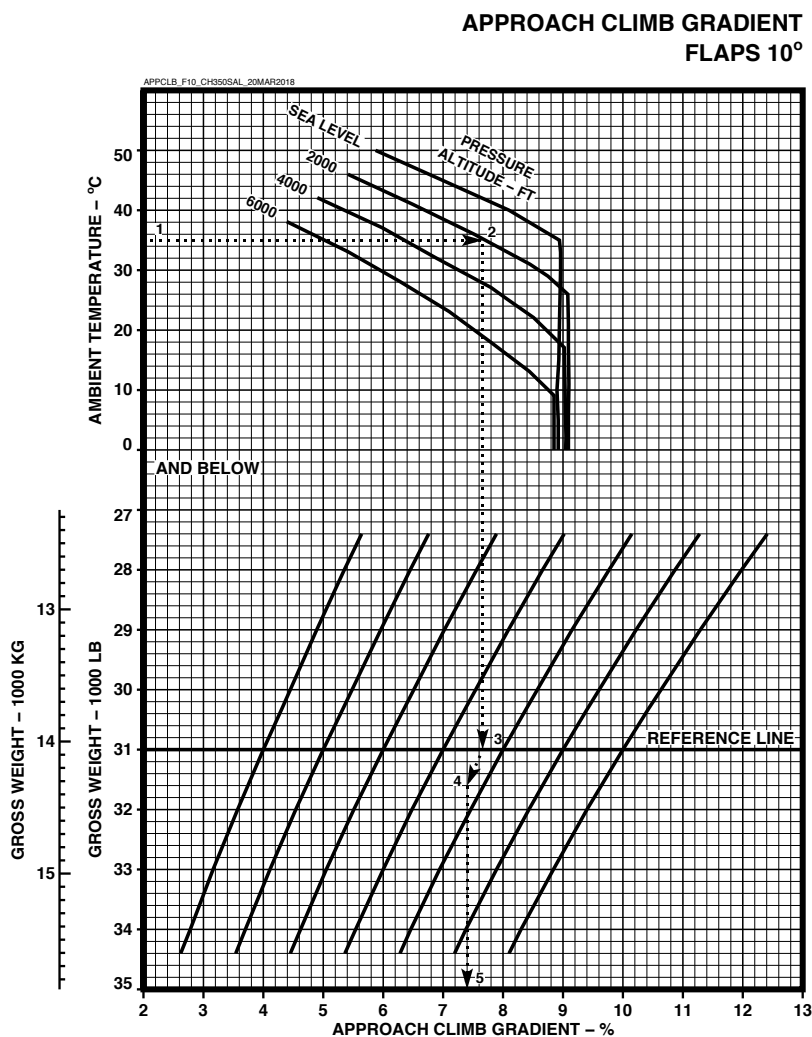
1. Weight..... 31 600 lb (14 334 kg)
2. Landing Reference Speed Curve
3. $SV_{REF} = V_{GA}$ 128.8 kias

Figure 07-10-01-3



APPROACH CLIMB GRADIENT, FLAPS 10°/GEAR UP

The Flaps 10, gear up, one-engine-inoperative configuration Approach Climb gradients for varying conditions of airport pressure altitude, ambient temperature and gross weight are provided in Fig. 07-10-01-4.



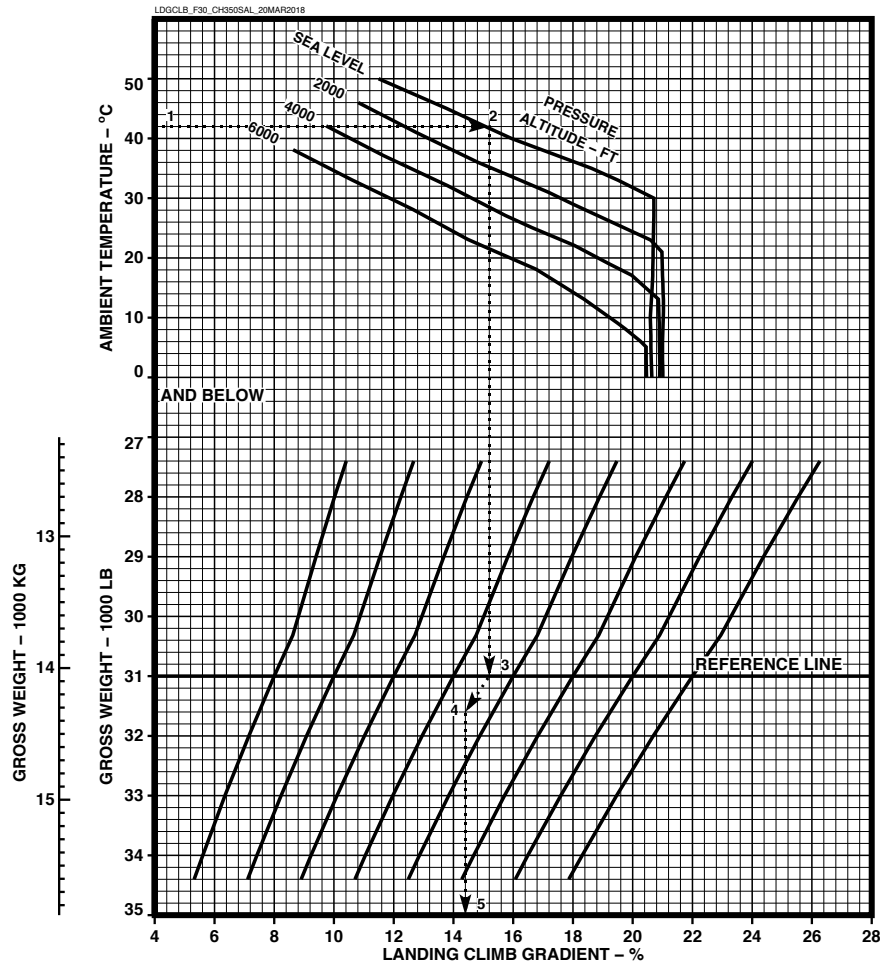
EXAMPLE:

- | | |
|---------------------------|--------------------------------------|
| 1. Temperature..... 35 °C | 4. Weight..... 31 600 lb (14 334 kg) |
| 2. Altitude..... 2 000 ft | 5. Approach Climb Gradient.. 7.4 % |
| 3. Weight Reference Line | |

Figure 07-10-01-4

LANDING CLIMB GRADIENT, FLAPS 30/GEAR DOWN

The Flaps 30, gear down, all-engines-operative configuration Landing Climb gradients for varying conditions of airport pressure altitude, ambient temperature and gross weight are provided in Fig. 07-10-01-5.

**LANDING CLIMB GRADIENT
FLAPS 30°****EXAMPLE:**

- | | |
|----------------------------|--------------------------------------|
| 1. Temperature..... 42 °C | 4. Weight..... 31 600 lb (14 334 kg) |
| 2. Altitude..... Sea Level | 5. Landing Climb Gradient... 14.4 % |
| 3. Weight Reference Line | |

Figure 07-10-01-5



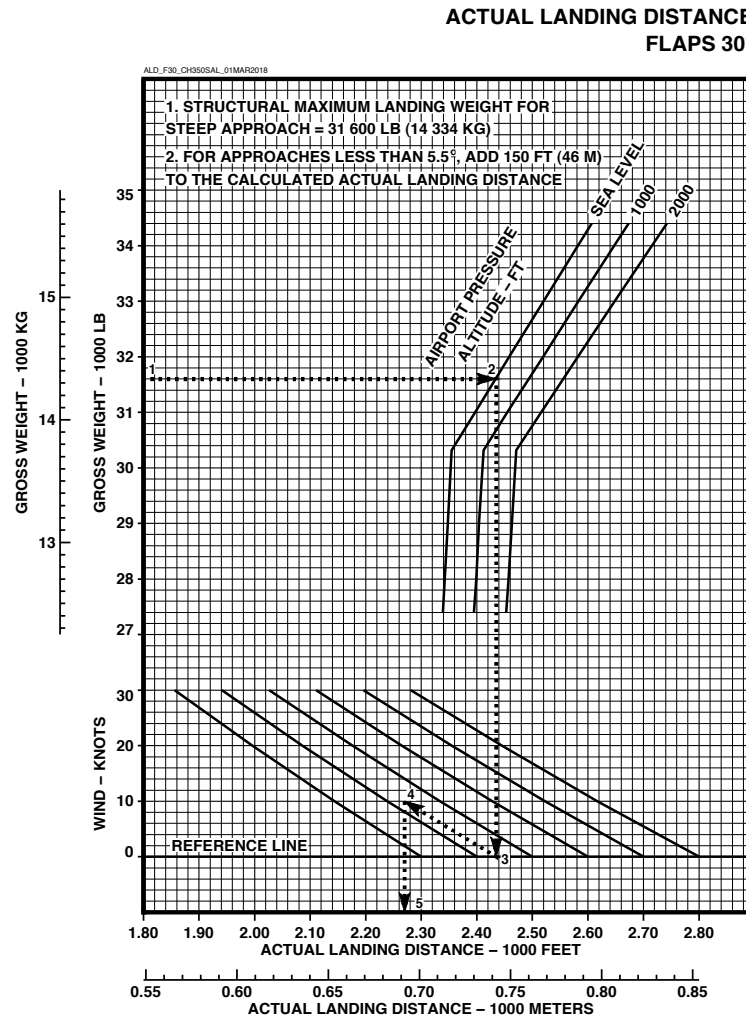
FACTORED LANDING DISTANCE, FLAPS 30/GEAR DOWN

The Steep Approach Actual Landing Distance data (Fig. 07-10-01-6) can be achieved using the following procedure:

1. Approach at SV_{REF} in the steep approach configuration (Flaps 30, Gear down, MFS max) using thrust to maintain the glideslope.
2. Briskly reduce the thrust levers to IDLE at 50 feet above the runway threshold.
3. A firm touchdown with minimal flare should be accomplished.
4. Apply maximum braking immediately after nosewheel touchdown until airplane comes to a complete stop.
5. Deploy thrust reversers, if necessary.
6. Spoilers are automatically deployed (Ground Lift Dumping).
7. Select Idle Reverse Thrust at 40 KIAS.

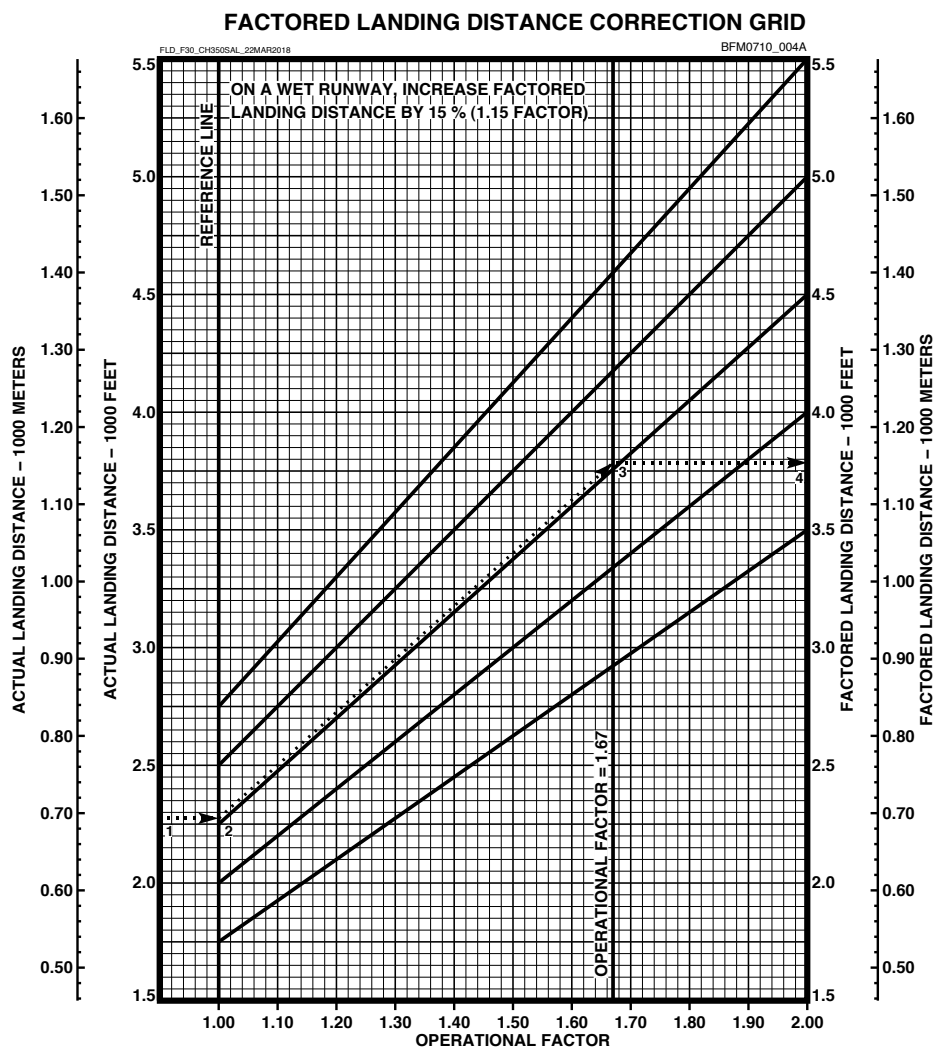
The Steep Approach Actual Landing Distance performance data on Fig. 07-10-01-6 is based on flying the above procedure with Flaps 30 and spoilers MAX, to a full stop on a dry, level, hard-surfaced runway at ISA temperature. For approach path angles of 4.5° up to but not including 5.5° , add 150 ft (46 m) to the Actual Landing Distance derived from Fig. 07-10-01-6.

- NOTE:**
1. The Factored Landing Distance required data on Fig. 07-10-01-7 is the Actual Landing Distance (Fig. 07-10-01-6) multiplied by an operational factor of 1.67.
 2. For wet runway surfaces, operational rules may require the runway length available to be at least 115% of the Factored Landing Distance derived from Fig. 07-10-01-7.

**EXAMPLE:**

- | | |
|--------------------------------------|--|
| 1. Weight..... 31 600 lb (14 334 kg) | 4. Wind..... 10 kt |
| 2. Altitude..... Sea Level | 5. Actual Landing Distance... 2 270 ft (692 m) |
| 3. Wind Reference Line | |

Figure 07-10-01-6

**EXAMPLE:**

- | | |
|--|---|
| 1. Actual Landing Distance..... 2 270 ft (692 m) | 3. Operational Factor..... 1.67 |
| 2. Operational Factor Reference Line | 4. Factored Landing Distance.. 3 783 ft (1 153 m) |

Figure 07-10-01-7

SUPPLEMENTS

The supplementary data in chapter 7 are applicable except for the following:

- SUPPLEMENT 1 – Operation On Contaminated Runways
- SUPPLEMENT 2 – Supplemental Information for the MMEL
- SUPPLEMENT 3 – Category II Operations
- SUPPLEMENT 5 – Operational Capabilities: the listed operational capabilities in Supplement 5 are applicable except for RNP AR, RNP APCH, LPV Approaches, Baro-VNAV and Vertical Navigation (VNAV).
- SUPPLEMENT 7 – Required Navigation Performance – Authorization Required (RNP-AR) Approach Operations
- SUPPLEMENT 9 – Operation on Wet Grooved Runways

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INTRODUCTION

NOTE: This Airplane Flight Manual Supplement is only applicable to airplanes 20813 and subsequent including airplanes 20501 to 20812, incorporating SB 350-27-008, Rudder Travel Increase.

The data in this supplement can be used when conducting takeoffs from a short runway. It presents improved takeoff performance which allows heavier takeoff weights on short runways.

This supplement complements and/or supersedes data contained in the basic Airplane Flight Manual and must be complied with in conjunction with the basic Airplane Flight Manual.

The effect of this supplement on the basic Airplane Flight Manual is given below.

LIMITATIONS

The limitations in Chapter 2 are applicable, except as modified by the following:

WEIGHT AND C.G. LIMITATIONS

TAKEOFF WEIGHT

The maximum takeoff weight (MTOW) allowed for Short Field Operation (SFO) is 38,000 lb.

OPERATIONAL LIMITATIONS

TAKEOFF AIRPORT LIMITS

Airport pressure altitude and outside air temperature limits are defined in Fig. 07-11A-01-1.

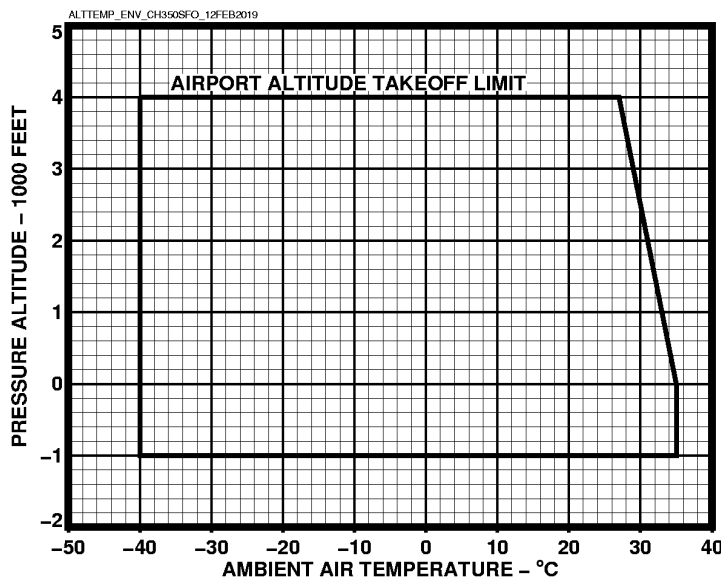
**ALTITUDE/TEMPERATURE LIMITATIONS**

Figure 07-11A-01-1

TAKEOFF

Takeoff configuration for this Supplement is limited to Flaps 20°.

OPERATION ON CONTAMINATED RUNWAYS

This supplement does not provide performance information for operation on contaminated runways. Refer to Chapter 7, Supplement 1, for takeoff performance on a contaminated runway.

SYSTEMS LIMITATIONS**INOPERATIVE SYSTEMS**

SFO takeoffs are prohibited if any of the following systems are not operative:

- Landing Gear Retraction System,
- Hydraulic Power Transfer Unit,
- Main Landing Gear Bay Overheat Detection Subsystem.

NAVIGATION SYSTEM LIMITATIONS

Use of the Flight Management System (FMS) takeoff performance function for SFO is prohibited.

EMERGENCY PROCEDURES

The emergency procedures in Chapter 3 are applicable.

NORMAL PROCEDURES

The normal procedures in Chapter 4 are applicable, except as modified by the following:

BEFORE TAXI

Replace step 2. with the following:

2. Flaps 20

NON-NORMAL PROCEDURES

The Non-Normal procedures in Chapter 5 are applicable.

PERFORMANCE

The standard takeoff procedures described in Chapter 6 for dry and wet runway operations remain applicable for the short runway performance data provided in this supplement.

The performance data in Chapter 6 are applicable, except as modified by the following:

CAUTION: The CAFM must not be used for any SFO takeoff performance, except for the takeoff path corrections described below.

Should temperature or altitude be below the lowest value shown in the takeoff performance tables, use the performance at the lowest value shown.

For weights below 28,000 lb, use the performance data for a weight of 28,000 lb.

Takeoff performance data may be interpolated, or use the next higher weight, temperature and/or altitude. Instead of interpolating data between two runway gradients, the more limiting data (longest takeoff field length) may be used.

Engine thrust setting (N_1) are obtained from either the CAFM Thrust Settings calculator or from the tables in chapter 6, and are indicated by the N_1 bugs.

The takeoff performance presented in this supplement assumes that takeoff thrust is set prior to brake release. If a rolling takeoff procedure is desired, refer to Chapter 6 for the detailed procedure. The takeoff field length correction of 35 m (100 ft) remains applicable for SFO.

MINIMUM CONTROL SPEED GROUND, V_{MCG}

– Flaps 20° 109 KIAS

ENGINE BLEED CONFIGURATIONS

Takeoff performance data are presented for the following engine bleed configurations:

1. Engine Bleed OFF (Zero engine bleed).
2. Engine Bleed ON (ECS is ON and Anti-Ice is OFF).



3. Engine Bleed ON, Engine Anti-Ice and Wing Anti-Ice ON (ECS is ON, engine cowl and wing Anti-Ice devices are ON).

Three other engine bleed configurations are available for dispatch. For the following configurations, use the takeoff performance data from configuration 3 above:

- Engine Anti-Ice ON.
- Engine Bleed ON, Engine Anti-Ice ON.
- Engine Anti-Ice and Wing Anti-Ice ON.

SFO TAKEOFF PERFORMANCE

DETERMINATION OF THE TAKEOFF WEIGHT

The SFO takeoff weight is the lowest weight based on the most restrictive limitation:

1. Field Length Weight Limitation (TOFL limited by available runway length).
2. Takeoff Path Weight Limitation (Obstacle Clearance).
3. SFO Maximum Takeoff Weight of 38,000 lb.

The following performance limits are not restricting SFO takeoff performance:

1. Climb Weight Limitation (minimum climb requirements).
2. Maximum Brake Energy Limitation (V_{1MBE} limit on V_1).
3. Takeoff Weight Limited by maximum tire speed.

Once the scheduled SFO takeoff weight is set, the corresponding takeoff speeds (V_1 , V_R , V_2 , and V_{FTO}) can be determined.

TAKEOFF DISTANCE AND SPEEDS ON A DRY RUNWAY

Fig. 07-11A-01-2 to Fig. 07-11A-01-19 present the SFO takeoff performance data on a dry runway, for the specified engine bleed configuration and airport pressure altitude, as a function of airplane weight, ambient temperature and runway gradient. The following takeoff data is provided:

TOFL	= Takeoff Field Length (ft)
V_1	= Takeoff Decision Speed (KIAS)
V_R	= Takeoff Rotation Speed (KIAS)
V_2	= Takeoff Safety Speed (KIAS)
V_{FTO}	= Final Takeoff Speed (KIAS)

Fig. 07-11A-01-20 provides corrections on TOFL and on V_1 speed for the effect of reported wind.

Example:

Determine the required runway length and takeoff speeds for the following conditions:

Aircraft Weight	= 33,000 lb
Engine Bleed	= Engine Bleed On
Runway Surface	= Dry
Rolling Takeoff	= Yes
Runway gradient	= +1.0% (Positive Uphill)
Airport pressure altitude	= 2,000 ft
Reported wind	= -10 knots (Negative for tailwind)
Airport Temperature (OAT)	= 25 °C

Fig. 07-11A-01-11 is used to determine the uncorrected takeoff data:

Uncorrected TOFL	= 3890 ft + 100 ft for rolling takeoff 3990 ft
Uncorrected V_1	= 113 KIAS
V_R	= 115 KIAS
V_2	= 121 KIAS
V_{FTO}	= 147 KIAS

V_1 and TOFL are then corrected for reported wind using Fig. 07-11A-01-20:

Corrected V_1	= 113 KIAS (no change below 115 KIAS)
Corrected TOFL	= $3990 \times 1.35 = 5387$ ft

Finally, the available SFO takeoff performance data is as follows:

TOFL	= 5387 ft
V_1	= 113 KIAS
V_R	= 115 KIAS
V_2	= 121 KIAS
V_{FTO}	= 147 KIAS

For the specified conditions, the required runway length for an SFO takeoff is 5387 ft.

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED OFF****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
28000 V _{FTO} = 136	-2	114 115 126 3205	114 115 126 3255	114 115 126 3305	114 115 126 3355	114 115 126 3405	114 115 126 3460	114 115 125 3550	
	-1	114 115 125 3195	114 115 125 3245	114 115 125 3295	114 115 125 3345	114 115 125 3395	114 115 125 3445	114 115 125 3540	
	0	114 115 125 3185	114 115 124 3235	114 115 124 3285	114 115 124 3335	114 115 124 3385	114 115 124 3435	113 115 124 3535	
	1	114 115 124 3180	114 115 124 3230	114 115 124 3280	114 115 124 3330	114 115 123 3380	114 115 123 3430	113 115 123 3535	
	2	114 115 123 3175	114 115 123 3225	114 115 123 3275	114 115 123 3325	113 115 123 3375	113 115 123 3430	113 115 122 3535	
30000 V _{FTO} = 140	-2	114 115 125 3270	114 115 125 3325	114 115 125 3375	114 115 125 3430	114 115 125 3480	114 115 125 3535	113 115 124 3630	
	-1	114 115 124 3265	114 115 124 3315	114 115 124 3370	114 115 124 3420	114 115 124 3470	114 115 124 3525	113 115 124 3630	
	0	114 115 123 3260	114 115 123 3315	114 115 123 3365	114 115 123 3415	113 115 123 3470	113 115 123 3520	113 115 123 3625	
	1	113 115 123 3260	113 115 123 3310	113 115 122 3360	113 115 122 3415	113 115 122 3465	113 115 122 3520	113 115 122 3630	
	2	113 115 122 3260	113 115 122 3315	113 115 122 3365	113 115 122 3415	113 115 121 3470	113 115 121 3520	113 115 121 3635	
32000 V _{FTO} = 145	-2	114 115 124 3340	114 115 124 3395	114 115 124 3450	114 115 124 3500	114 115 124 3555	114 115 124 3610	113 115 124 3715	
	-1	114 115 123 3335	113 115 123 3390	113 115 123 3445	113 115 123 3500	113 115 123 3550	113 115 123 3605	113 115 123 3715	
	0	113 115 122 3335	113 115 122 3390	113 115 122 3445	113 115 122 3500	113 115 122 3550	113 115 122 3605	113 115 122 3720	
	1	113 115 122 3340	113 115 121 3395	113 115 121 3450	113 115 121 3500	113 115 121 3555	113 115 121 3610	113 115 121 3730	
	2	113 115 121 3350	113 115 121 3405	113 115 121 3455	113 115 120 3510	113 115 120 3560	113 115 120 3615	113 115 120 3750	
33000 V _{FTO} = 147	-2	114 115 124 3375	114 115 124 3430	114 115 123 3485	113 115 123 3540	113 115 123 3590	113 115 123 3645	113 115 123 3755	
	-1	113 115 123 3375	113 115 123 3430	113 115 123 3485	113 115 123 3535	113 115 122 3590	113 115 122 3645	113 115 122 3760	
	0	113 115 122 3375	113 115 122 3430	113 115 122 3485	113 115 122 3540	113 115 122 3595	113 115 122 3650	113 115 121 3770	
	1	113 115 121 3385	113 115 121 3440	113 115 121 3490	113 115 121 3545	113 115 121 3600	113 115 121 3655	113 115 121 3780	
	2	113 115 120 3420	113 115 120 3470	113 115 120 3520	113 115 120 3570	113 115 120 3625	113 115 120 3680	113 115 120 3850	

TODATA_350SFO_IMP_F20_DRY_ZERO_SL_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-2 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE SEA LEVEL

ENGINE BLEED OFF

V₁ (KIAS) V_R (KIAS)
V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)									
		5 & BELOW	10	15	20	25	30	35			
34000 V _{FTO} = 149	-2	113 115 124 3410	113 115 124 3465	113 115 124 3520	113 115 124 3575	113 115 124 3630	113 115 124 3685	113 115 124 3800			
	-1	113 115 123 3410	113 115 123 3470	113 115 123 3520	113 115 123 3575	113 116 123 3630	113 116 123 3685	113 116 123 3805			
	0	113 116 122 3415	113 116 122 3475	113 116 122 3525	113 116 122 3580	113 116 122 3635	113 116 122 3695	113 116 122 3815			
	1	114 116 122 3480	114 116 122 3540	114 116 122 3590	114 116 122 3645	114 116 122 3700	114 116 122 3755	114 116 122 3930			
	2	116 117 122 3610	116 117 122 3670	116 117 122 3725	115 117 122 3780	115 117 122 3835	115 117 122 3895	116 117 122 4080			
35000 V _{FTO} = 151	-2	113 117 125 3445	113 117 125 3505	113 117 125 3560	113 117 125 3615	113 117 125 3670	113 117 125 3725	113 117 125 3840			
	-1	113 117 124 3450	113 117 124 3505	113 117 124 3560	113 117 124 3615	113 117 124 3670	113 117 124 3730	113 117 124 3870			
	0	115 117 124 3550	114 117 124 3605	114 117 124 3660	114 117 124 3715	114 117 124 3770	114 117 124 3830	114 117 124 3995			
	1	116 118 124 3675	116 118 124 3740	116 118 124 3795	116 118 124 3850	116 118 124 3910	116 118 124 3970	116 118 124 4155			
	2	118 119 124 3815	118 119 124 3880	118 119 124 3935	118 119 124 3995	118 119 124 4055	118 119 124 4120	118 119 124 4315			
36000 V _{FTO} = 153	-2	113 118 126 3500	113 119 126 3555	113 119 126 3610	113 119 126 3665	113 119 126 3720	113 119 126 3775	113 119 126 3925			
	-1	115 119 126 3610	115 119 126 3670	115 119 126 3725	115 119 126 3780	115 119 126 3835	115 119 126 3895	115 119 126 4060			
	0	117 119 125 3735	117 119 125 3800	117 119 125 3855	117 119 125 3915	117 119 125 3975	117 119 125 4035	117 120 125 4220			
	1	119 120 125 3880	119 120 125 3945	119 120 125 4005	118 120 125 4065	118 120 125 4125	118 120 125 4190	119 120 125 4390			
	2	120 121 125 4030	120 121 125 4100	120 121 125 4160	120 121 125 4225	120 121 125 4285	120 121 125 4355	120 121 125 4570			
38000 V _{FTO} = 157	-2	117 122 129 3825	117 122 129 3890	117 122 129 3950	117 122 129 4010	117 122 129 4070	117 122 129 4130	117 122 129 4310			
	-1	119 123 129 3980	119 123 129 4045	119 123 129 4105	119 123 129 4170	119 123 129 4235	119 123 129 4300	120 123 129 4495			
	0	121 123 129 4135	121 123 129 4210	121 123 129 4270	121 124 129 4335	121 124 129 4405	121 124 129 4470	121 124 129 4685			
	1	123 124 129 4300	123 124 129 4370	123 124 129 4435	123 124 129 4505	123 124 129 4575	123 124 129 4645	123 124 129 4880			
	2	125 125 129 4565	125 125 129 4635	125 125 129 4690	125 125 129 4750	125 125 129 4810	125 125 129 4880	125 125 129 5125			

TODATA_350SFO_IMP_F20_DRY_ZERO_SL_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-2 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115	114 115	
		126 3255	126 3305	126 3355	126 3405	126 3460	125 3525	125 3605	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	114 115	
		125 3240	125 3295	125 3345	125 3395	125 3445	125 3515	125 3595	
	0	114 115	114 115	114 115	114 115	114 115	114 115	113 115	
		124 3235	124 3285	124 3335	124 3385	124 3440	124 3505	124 3595	
	1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	
		124 3225	124 3280	124 3330	123 3380	123 3430	123 3500	123 3590	
	2	114 115	114 115	114 115	113 115	113 115	113 115	113 115	
		123 3225	123 3275	123 3325	123 3375	123 3430	123 3500	122 3595	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	114 115	113 115	
		125 3320	125 3375	125 3425	125 3480	125 3535	124 3605	124 3690	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	113 115	
		124 3315	124 3370	124 3420	124 3475	124 3525	124 3595	124 3685	
	0	114 115	114 115	114 115	113 115	113 115	113 115	113 115	
		123 3310	123 3365	123 3415	123 3470	123 3520	123 3595	123 3690	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		123 3310	122 3360	122 3415	122 3465	122 3520	122 3595	122 3695	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		122 3310	122 3365	122 3415	121 3470	121 3520	121 3595	121 3700	
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	
		124 3390	124 3445	124 3500	124 3555	124 3610	124 3680	123 3775	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		123 3390	123 3445	123 3495	123 3550	123 3605	123 3680	123 3780	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		122 3390	122 3445	122 3495	122 3550	122 3605	122 3680	122 3785	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		121 3395	121 3450	121 3500	121 3555	121 3610	121 3690	121 3795	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		121 3400	121 3455	120 3510	120 3565	120 3620	120 3695	120 3825	
33000 V _{FTO} = 147	-2	114 115	114 115	113 115	113 115	113 115	113 115	113 115	
		124 3430	124 3485	123 3540	123 3595	123 3650	123 3720	123 3820	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		123 3425	123 3485	123 3535	122 3590	122 3650	122 3725	122 3825	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		122 3430	122 3485	122 3540	122 3595	122 3650	122 3725	121 3835	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	
		121 3435	121 3490	121 3545	121 3600	121 3655	121 3735	120 3850	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		120 3465	120 3520	120 3570	120 3625	120 3680	120 3775	120 3935	

TODATA_350SFO_IMP_F20_DRY_ZERO_500_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-3 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED OFF**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		124 3465	124 3520	124 3575	124 3630	124 3690	124 3765	123 3865	
	-1	113 115	113 115	113 115	113 116	113 116	113 116	113 116	
		123 3465	123 3520	123 3575	123 3635	123 3690	123 3765	123 3870	
	0	113 116	113 116	113 116	113 116	113 116	113 116	113 116	
		122 3470	122 3525	122 3580	122 3640	122 3695	122 3775	122 3885	
	1	114 116	114 116	114 116	114 116	114 116	114 116	114 116	
		122 3535	122 3590	122 3645	122 3700	122 3755	122 3850	122 4020	
	2	116 117	116 117	115 117	115 117	115 117	115 117	116 117	
		122 3665	122 3725	122 3780	122 3835	122 3895	122 3995	122 4170	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		125 3500	125 3555	125 3615	125 3670	125 3725	125 3805	125 3910	
	-1	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		124 3505	124 3560	124 3615	124 3675	124 3730	124 3810	124 3950	
	0	114 117	114 117	114 117	114 117	114 117	114 117	115 118	
		124 3600	124 3660	124 3715	124 3775	124 3830	124 3925	124 4085	
	1	116 118	116 118	116 118	116 118	116 118	116 118	116 118	
		124 3730	124 3795	124 3850	124 3910	124 3970	124 4070	124 4250	
	2	118 119	118 119	118 119	118 119	118 119	118 119	118 119	
		124 3870	124 3935	124 3995	124 4055	124 4120	124 4225	124 4415	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	113 119	114 119	
		126 3550	126 3610	126 3665	126 3720	126 3780	126 3865	126 4005	
	-1	115 119	115 119	115 119	115 119	115 119	115 119	115 119	
		126 3665	126 3725	126 3780	126 3840	126 3895	126 3990	125 4145	
	0	117 119	117 119	117 119	117 119	117 119	117 120	117 120	
		125 3790	125 3855	125 3910	125 3975	125 4035	125 4135	125 4315	
	1	119 120	119 120	118 120	118 120	118 120	118 120	119 120	
		125 3935	125 4000	125 4060	125 4125	125 4190	125 4300	125 4490	
	2	120 121	120 121	120 121	120 121	120 121	120 121	121 121	
		125 4090	125 4160	125 4220	125 4285	125 4355	125 4465	125 4680	
38000 V _{FTO} = 157	-2	117 122	117 122	117 122	117 122	117 122	117 122	118 122	
		129 3885	129 3950	129 4005	129 4070	129 4130	129 4235	129 4405	
	-1	119 123	119 123	119 123	119 123	119 123	119 123	120 123	
		129 4040	129 4105	129 4170	129 4235	129 4300	129 4410	129 4595	
	0	121 123	121 123	121 124	121 124	121 124	121 124	122 124	
		129 4200	129 4270	129 4335	129 4405	129 4475	129 4590	129 4790	
	1	123 124	123 124	123 124	123 124	123 124	123 124	123 125	
		129 4365	129 4435	129 4505	129 4575	129 4645	129 4770	129 4995	
	2	125 125	125 125	125 125	125 125	125 125	125 125	125 125	
		129 4620	129 4690	129 4745	129 4810	129 4880	129 5010	129 5265	

TODATA_350SFO_IMP_F20_DRY_ZERO_500_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-3 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
28000 V _{FTO} = 136	-2	114 115 126 3300	114 115 126 3355	114 115 126 3405	114 115 126 3460	114 115 125 3510	114 115 125 3600	114 115 125 3660	
		114 115 125 3290	114 115 125 3340	114 115 125 3395	114 115 125 3445	114 115 125 3500	114 115 125 3590	113 115 124 3655	
	-1	114 115 124 3280	114 115 124 3335	114 115 124 3385	114 115 124 3440	114 115 124 3490	113 115 124 3580	113 115 124 3650	
		114 115 124 3275	114 115 124 3325	114 115 124 3380	114 115 123 3430	114 115 123 3485	113 115 123 3580	113 115 123 3650	
	0	114 115 123 3270	114 115 123 3325	113 115 123 3375	113 115 123 3430	113 115 123 3480	113 115 122 3580	113 115 122 3655	
		114 115 125 3370	114 115 125 3425	114 115 125 3480	114 115 125 3535	114 115 124 3590	114 115 124 3680	113 115 124 3750	
	1	114 115 124 3365	114 115 124 3420	114 115 124 3470	114 115 124 3525	114 115 124 3580	113 115 124 3675	113 115 123 3750	
		114 115 123 3360	114 115 123 3415	114 115 123 3465	113 115 123 3520	113 115 123 3575	113 115 123 3675	113 115 123 3750	
	2	113 115 123 3360	113 115 122 3410	113 115 122 3465	113 115 122 3520	113 115 122 3575	113 115 122 3675	113 115 122 3755	
		113 115 122 3360	113 115 122 3415	113 115 122 3465	113 115 121 3520	113 115 121 3575	113 115 121 3680	113 115 121 3765	
30000 V _{FTO} = 140	-2	114 115 124 3445	114 115 124 3500	114 115 124 3555	114 115 124 3610	114 115 124 3665	113 115 124 3765	113 115 123 3845	
		113 115 123 3440	113 115 123 3495	113 115 123 3550	113 115 123 3605	113 115 123 3660	113 115 123 3765	113 115 122 3845	
	-1	113 115 122 3440	113 115 122 3495	113 115 122 3550	113 115 122 3605	113 115 122 3660	113 115 122 3770	113 115 122 3850	
		113 115 121 3445	113 115 121 3500	113 115 121 3555	113 115 121 3610	113 115 121 3665	113 115 121 3775	113 115 121 3865	
	0	113 115 121 3450	113 115 121 3505	113 115 120 3560	113 115 120 3615	113 115 120 3675	113 115 120 3790	113 115 120 3905	
		114 115 124 3480	113 115 123 3535	113 115 123 3590	113 115 123 3650	113 115 123 3705	113 115 123 3805	113 115 123 3885	
	1	113 115 123 3480	113 115 123 3535	113 115 123 3590	113 115 122 3645	113 115 122 3705	113 115 122 3810	113 115 122 3890	
		113 115 122 3480	113 115 122 3540	113 115 122 3595	113 115 122 3650	113 115 122 3705	113 115 121 3815	113 115 121 3900	
	2	113 115 121 3485	113 115 121 3545	113 115 121 3600	113 115 121 3655	113 115 121 3715	113 115 121 3830	112 115 120 3920	
		113 115 120 3515	113 115 120 3565	113 115 120 3620	113 115 120 3675	113 115 120 3735	113 115 120 3880	114 115 120 4025	

TODATA_350SFO_IMP_F20_DRY_ZERO_1K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-4 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		124 3515	124 3575	124 3630	124 3685	124 3745	124 3850	123 3930	
	-1	113 115	113 115	113 116	113 116	113 116	113 116	113 116	
		123 3520	123 3575	123 3630	123 3690	123 3745	123 3855	123 3940	
	0	113 116	113 116	113 116	113 116	113 116	113 116	113 116	
		123 3525	123 3580	123 3635	122 3695	122 3750	122 3865	122 3960	
	1	114 116	114 116	114 116	114 116	114 116	114 116	114 116	
		122 3585	122 3640	122 3695	122 3755	122 3815	122 3960	122 4105	
	2	115 117	115 117	115 117	115 117	115 117	115 117	116 117	
		122 3715	122 3775	122 3830	122 3890	122 3955	122 4110	122 4270	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		125 3555	125 3610	125 3670	125 3725	125 3785	125 3890	125 3975	
	-1	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		124 3555	124 3615	124 3670	124 3730	124 3790	124 3910	124 4030	
	0	114 117	114 117	114 117	114 117	114 118	114 118	115 118	
		124 3655	124 3715	124 3770	124 3830	124 3890	124 4035	124 4180	
	1	116 118	116 118	116 118	116 118	116 118	116 118	117 119	
		124 3785	124 3845	124 3905	124 3965	124 4030	124 4190	124 4345	
	2	118 119	118 119	118 119	118 119	118 119	118 119	118 119	
		124 3925	124 3990	124 4050	124 4115	124 4180	124 4350	124 4515	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	113 119	114 119	
		126 3605	126 3660	126 3715	126 3775	126 3835	126 3970	126 4090	
	-1	115 119	115 119	115 119	115 119	115 119	115 119	115 119	
		126 3715	126 3775	126 3835	126 3895	126 3955	126 4100	125 4235	
	0	117 119	117 119	117 119	116 119	116 120	117 120	117 120	
		125 3845	125 3905	125 3965	125 4030	125 4095	125 4255	125 4410	
	1	118 120	118 120	118 120	118 120	118 120	118 120	119 121	
		125 3995	125 4055	125 4120	125 4185	125 4250	125 4425	125 4595	
	2	120 121	120 121	120 121	120 121	120 121	120 121	121 121	
		125 4145	125 4215	125 4280	125 4345	125 4415	125 4600	125 4795	
38000 V _{FTO} = 157	-2	117 122	117 122	117 122	117 122	117 122	117 122	118 122	
		129 3940	129 4005	129 4065	129 4130	129 4195	129 4350	129 4505	
	-1	119 123	119 123	119 123	119 123	119 123	119 123	120 123	
		129 4095	129 4165	129 4230	129 4295	129 4365	129 4535	129 4700	
	0	121 123	121 124	121 124	121 124	121 124	121 124	122 124	
		129 4260	129 4330	129 4395	129 4470	129 4540	129 4725	129 4905	
	1	123 124	123 124	123 124	123 124	123 124	123 124	124 125	
		129 4425	129 4500	129 4570	129 4640	129 4715	129 4915	129 5120	
	2	125 125	125 125	125 125	125 125	125 125	125 125	126 126	
		129 4670	129 4735	129 4795	129 4875	129 4950	129 5165	129 5415	

TODATA_350SFO_IMP_F20_DRY_ZERO_1K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-4 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
28000 V _{FTO} = 136	-2	114 115 126 3405	114 115 126 3460	114 115 126 3510	114 115 125 3565	114 115 125 3640	114 115 125 3760	113 115 125 3780	
	-1	114 115 125 3390	114 115 125 3445	114 115 125 3500	114 115 125 3555	114 115 125 3630	113 115 124 3750	113 115 124 3775	
	0	114 115 124 3385	114 115 124 3435	114 115 124 3490	114 115 124 3545	114 115 124 3625	113 115 123 3750	113 115 123 3775	
	1	114 115 124 3375	114 115 124 3430	114 115 123 3485	114 115 123 3540	113 115 123 3620	113 115 123 3750	113 115 123 3780	
	2	114 115 123 3375	113 115 123 3425	113 115 123 3480	113 115 123 3535	113 115 122 3615	113 115 122 3755	113 115 122 3785	
30000 V _{FTO} = 140	-2	114 115 125 3475	114 115 125 3530	114 115 125 3590	114 115 124 3645	114 115 124 3725	113 115 124 3850	113 115 124 3875	
	-1	114 115 124 3470	114 115 124 3525	114 115 124 3580	114 115 124 3635	113 115 124 3720	113 115 123 3850	113 115 123 3875	
	0	114 115 123 3465	114 115 123 3520	113 115 123 3575	113 115 123 3630	113 115 123 3715	113 115 122 3850	113 115 122 3880	
	1	113 115 122 3460	113 115 122 3515	113 115 122 3575	113 115 122 3630	113 115 122 3715	113 115 122 3860	113 115 122 3890	
	2	113 115 122 3465	113 115 122 3520	113 115 121 3575	113 115 121 3630	113 115 121 3720	113 115 121 3870	112 115 121 3905	
32000 V _{FTO} = 145	-2	114 115 124 3550	114 115 124 3610	114 115 124 3665	113 115 124 3725	113 115 124 3810	113 115 123 3945	113 115 123 3970	
	-1	113 115 123 3550	113 115 123 3605	113 115 123 3660	113 115 123 3720	113 115 123 3805	113 115 122 3950	113 115 122 3980	
	0	113 115 122 3545	113 115 122 3605	113 115 122 3660	113 115 122 3720	113 115 122 3810	113 115 121 3955	113 115 121 3990	
	1	113 115 121 3550	113 115 121 3605	113 115 121 3665	113 115 121 3725	113 115 121 3815	112 115 121 3970	112 115 121 4005	
	2	113 115 121 3560	113 115 120 3615	113 115 120 3670	113 115 120 3730	113 115 120 3825	113 115 120 4020	113 115 120 4070	
33000 V _{FTO} = 147	-2	113 115 123 3590	113 115 123 3645	113 115 123 3705	113 115 123 3765	113 115 123 3850	113 115 123 3990	113 115 123 4020	
	-1	113 115 123 3590	113 115 123 3645	113 115 122 3705	113 115 122 3760	113 115 122 3850	113 115 122 4000	113 115 122 4030	
	0	113 115 122 3590	113 115 122 3645	113 115 122 3705	113 115 122 3765	113 115 121 3855	112 115 121 4010	112 115 121 4045	
	1	113 115 121 3595	113 115 121 3655	113 115 121 3710	113 115 121 3770	113 115 121 3865	112 115 120 4030	112 115 120 4060	
	2	113 115 120 3610	113 115 120 3665	113 115 120 3725	113 115 120 3785	113 115 120 3900	114 115 120 4155	114 115 120 4215	

TODATA_350SFO_IMP_F20_DRY_ZERO_2K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-5 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
34000 V _{FTO} = 149	-2	113 115 124 3625	113 115 124 3685	113 115 124 3745	113 115 124 3805	113 116 124 3895	113 115 123 4035	113 115 123 4070	
	-1	113 116 123 3630	113 116 123 3685	113 116 123 3745	113 116 123 3805	113 116 123 3895	113 116 123 4050	112 116 122 4080	
	0	113 116 123 3635	113 116 123 3690	113 116 123 3750	113 116 123 3810	113 116 123 3905	113 116 122 4080	113 116 122 4130	
	1	114 116 122 3690	114 116 122 3745	113 116 122 3805	113 116 122 3865	114 116 122 3985	114 116 122 4240	115 117 122 4295	
	2	115 117 122 3820	115 117 122 3880	115 117 122 3940	115 117 122 4005	115 117 122 4135	116 117 122 4405	116 117 122 4465	
35000 V _{FTO} = 151	-2	113 117 125 3665	113 117 125 3725	113 117 125 3785	113 117 125 3845	113 117 125 3935	113 117 125 4085	113 117 124 4115	
	-1	113 117 125 3670	113 117 125 3730	113 117 125 3785	113 117 124 3850	113 117 124 3940	113 117 124 4150	113 117 124 4200	
	0	114 117 124 3760	114 118 124 3820	114 118 124 3880	114 118 124 3945	114 118 124 4060	115 118 124 4310	115 118 124 4365	
	1	116 118 124 3890	116 118 124 3955	116 118 124 4015	116 118 124 4085	116 118 124 4210	117 119 124 4485	117 119 124 4550	
	2	118 119 124 4035	118 119 124 4100	118 119 124 4165	118 119 124 4235	118 119 124 4375	118 119 124 4665	119 120 124 4735	
36000 V _{FTO} = 153	-2	113 119 127 3710	113 119 126 3765	113 119 126 3825	113 119 126 3890	113 119 126 4000	114 119 126 4210	114 119 126 4260	
	-1	115 119 126 3825	115 119 126 3885	115 119 126 3950	115 119 126 4010	115 119 126 4130	115 119 125 4370	116 119 125 4430	
	0	116 119 125 3955	116 119 125 4015	116 119 125 4080	116 120 125 4150	116 120 125 4280	117 120 125 4555	118 120 125 4615	
	1	118 120 125 4105	118 120 125 4170	118 120 125 4240	118 120 125 4310	118 120 125 4450	119 121 125 4745	119 121 125 4810	
	2	120 121 125 4260	120 121 125 4325	120 121 125 4400	120 121 125 4470	120 121 125 4620	121 122 125 4955	121 122 125 5030	
38000 V _{FTO} = 157	-2	117 122 129 4055	117 122 129 4120	117 122 129 4185	117 122 129 4255	117 122 129 4380	118 122 129 4650	118 123 129 4715	
	-1	119 123 129 4215	119 123 129 4280	119 123 129 4350	119 123 129 4425	119 123 129 4565	120 123 129 4850	120 123 129 4920	
	0	121 124 129 4385	121 124 129 4455	121 124 129 4525	121 124 129 4600	121 124 129 4750	122 124 129 5060	122 124 129 5135	
	1	123 124 129 4555	123 124 129 4625	123 124 129 4700	123 124 129 4780	123 124 129 4940	124 125 129 5290	124 125 129 5375	
	2	125 125 129 4775	125 125 129 4850	125 125 129 4930	125 125 129 5015	125 125 129 5185	126 126 129 5600	126 126 129 5725	

TODATA_350SFO_IMP_F20_DRY_ZERO_2K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-5 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
28000 V _{FTO} = 136	-2	114 115 126 3515	114 115 125 3570	114 115 125 3630	114 115 125 3695	114 115 125 3800	113 115 124 3905	
	-1	114 115 125 3500	114 115 125 3560	114 115 125 3615	114 115 125 3685	113 115 124 3795	113 115 124 3905	
	0	114 115 124 3495	114 115 124 3550	114 115 124 3605	114 115 124 3675	113 115 124 3790	113 115 123 3905	
	1	114 115 123 3485	114 115 123 3540	114 115 123 3600	113 115 123 3670	113 115 123 3790	113 115 122 3910	
	2	113 115 123 3485	113 115 123 3540	113 115 122 3595	113 115 122 3670	113 115 122 3790	113 115 121 3920	
30000 V _{FTO} = 140	-2	114 115 125 3590	114 115 124 3650	114 115 124 3705	114 115 124 3780	113 115 124 3890	113 115 123 4010	
	-1	114 115 124 3585	114 115 124 3640	114 115 124 3700	113 115 124 3775	113 115 123 3890	113 115 123 4010	
	0	113 115 123 3580	113 115 123 3635	113 115 123 3695	113 115 123 3770	113 115 123 3890	113 115 122 4020	
	1	113 115 122 3575	113 115 122 3635	113 115 122 3690	113 115 122 3770	113 115 122 3895	112 115 121 4030	
	2	113 115 121 3580	113 115 121 3635	113 115 121 3695	113 115 121 3775	113 115 121 3905	112 115 120 4045	
32000 V _{FTO} = 145	-2	114 115 124 3670	113 115 124 3730	113 115 124 3790	113 115 123 3865	113 115 123 3985	113 115 123 4110	
	-1	113 115 123 3665	113 115 123 3725	113 115 123 3785	113 115 123 3860	113 115 122 3990	113 115 122 4120	
	0	113 115 122 3665	113 115 122 3725	113 115 122 3785	113 115 122 3865	113 115 122 3995	112 115 121 4135	
	1	113 115 121 3670	113 115 121 3725	113 115 121 3790	113 115 121 3870	112 115 121 4005	112 115 120 4150	
	2	113 115 120 3675	113 115 120 3735	113 115 120 3795	113 115 120 3880	112 115 120 4035	113 115 119 4240	
33000 V _{FTO} = 147	-2	113 115 123 3710	113 115 123 3770	113 115 123 3830	113 115 123 3905	113 115 123 4030	113 115 122 4160	
	-1	113 115 122 3705	113 115 122 3765	113 115 122 3830	113 115 122 3910	113 115 122 4040	112 115 121 4175	
	0	113 115 122 3710	113 115 122 3770	113 115 121 3830	113 115 121 3910	113 115 121 4050	112 115 121 4190	
	1	113 115 121 3715	113 115 121 3775	113 115 121 3835	113 115 121 3920	112 115 120 4065	113 115 120 4245	
	2	113 115 120 3725	113 115 120 3785	113 115 120 3850	113 115 120 3945	113 115 120 4165	114 115 120 4415	

TODATA_350SFO_IMP_F20_DRY_ZERO_3K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-6 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
34000 V _{FTO} = 149	-2	113 115 124 3745	113 116 124 3810	113 116 124 3870	113 116 124 3950	113 116 123 4080	113 115 123 4210	
	-1	113 116 123 3750	113 116 123 3810	113 116 123 3870	113 116 123 3955	113 116 123 4090	112 116 122 4230	
	0	113 116 123 3755	113 116 123 3815	113 116 123 3875	113 116 123 3960	112 116 122 4105	113 116 122 4325	
	1	113 116 122 3810	113 116 122 3870	113 116 122 3935	113 116 122 4030	114 116 122 4250	115 117 122 4505	
	2	115 117 122 3945	115 117 122 4010	115 117 122 4075	115 117 122 4180	116 117 122 4415	117 118 122 4680	
35000 V _{FTO} = 151	-2	113 117 125 3785	113 117 125 3850	113 117 125 3910	113 117 125 3995	113 117 125 4125	112 117 124 4265	
	-1	113 117 125 3790	113 117 125 3850	113 117 124 3915	113 117 124 4000	113 117 124 4175	114 118 124 4390	
	0	114 118 124 3885	114 118 124 3950	114 118 124 4015	114 118 124 4110	115 118 124 4325	116 118 124 4575	
	1	116 118 124 4020	116 118 124 4085	116 118 124 4155	116 118 124 4260	116 119 124 4500	117 119 124 4770	
	2	118 119 124 4170	117 119 124 4240	117 119 124 4310	118 119 124 4420	118 119 124 4675	119 120 124 4980	
36000 V _{FTO} = 153	-2	113 119 126 3830	113 119 126 3890	113 119 126 3955	113 119 126 4050	113 119 126 4240	114 119 125 4445	
	-1	115 119 126 3950	115 119 126 4015	115 119 126 4080	115 119 126 4180	115 119 125 4385	116 120 125 4640	
	0	116 119 125 4085	116 120 125 4150	116 120 125 4225	116 120 125 4330	117 120 125 4565	118 120 125 4835	
	1	118 120 125 4245	118 120 125 4310	118 120 125 4385	118 120 125 4500	119 121 125 4755	120 121 125 5040	
	2	120 121 125 4400	120 121 125 4475	120 121 125 4550	120 121 125 4670	121 122 125 4960	122 122 125 5290	
38000 V _{FTO} = 157	-2	117 122 129 4190	117 122 129 4260	117 122 129 4330	117 122 129 4435	118 122 129 4670	119 123 129 4935	
	-1	119 123 129 4355	119 123 129 4425	119 123 129 4505	119 123 129 4615	120 123 129 4870	121 124 129 5155	
	0	121 124 129 4530	121 124 129 4605	121 124 129 4685	121 124 129 4805	122 124 129 5075	122 124 129 5380	
	1	123 124 129 4705	123 124 129 4785	123 125 129 4865	123 125 129 4995	123 125 129 5295	124 125 129 5650	
	2	125 125 129 4935	125 125 129 5015	125 125 129 5100	125 125 129 5240	125 126 129 5570	126 126 129 6070	

TODATA_350SFO_IMP_F20_DRY_ZERO_3K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-6 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
28000 V _{FTO} = 136	-2	114 115 125 3630	114 115 125 3690	114 115 125 3755	114 115 125 3855	113 115 124 3980	113 115 124 4035	
	-1	114 115 125 3620	114 115 124 3680	114 115 124 3745	113 115 124 3850	113 115 124 3975	113 115 123 4035	
	0	114 115 124 3610	114 115 124 3670	114 115 124 3735	113 115 123 3845	113 115 123 3975	113 115 123 4040	
	1	114 115 123 3605	113 115 123 3665	113 115 123 3730	113 115 123 3840	113 115 122 3980	113 115 122 4045	
	2	113 115 122 3600	113 115 122 3660	113 115 122 3730	113 115 122 3845	113 115 121 3990	112 115 121 4060	
30000 V _{FTO} = 140	-2	114 115 124 3710	114 115 124 3775	114 115 124 3840	113 115 124 3950	113 115 123 4080	113 115 123 4145	
	-1	114 115 124 3705	114 115 124 3765	113 115 123 3835	113 115 123 3945	113 115 123 4085	113 115 122 4150	
	0	113 115 123 3700	113 115 123 3760	113 115 123 3830	113 115 122 3945	113 115 122 4090	112 115 122 4160	
	1	113 115 122 3700	113 115 122 3760	113 115 122 3830	113 115 122 3950	112 115 121 4100	112 115 121 4175	
	2	113 115 121 3700	113 115 121 3760	113 115 121 3835	113 115 121 3960	112 115 120 4115	112 115 120 4200	
32000 V _{FTO} = 145	-2	113 115 123 3795	113 115 123 3855	113 115 123 3930	113 115 123 4045	113 115 122 4185	113 115 122 4250	
	-1	113 115 123 3790	113 115 123 3855	113 115 123 3925	113 115 122 4045	113 115 122 4195	112 115 121 4265	
	0	113 115 122 3790	113 115 122 3855	113 115 122 3925	113 115 122 4050	112 115 121 4205	112 115 121 4280	
	1	113 115 121 3795	113 115 121 3860	113 115 121 3930	113 115 121 4060	112 115 120 4225	112 115 120 4305	
	2	113 115 120 3805	113 115 120 3865	113 115 120 3940	112 115 120 4075	113 115 119 4310	113 115 119 4440	
33000 V _{FTO} = 147	-2	113 115 123 3835	113 115 123 3900	113 115 123 3970	113 115 123 4090	113 115 122 4235	112 115 122 4305	
	-1	113 115 122 3835	113 115 122 3900	113 115 122 3970	113 115 122 4095	112 115 121 4250	112 115 121 4320	
	0	113 115 121 3840	113 115 121 3900	113 115 121 3975	113 115 121 4105	112 115 120 4265	112 115 120 4345	
	1	113 115 121 3845	113 115 121 3910	113 115 121 3985	112 115 120 4120	113 115 120 4325	113 115 120 4450	
	2	113 115 120 3865	113 115 120 3930	113 115 120 4010	113 115 120 4205	114 116 120 4495	115 116 120 4630	

TODATA_350SFO_IMP_F20_DRY_ZERO_4K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-7 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
34000 V _{FTO} = 149	-2	113 116	113 116	113 116	113 116	113 116	112 115	
		124 3875	124 3940	124 4015	123 4135	123 4290	122 4360	
	-1	113 116	113 116	113 116	113 116	112 116	112 116	
		123 3880	123 3945	123 4020	123 4145	122 4305	122 4380	
	0	113 116	113 116	113 116	112 116	113 116	114 116	
		123 3885	123 3950	122 4025	122 4155	122 4410	122 4530	
	1	113 116	113 116	113 116	114 116	115 117	115 117	
		122 3950	122 4015	122 4095	122 4290	122 4585	122 4720	
	2	115 117	115 117	115 117	116 117	117 118	117 118	
		122 4095	122 4160	122 4250	122 4455	122 4765	122 4925	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	112 117	112 117	
		125 3920	125 3985	125 4060	125 4185	124 4340	124 4415	
	-1	113 117	113 118	113 118	113 118	114 118	114 118	
		124 3925	124 3990	124 4065	124 4220	124 4475	124 4605	
	0	114 118	114 118	114 118	114 118	116 118	116 119	
		124 4025	124 4095	124 4175	124 4365	124 4660	124 4800	
	1	116 118	116 118	116 118	116 119	117 119	118 119	
		124 4170	124 4240	124 4330	124 4540	124 4855	124 5000	
	2	118 119	118 119	118 119	118 119	119 120	120 120	
		124 4325	124 4400	124 4495	124 4715	124 5075	124 5240	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	114 119	115 119	
		126 3970	126 4035	126 4115	126 4285	126 4530	126 4660	
	-1	115 119	115 119	115 119	115 119	116 120	117 120	
		126 4095	126 4165	126 4245	126 4425	126 4730	126 4860	
	0	116 120	116 120	116 120	117 120	118 121	118 121	
		126 4240	126 4310	126 4400	126 4610	126 4925	126 5070	
	1	118 120	118 120	118 121	119 121	120 121	120 121	
		126 4405	126 4480	126 4575	126 4795	126 5135	126 5295	
	2	120 121	120 121	120 121	120 122	122 122	122 122	
		126 4570	126 4645	126 4745	126 5000	126 5385	126 5570	
38000 V _{FTO} = 157	-2	117 122	117 122	117 122	117 123	119 123	119 123	
		129 4345	129 4415	129 4510	129 4715	129 5030	129 5170	
	-1	119 123	119 123	119 123	119 123	121 124	121 124	
		129 4520	129 4600	129 4695	129 4915	129 5250	129 5405	
	0	121 124	121 124	121 124	121 124	122 125	123 125	
		129 4700	129 4780	129 4880	129 5120	129 5480	129 5645	
	1	123 125	123 125	123 125	123 125	124 125	125 126	
		129 4885	129 4970	129 5075	129 5335	129 5755	129 5940	
	2	125 125	125 125	125 125	125 126	126 126	126 126	
		129 5125	129 5210	129 5325	129 5610	129 6175	129 6450	

TODATA_350SFO_IMP_F20_DRY_ZERO_4K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-7 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED ON****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
28000 V _{FTO} = 136	-2	114 115 126 3205	114 115 126 3255	114 115 126 3305	114 115 126 3355	114 115 126 3410	114 115 125 3465	114 115 125 3560	
	-1	114 115 125 3195	114 115 125 3245	114 115 125 3295	114 115 125 3345	114 115 125 3395	114 115 125 3455	114 115 124 3555	
	0	114 115 124 3185	114 115 124 3235	114 115 124 3285	114 115 124 3335	114 115 124 3385	114 115 124 3445	113 115 124 3550	
	1	114 115 124 3180	114 115 124 3230	114 115 124 3280	114 115 124 3330	114 115 123 3380	114 115 123 3440	113 115 123 3550	
	2	114 115 123 3175	114 115 123 3230	114 115 123 3275	113 115 123 3325	113 115 123 3380	113 115 123 3445	113 115 122 3550	
30000 V _{FTO} = 140	-2	114 115 125 3270	114 115 125 3325	114 115 125 3375	114 115 125 3430	114 115 125 3480	114 115 125 3540	113 115 124 3645	
	-1	114 115 124 3265	114 115 124 3320	114 115 124 3370	114 115 124 3420	114 115 124 3475	114 115 124 3535	113 115 124 3640	
	0	114 115 123 3260	114 115 123 3315	114 115 123 3365	114 115 123 3415	113 115 123 3470	113 115 123 3530	113 115 123 3640	
	1	113 115 123 3260	113 115 122 3315	113 115 122 3365	113 115 122 3415	113 115 122 3470	113 115 122 3530	113 115 122 3645	
	2	113 115 122 3260	113 115 122 3315	113 115 122 3365	113 115 122 3415	113 115 121 3470	113 115 121 3530	113 115 121 3655	
32000 V _{FTO} = 145	-2	114 115 124 3340	114 115 124 3395	114 115 124 3450	114 115 124 3500	114 115 124 3555	113 115 124 3615	113 115 123 3730	
	-1	114 115 123 3340	113 115 123 3395	113 115 123 3445	113 115 123 3500	113 115 123 3555	113 115 123 3615	113 115 123 3730	
	0	113 115 122 3340	113 115 122 3395	113 115 122 3445	113 115 122 3500	113 115 122 3555	113 115 122 3615	113 115 122 3740	
	1	113 115 121 3340	113 115 121 3395	113 115 121 3450	113 115 121 3505	113 115 121 3555	113 115 121 3620	113 115 121 3750	
	2	113 115 121 3350	113 115 121 3405	113 115 120 3455	113 115 120 3510	113 115 120 3565	113 115 120 3630	113 115 120 3790	
33000 V _{FTO} = 147	-2	114 115 124 3375	114 115 124 3430	113 115 123 3485	113 115 123 3540	113 115 123 3595	113 115 123 3655	113 115 123 3770	
	-1	113 115 123 3375	113 115 123 3430	113 115 123 3485	113 115 123 3540	113 115 122 3595	113 115 122 3655	113 115 122 3775	
	0	113 115 122 3380	113 115 122 3435	113 115 122 3485	113 115 122 3540	113 115 122 3595	113 115 122 3660	113 115 121 3785	
	1	113 115 121 3385	113 115 121 3440	113 115 121 3495	113 115 121 3550	113 115 121 3600	113 115 121 3665	112 115 120 3800	
	2	113 115 120 3420	113 115 120 3475	113 115 120 3525	113 115 120 3575	113 115 120 3630	113 115 120 3700	114 115 120 3905	

TODATA_350SFO_IMP_F20_DRY_ECS_SL_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-8 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE SEA LEVEL

ENGINE BLEED ON

V₁ (KIAS) V_R (KIAS)
V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
34000 V _{FTO} = 149	-2	113 115 124 3410	113 115 124 3470	113 115 124 3520	113 115 124 3575	113 115 124 3630	113 115 124 3695	113 115 123 3815	
	-1	113 115 123 3415	113 115 123 3470	113 115 123 3525	113 115 123 3580	113 116 123 3635	113 116 123 3695	113 115 123 3825	
	0	113 116 122 3420	113 116 122 3475	113 116 122 3530	113 116 122 3585	113 116 122 3640	113 116 122 3705	113 116 122 3845	
	1	114 116 122 3485	114 116 122 3545	114 116 122 3595	114 116 122 3650	114 116 122 3705	114 116 122 3775	114 116 122 3985	
	2	116 117 122 3615	116 117 122 3675	116 117 122 3730	115 117 122 3785	115 117 122 3845	115 117 122 3915	116 117 122 4135	
35000 V _{FTO} = 151	-2	113 117 125 3450	113 117 125 3505	113 117 125 3560	113 117 125 3615	113 117 125 3670	113 117 125 3735	113 117 125 3860	
	-1	113 117 124 3450	113 117 124 3510	113 117 124 3565	113 117 124 3620	113 117 124 3675	113 117 124 3740	113 117 124 3910	
	0	115 117 124 3550	115 117 124 3610	114 117 124 3665	114 117 124 3720	114 117 124 3775	114 117 124 3845	115 118 124 4055	
	1	116 118 124 3680	116 118 124 3745	116 118 124 3800	116 118 124 3860	116 118 124 3915	116 118 124 3990	117 118 124 4215	
	2	118 119 124 3820	118 119 124 3885	118 119 124 3940	118 119 124 4000	118 119 124 4060	118 119 124 4140	118 119 124 4375	
36000 V _{FTO} = 153	-2	114 118 126 3505	114 119 126 3560	113 119 126 3615	113 119 126 3670	113 119 126 3725	113 119 126 3790	114 119 126 3970	
	-1	115 119 126 3610	115 119 126 3675	115 119 126 3730	115 119 126 3785	115 119 126 3840	115 119 126 3910	115 119 125 4110	
	0	117 119 125 3740	117 119 125 3805	117 119 125 3860	117 119 125 3920	117 119 125 3980	117 120 125 4055	117 120 125 4280	
	1	119 120 125 3885	119 120 125 3950	119 120 125 4010	119 120 125 4070	118 120 125 4130	118 120 125 4210	119 121 125 4450	
	2	121 121 125 4040	120 121 125 4110	120 121 125 4170	120 121 125 4230	120 121 125 4295	120 121 125 4380	121 121 125 4650	
38000 V _{FTO} = 157	-2	118 122 129 3830	117 122 129 3895	117 122 129 3950	117 122 129 4010	117 122 129 4075	117 122 129 4150	118 122 129 4370	
	-1	120 123 129 3985	120 123 129 4055	119 123 129 4115	119 123 129 4175	119 123 129 4240	119 123 129 4320	120 123 129 4560	
	0	121 123 129 4145	121 123 129 4215	121 124 129 4280	121 124 129 4345	121 124 129 4410	121 124 129 4495	122 124 129 4750	
	1	123 124 129 4305	123 124 129 4380	123 124 129 4445	123 124 129 4510	123 124 129 4580	123 124 129 4670	124 125 129 4960	
	2	125 125 129 4580	125 125 129 4650	125 125 129 4705	125 125 129 4765	125 125 129 4825	125 125 129 4910	126 126 129 5285	

TODATA_350SFO_IMP_F20_DRY_ECS_SL_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-8 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED ON****V₂ (KIAS) TOFL (FT)**

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)									
WT (LB) V_{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
28000 V_{FTO} = 136	-2	114 115 126 3255	114 115 126 3305	114 115 126 3355	114 115 126 3410	114 115 125 3460	114 115 125 3535	114 115 125 3620	
	-1	114 115 125 3245	114 115 125 3295	114 115 125 3345	114 115 125 3395	114 115 125 3450	114 115 125 3525	113 115 124 3610	
	0	114 115 124 3235	114 115 124 3285	114 115 124 3335	114 115 124 3390	114 115 124 3440	114 115 124 3520	113 115 124 3610	
	1	114 115 124 3230	114 115 124 3280	114 115 124 3330	114 115 123 3380	114 115 123 3435	113 115 123 3515	113 115 123 3610	
	2	114 115 123 3225	114 115 123 3275	113 115 123 3325	113 115 123 3380	113 115 123 3430	113 115 122 3515	113 115 122 3610	
30000 V_{FTO} = 140	-2	114 115 125 3325	114 115 125 3375	114 115 125 3430	114 115 125 3480	114 115 125 3535	114 115 124 3615	113 115 124 3705	
	-1	114 115 124 3315	114 115 124 3370	114 115 124 3420	114 115 124 3475	114 115 124 3525	113 115 124 3610	113 115 123 3705	
	0	114 115 123 3310	114 115 123 3365	114 115 123 3415	113 115 123 3470	113 115 123 3525	113 115 123 3610	113 115 123 3705	
	1	113 115 123 3310	113 115 122 3365	113 115 122 3415	113 115 122 3470	113 115 122 3520	113 115 122 3610	113 115 123 3710	
	2	113 115 122 3310	113 115 122 3365	113 115 122 3415	113 115 121 3470	113 115 121 3525	113 115 121 3615	113 115 121 3720	
32000 V_{FTO} = 145	-2	114 115 124 3395	114 115 124 3450	114 115 124 3500	114 115 124 3555	114 115 124 3610	113 115 124 3695	113 115 123 3790	
	-1	113 115 123 3390	113 115 123 3445	113 115 123 3500	113 115 123 3555	113 115 123 3610	113 115 123 3695	113 115 122 3795	
	0	113 115 122 3390	113 115 122 3445	113 115 122 3500	113 115 122 3555	113 115 122 3610	113 115 122 3700	113 115 122 3805	
	1	113 115 121 3395	113 115 121 3450	113 115 121 3505	113 115 121 3560	113 115 121 3610	113 115 121 3705	113 115 121 3815	
	2	113 115 121 3400	113 115 120 3455	113 115 120 3510	113 115 120 3565	113 115 120 3620	113 115 120 3715	113 115 120 3870	
33000 V_{FTO} = 147	-2	114 115 124 3430	113 115 123 3485	113 115 123 3540	113 115 123 3595	113 115 123 3650	113 115 123 3740	113 115 123 3835	
	-1	113 115 123 3430	113 115 123 3485	113 115 123 3540	113 115 122 3595	113 115 122 3650	113 115 122 3740	113 115 122 3845	
	0	113 115 122 3430	113 115 122 3485	113 115 122 3540	113 115 122 3595	113 115 122 3650	113 115 121 3745	113 115 121 3855	
	1	113 115 121 3435	113 115 121 3495	113 115 121 3545	113 115 121 3605	113 115 121 3660	113 115 121 3755	112 115 120 3870	
	2	113 115 120 3470	113 115 120 3525	113 115 120 3575	113 115 120 3630	113 115 120 3685	113 115 120 3805	114 115 120 3995	

TODATA_350SFO_IMP_F20_DRY_ECS_500_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-9 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 500 FT

ENGINE BLEED ON

V₁ (KIAS) V_R (KIAS)
V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
34000 V _{FTO} = 149	-2	113 115 124 3465	113 115 124 3520	113 115 124 3575	113 115 124 3635	113 115 124 3690	113 115 124 3780	113 115 123 3880	
	-1	113 115 123 3465	113 115 123 3525	113 115 123 3580	113 116 123 3635	113 116 123 3690	113 116 123 3785	113 116 122 3890	
	0	113 116 122 3470	113 116 122 3530	113 116 122 3585	113 116 122 3640	113 116 122 3695	113 116 122 3790	113 116 122 3925	
	1	114 116 122 3540	114 116 122 3595	114 116 122 3650	114 116 122 3705	114 116 122 3765	114 116 122 3885	115 116 122 4080	
	2	116 117 122 3670	116 117 122 3730	115 117 122 3785	115 117 122 3845	115 117 122 3900	115 117 122 4030	116 117 122 4235	
35000 V _{FTO} = 151	-2	113 117 125 3500	113 117 125 3560	113 117 125 3615	113 117 125 3670	113 117 125 3730	113 117 125 3820	113 117 124 3925	
	-1	113 117 124 3505	113 117 124 3565	113 117 124 3620	113 117 124 3675	113 117 124 3730	113 117 124 3835	113 117 124 3995	
	0	114 117 124 3605	114 117 124 3665	114 117 124 3720	114 117 124 3780	114 117 124 3835	114 117 124 3955	115 118 124 4150	
	1	116 118 124 3740	116 118 124 3800	116 118 124 3855	116 118 124 3915	116 118 124 3975	116 118 124 4110	117 119 124 4315	
	2	118 119 124 3875	118 119 124 3940	118 119 124 4000	118 119 124 4060	118 119 124 4125	118 119 124 4265	119 119 124 4490	
36000 V _{FTO} = 153	-2	113 119 126 3555	113 119 126 3615	113 119 126 3670	113 119 126 3725	113 119 126 3780	113 119 126 3890	114 119 126 4055	
	-1	115 119 126 3670	115 119 126 3730	115 119 126 3785	115 119 126 3840	115 119 126 3900	115 119 126 4020	116 119 125 4205	
	0	117 119 125 3795	117 119 125 3860	117 119 125 3920	117 119 125 3980	117 120 125 4040	117 120 125 4170	117 120 125 4380	
	1	119 120 125 3945	119 120 125 4010	119 120 125 4070	118 120 125 4135	118 120 125 4195	119 120 125 4335	119 121 125 4560	
	2	120 121 125 4100	120 121 125 4170	120 121 125 4230	120 121 125 4295	120 121 125 4360	120 121 125 4510	121 122 125 4765	
38000 V _{FTO} = 157	-2	117 122 129 3890	117 122 129 3950	117 122 129 4010	117 122 129 4075	117 122 129 4140	117 122 129 4265	118 122 129 4475	
	-1	119 123 129 4045	119 123 129 4115	119 123 129 4175	119 123 129 4240	119 123 129 4305	119 123 129 4445	120 123 129 4665	
	0	121 123 129 4210	121 124 129 4280	121 124 129 4340	121 124 129 4410	121 124 129 4480	121 124 129 4630	122 124 129 4865	
	1	123 124 129 4370	123 124 129 4445	123 124 129 4510	123 124 129 4580	123 124 129 4655	123 124 129 4815	124 125 129 5085	
	2	125 125 129 4635	125 125 129 4705	125 125 129 4760	125 125 129 4825	125 125 129 4890	125 125 129 5060	126 126 129 5445	

TODATA_350SFO_IMP_F20_DRY_ECS_500_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-9 (Sheet 2 of 2)



DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 1000 FT

V₁ (KIAS) V_R (KIAS)

ENGINE BLEED ON

V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)									
WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115	114 115	114 115
		126 3305	126 3355	126 3405	126 3460	125 3515	125 3610	125 3675	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	114 115	113 115
		125 3290	125 3345	125 3395	125 3450	125 3500	124 3600	124 3670	
	0	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3285	124 3335	124 3385	124 3440	124 3490	124 3595	123 3670	
	1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3275	124 3330	123 3380	123 3435	123 3485	123 3595	123 3670	
	2	114 115	114 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3275	123 3325	123 3375	123 3430	123 3480	122 3595	122 3675	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		125 3375	125 3425	125 3480	125 3535	124 3590	124 3695	124 3765	
	-1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3365	124 3420	124 3475	124 3525	124 3580	124 3690	123 3765	
	0	114 115	114 115	114 115	113 115	113 115	113 115	113 115	113 115
		123 3360	123 3415	123 3470	123 3520	123 3575	123 3690	122 3770	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3360	122 3415	122 3465	122 3520	122 3575	122 3695	122 3775	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3360	122 3415	121 3470	121 3525	121 3575	121 3700	121 3790	
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3445	124 3500	124 3555	124 3610	124 3665	123 3780	123 3855	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3440	123 3495	123 3550	123 3610	123 3665	123 3780	122 3860	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3440	122 3500	122 3550	122 3610	122 3665	122 3790	121 3870	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3445	121 3500	121 3555	121 3610	121 3670	121 3795	121 3885	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		121 3455	120 3510	120 3565	120 3620	120 3675	120 3820	120 3950	
33000 V _{FTO} = 147	-2	114 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 3480	123 3540	123 3595	123 3650	123 3705	123 3825	123 3905	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3480	123 3535	122 3590	122 3650	122 3705	122 3830	122 3910	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3485	122 3540	122 3595	122 3650	122 3710	121 3835	121 3925	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3490	121 3545	121 3600	121 3660	121 3715	120 3850	120 3945	
	2	113 115	113 115	113 115	113 115	113 115	113 115	114 115	114 115
		120 3520	120 3570	120 3625	120 3680	120 3740	120 3930	120 4090	

TODATA_350SFO_IMP_F20_DRY_ECS_1K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-10 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
34000 V _{FTO} = 149	-2	113 115 124 3520	113 115 124 3575	113 115 124 3630	113 115 124 3690	113 115 124 3745	113 115 123 3865	113 115 123 3950	
	-1	113 115 123 3520	113 115 123 3575	113 116 123 3635	113 116 123 3690	113 116 123 3745	113 116 123 3875	113 116 122 3960	
	0	113 116 122 3525	113 116 122 3580	113 116 122 3640	113 116 122 3695	113 116 122 3755	113 116 122 3885	113 116 122 4015	
	1	114 116 122 3590	114 116 122 3645	114 116 122 3700	114 116 122 3760	114 116 122 3820	114 116 122 4015	115 117 122 4175	
	2	116 117 122 3720	115 117 122 3780	115 117 122 3835	115 117 122 3900	115 117 122 3960	116 117 122 4165	116 117 122 4335	
35000 V _{FTO} = 151	-2	113 117 125 3555	113 117 125 3615	113 117 125 3670	113 117 125 3730	113 117 125 3785	113 117 125 3910	113 117 124 3995	
	-1	113 117 124 3560	113 117 124 3615	113 117 124 3675	113 117 124 3730	113 117 124 3790	113 117 124 3945	113 117 124 4080	
	0	114 117 124 3660	114 117 124 3715	114 117 124 3775	114 117 124 3835	114 118 124 3895	115 118 124 4080	115 118 124 4245	
	1	116 118 124 3790	116 118 124 3850	116 118 124 3910	116 118 124 3975	116 118 124 4035	116 118 124 4245	117 119 124 4420	
	2	118 119 124 3930	118 119 124 3995	118 119 124 4055	118 119 124 4120	118 119 124 4185	118 119 124 4410	119 120 124 4605	
36000 V _{FTO} = 153	-2	113 119 126 3610	113 119 126 3665	113 119 126 3720	113 119 126 3780	113 119 126 3840	113 119 126 4005	114 119 126 4140	
	-1	115 119 126 3720	115 119 126 3780	115 119 126 3840	115 119 126 3900	115 119 126 3960	115 119 125 4140	116 119 125 4305	
	0	117 119 125 3850	117 119 125 3915	117 119 125 3975	117 119 125 4035	117 120 125 4100	117 120 125 4310	118 120 125 4485	
	1	119 120 125 4000	118 120 125 4065	118 120 125 4125	118 120 125 4190	118 120 125 4260	119 121 125 4485	119 121 125 4665	
	2	120 121 125 4155	120 121 125 4225	120 121 125 4285	120 121 125 4355	120 121 125 4425	121 121 125 4675	121 122 125 4890	
38000 V _{FTO} = 157	-2	117 122 129 3945	117 122 129 4010	117 122 129 4070	117 122 129 4135	117 122 129 4200	118 122 129 4405	118 123 129 4580	
	-1	119 123 129 4105	119 123 129 4170	119 123 129 4235	119 123 129 4305	119 123 129 4370	120 123 129 4595	120 123 129 4775	
	0	121 123 129 4270	121 124 129 4340	121 124 129 4405	121 124 129 4475	121 124 129 4545	122 124 129 4785	122 124 129 4980	
	1	123 124 129 4435	123 124 129 4505	123 124 129 4575	123 124 129 4650	123 124 129 4725	123 125 129 4985	124 125 129 5215	
	2	125 125 129 4685	125 125 129 4750	125 125 129 4810	125 125 129 4885	125 125 129 4960	125 125 129 5260	126 126 129 5610	

TODATA_350SFO_IMP_F20_DRY_ECS_1K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-10 (Sheet 2 of 2)



DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 2000 FT

V₁ (KIAS) V_R (KIAS)

ENGINE BLEED ON

V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
28000 V _{FTO} = 136	-2	114 115 126 3405	114 115 126 3460	114 115 125 3515	114 115 125 3570	114 115 125 3655	113 115 125 3775	113 115 124 3800	
	-1	114 115 125 3395	114 115 125 3445	114 115 125 3500	114 115 125 3555	114 115 125 3645	113 115 124 3770	113 115 124 3795	
	0	114 115 124 3385	114 115 124 3435	114 115 124 3490	114 115 124 3545	113 115 124 3640	113 115 123 3770	113 115 123 3795	
	1	114 115 124 3380	114 115 123 3430	114 115 123 3485	114 115 123 3540	113 115 123 3640	113 115 122 3770	113 115 122 3800	
	2	114 115 123 3375	113 115 123 3425	113 115 123 3480	113 115 123 3535	113 115 122 3640	113 115 122 3775	113 115 121 3805	
30000 V _{FTO} = 140	-2	114 115 125 3480	114 115 125 3535	114 115 125 3590	114 115 124 3645	113 115 124 3740	113 115 124 3870	113 115 124 3895	
	-1	114 115 124 3470	114 115 124 3525	114 115 124 3580	114 115 124 3640	113 115 124 3735	113 115 123 3870	113 115 123 3895	
	0	114 115 123 3465	113 115 123 3520	113 115 123 3575	113 115 123 3635	113 115 123 3735	113 115 122 3875	113 115 122 3905	
	1	113 115 122 3465	113 115 122 3520	113 115 122 3575	113 115 122 3630	113 115 122 3735	113 115 121 3885	113 115 121 3915	
	2	113 115 122 3465	113 115 122 3520	113 115 121 3575	113 115 121 3635	113 115 121 3745	112 115 121 3895	112 115 120 3930	
32000 V _{FTO} = 145	-2	114 115 124 3555	114 115 124 3610	114 115 124 3665	113 115 124 3725	113 115 123 3825	113 115 123 3965	113 115 123 3995	
	-1	113 115 123 3550	113 115 123 3605	113 115 123 3665	113 115 123 3720	113 115 123 3825	113 115 122 3970	113 115 122 4000	
	0	113 115 122 3550	113 115 122 3605	113 115 122 3665	113 115 122 3720	113 115 122 3830	113 115 121 3980	112 115 121 4015	
	1	113 115 121 3555	113 115 121 3610	113 115 121 3665	113 115 121 3725	113 115 121 3840	112 115 120 3995	112 115 120 4030	
	2	113 115 120 3560	113 115 120 3615	113 115 120 3675	113 115 120 3735	112 115 120 3850	113 115 120 4075	113 115 119 4125	
33000 V _{FTO} = 147	-2	113 115 123 3590	113 115 123 3650	113 115 123 3705	113 115 123 3765	113 115 123 3870	113 115 122 4010	113 115 122 4040	
	-1	113 115 123 3590	113 115 122 3645	113 115 122 3705	113 115 122 3765	113 115 122 3875	113 115 122 4020	113 115 121 4055	
	0	113 115 122 3590	113 115 122 3650	113 115 122 3705	113 115 121 3765	113 115 121 3880	112 115 121 4035	112 115 121 4070	
	1	113 115 121 3600	113 115 121 3655	113 115 121 3715	113 115 121 3775	113 115 121 3890	113 115 120 4075	113 115 120 4130	
	2	113 115 120 3615	113 115 120 3670	113 115 120 3730	113 115 120 3790	113 115 120 3955	114 115 120 4230	114 116 120 4290	

TODATA_350SFO_IMP_F20_DRY_ECS_2K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-11 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 2000 FT

ENGINE BLEED ON

V₁ (KIAS) V_R (KIAS)
V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 3630	124 3685	124 3745	124 3805	124 3915	123 4060	123 4090	
	-1	113 116	113 116	113 116	113 116	113 116	112 116	112 116	112 116
		123 3630	123 3690	123 3745	123 3805	123 3920	122 4075	122 4105	
	0	113 116	113 116	113 116	113 116	113 116	113 116	113 116	113 116
		123 3635	123 3695	123 3750	123 3810	122 3930	122 4150	122 4210	
	1	114 116	114 116	113 116	113 116	114 116	115 117	115 117	115 117
		122 3695	122 3750	122 3810	122 3870	122 4035	122 4320	122 4380	
	2	115 117	115 117	115 117	115 117	115 117	117 118	117 118	117 118
		122 3825	122 3885	122 3945	122 4010	122 4190	122 4485	122 4550	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	113 117
		125 3665	125 3725	125 3785	125 3845	125 3960	124 4110	124 4140	
	-1	113 117	113 117	113 117	113 117	113 117	114 117	114 117	114 117
		125 3670	125 3730	124 3790	124 3850	124 3980	124 4215	124 4275	
	0	114 117	114 118	114 118	114 118	114 118	116 118	116 118	116 118
		124 3765	124 3825	124 3885	124 3950	124 4105	124 4390	124 4450	
	1	116 118	116 118	116 118	116 118	116 118	117 119	118 119	118 119
		124 3900	124 3960	124 4025	124 4090	124 4265	124 4570	124 4635	
	2	118 119	118 119	118 119	118 119	118 119	119 120	119 120	119 120
		124 4045	124 4105	124 4175	124 4240	124 4430	124 4770	124 4845	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	114 119	114 119	114 119
		126 3715	126 3770	126 3830	126 3895	126 4040	126 4270	125 4325	
	-1	115 119	115 119	115 119	115 119	115 119	116 119	116 120	116 120
		126 3830	126 3890	126 3950	126 4015	126 4175	125 4455	125 4515	
	0	116 119	116 119	116 120	116 120	117 120	118 120	118 120	118 120
		125 3960	125 4025	125 4090	125 4155	125 4335	125 4640	125 4700	
	1	118 120	118 120	118 120	118 120	119 120	120 121	120 121	120 121
		125 4115	125 4180	125 4245	125 4315	125 4510	125 4830	125 4895	
	2	120 121	120 121	120 121	120 121	120 121	122 122	122 122	122 122
		125 4270	125 4335	125 4405	125 4480	125 4690	125 5065	125 5145	
38000 V _{FTO} = 157	-2	117 122	117 122	117 122	117 122	117 122	119 123	119 123	119 123
		129 4060	129 4125	129 4190	129 4260	129 4430	129 4735	129 4800	
	-1	119 123	119 123	119 123	119 123	119 123	121 124	121 124	121 124
		129 4220	129 4290	129 4360	129 4430	129 4620	129 4940	129 5010	
	0	121 124	121 124	121 124	121 124	121 124	122 124	123 124	123 124
		129 4390	129 4460	129 4535	129 4610	129 4810	129 5155	129 5225	
	1	123 124	123 124	123 124	123 124	123 125	124 125	125 125	125 125
		129 4560	129 4635	129 4710	129 4790	129 5010	129 5405	129 5490	
	2	125 125	125 125	125 125	125 125	125 125	126 126	126 126	126 126
		129 4785	129 4860	129 4940	129 5025	129 5265	129 5830	129 5955	

TODATA_350SFO_IMP_F20_DRY_ECS_2K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07–11A–01–11 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	113 115	113 115	
		125 3515	125 3570	125 3630	125 3715	125 3820	124 3925	
	-1	114 115	114 115	114 115	114 115	113 115	113 115	
		125 3505	125 3560	125 3615	124 3700	124 3815	123 3925	
	0	114 115	114 115	114 115	113 115	113 115	113 115	
		124 3495	124 3550	124 3605	124 3695	123 3810	123 3930	
	1	114 115	114 115	114 115	113 115	113 115	113 115	
		123 3490	123 3545	123 3600	123 3690	122 3810	122 3935	
	2	113 115	113 115	113 115	113 115	113 115	112 115	
		123 3485	123 3540	122 3595	122 3690	122 3815	121 3945	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	113 115	113 115	
		125 3590	124 3650	124 3710	124 3800	124 3915	123 4030	
	-1	114 115	114 115	114 115	113 115	113 115	113 115	
		124 3585	124 3640	124 3700	124 3790	123 3915	122 4035	
	0	113 115	113 115	113 115	113 115	113 115	113 115	
		123 3580	123 3635	123 3695	123 3790	122 3915	122 4045	
	1	113 115	113 115	113 115	113 115	113 115	112 115	
		122 3580	122 3635	122 3695	122 3790	121 3925	121 4060	
	2	113 115	113 115	113 115	113 115	112 115	112 115	
		121 3580	121 3635	121 3695	121 3795	121 3935	120 4090	
32000 V _{FTO} = 145	-2	114 115	113 115	113 115	113 115	113 115	113 115	
		124 3670	124 3730	123 3790	123 3885	123 4010	122 4135	
	-1	113 115	113 115	113 115	113 115	113 115	112 115	
		123 3665	123 3725	123 3785	123 3885	122 4015	121 4145	
	0	113 115	113 115	113 115	113 115	113 115	112 115	
		122 3665	122 3725	122 3785	122 3885	121 4025	121 4160	
	1	113 115	113 115	113 115	113 115	112 115	112 115	
		121 3670	121 3730	121 3790	121 3895	120 4035	120 4195	
	2	113 115	113 115	113 115	113 115	113 115	113 115	
		120 3680	120 3735	120 3800	120 3905	120 4095	119 4320	
33000 V _{FTO} = 147	-2	113 115	113 115	113 115	113 115	113 115	113 115	
		123 3710	123 3770	123 3830	123 3930	122 4055	122 4185	
	-1	113 115	113 115	113 115	113 115	113 115	112 115	
		122 3710	122 3770	122 3830	122 3930	122 4065	121 4200	
	0	113 115	113 115	113 115	113 115	112 115	112 115	
		122 3710	122 3770	121 3830	121 3935	121 4075	120 4220	
	1	113 115	113 115	113 115	113 115	112 115	113 115	
		121 3715	121 3775	121 3840	121 3945	120 4095	120 4335	
	2	113 115	113 115	113 115	113 115	114 115	115 116	
		120 3735	120 3790	120 3855	120 3995	120 4250	120 4505	

TODATA_350SFO_IMP_F20_DRY_ECS_3K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-12 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
34000 V _{FTO} = 149	-2	113 115	113 116	113 116	113 116	113 116	112 115	
		124 3750	124 3810	124 3870	124 3975	123 4105	122 4240	
	-1	113 116	113 116	113 116	113 116	113 116	112 116	
		123 3750	123 3810	123 3875	123 3975	122 4115	122 4255	
	0	113 116	113 116	113 116	113 116	113 116	114 116	
		123 3755	123 3815	123 3880	122 3985	122 4170	122 4415	
	1	114 116	113 116	113 116	114 116	115 117	116 117	
		122 3815	122 3875	122 3940	122 4080	122 4340	122 4595	
	2	115 117	115 117	115 117	115 117	116 118	117 118	
		122 3950	122 4015	122 4085	122 4235	122 4505	122 4795	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	112 117	
		125 3790	125 3850	125 3915	125 4015	124 4155	124 4300	
	-1	113 117	113 117	113 117	113 117	113 117	114 118	
		125 3795	124 3855	124 3920	124 4025	124 4240	124 4485	
	0	114 118	114 118	114 118	114 118	115 118	116 119	
		124 3890	124 3955	124 4020	124 4150	124 4415	124 4670	
	1	116 118	116 118	116 118	116 118	117 119	118 119	
		124 4030	124 4095	124 4160	124 4310	124 4590	124 4865	
	2	118 119	118 119	118 119	118 119	119 120	120 120	
		124 4180	124 4245	124 4315	124 4480	124 4785	124 5100	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	114 119	115 119	
		126 3835	126 3895	126 3960	126 4090	126 4305	125 4535	
	-1	115 119	115 119	115 119	115 119	116 119	117 120	
		126 3955	126 4020	126 4085	126 4220	125 4475	125 4730	
	0	116 120	116 120	116 120	117 120	118 120	119 121	
		125 4095	125 4160	125 4230	125 4380	125 4660	125 4935	
	1	118 120	118 120	118 120	118 121	119 121	120 121	
		125 4250	125 4320	125 4395	125 4555	125 4850	125 5150	
	2	120 121	120 121	120 121	120 121	121 122	122 122	
		125 4410	125 4480	125 4560	125 4735	125 5080	125 5460	
38000 V _{FTO} = 157	-2	117 122	117 122	117 122	117 122	118 123	119 123	
		129 4195	129 4265	129 4335	129 4480	129 4765	129 5035	
	-1	119 123	119 123	119 123	119 123	120 124	121 124	
		129 4365	129 4435	129 4510	129 4670	129 4965	129 5255	
	0	121 124	121 124	121 124	121 124	122 124	123 125	
		129 4540	129 4610	129 4690	129 4860	129 5180	129 5485	
	1	123 124	123 124	123 125	123 125	124 125	125 126	
		129 4715	129 4790	129 4875	129 5060	129 5425	129 5780	
	2	125 125	125 125	125 125	125 125	126 126	126 126	
		129 4945	129 5025	129 5110	129 5310	129 5800	129 6330	

TODATA_350SFO_IMP_F20_DRY_ECS_3K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-12 (Sheet 2 of 2)



DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 4000 FT

V₁ (KIAS) V_R (KIAS)

ENGINE BLEED ON

V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
28000 V _{FTO} = 136	-2	114 115 125 3635	114 115 125 3690	114 115 125 3775	114 115 124 3875	113 115 124 4005	113 115 124 4060	
	-1	114 115 125 3620	114 115 124 3680	114 115 124 3765	113 115 124 3870	113 115 123 4000	113 115 123 4065	
	0	114 115 124 3610	114 115 124 3670	113 115 124 3755	113 115 123 3865	113 115 122 4005	113 115 122 4070	
	1	114 115 123 3605	113 115 123 3665	113 115 123 3750	113 115 122 3865	113 115 122 4010	112 115 121 4075	
	2	113 115 122 3605	113 115 122 3660	113 115 122 3750	113 115 122 3870	112 115 121 4020	112 115 121 4090	
30000 V _{FTO} = 140	-2	114 115 124 3715	114 115 124 3775	114 115 124 3860	113 115 124 3970	113 115 123 4110	113 115 123 4170	
	-1	114 115 124 3705	113 115 124 3765	113 115 123 3855	113 115 123 3970	113 115 122 4115	113 115 122 4180	
	0	113 115 123 3700	113 115 123 3760	113 115 123 3850	113 115 122 3970	113 115 121 4120	112 115 121 4190	
	1	113 115 122 3700	113 115 122 3760	113 115 122 3855	113 115 121 3975	112 115 121 4135	112 115 120 4210	
	2	113 115 121 3705	113 115 121 3765	113 115 121 3860	113 115 121 3985	112 115 120 4165	113 115 120 4275	
32000 V _{FTO} = 145	-2	113 115 123 3795	113 115 123 3860	113 115 123 3950	113 115 123 4065	113 115 122 4215	113 115 122 4280	
	-1	113 115 123 3790	113 115 123 3855	113 115 123 3950	113 115 122 4070	112 115 121 4225	112 115 121 4295	
	0	113 115 122 3795	113 115 122 3855	113 115 122 3950	113 115 121 4080	112 115 121 4240	112 115 120 4315	
	1	113 115 121 3795	113 115 121 3860	113 115 121 3960	112 115 120 4090	112 115 120 4270	112 115 119 4380	
	2	113 115 120 3805	113 115 120 3870	113 115 120 3970	113 115 120 4135	114 115 119 4405	114 115 119 4535	
33000 V _{FTO} = 147	-2	113 115 123 3835	113 115 123 3900	113 115 123 3995	113 115 122 4115	113 115 122 4270	112 115 121 4340	
	-1	113 115 122 3835	113 115 122 3900	113 115 122 3995	113 115 121 4120	112 115 121 4280	112 115 121 4355	
	0	113 115 121 3840	113 115 121 3905	113 115 121 4000	113 115 121 4135	112 115 120 4300	112 115 120 4380	
	1	113 115 121 3845	113 115 121 3910	113 115 120 4010	112 115 120 4150	113 115 120 4420	114 115 120 4550	
	2	113 115 120 3870	113 115 120 3935	113 115 120 4060	114 115 120 4295	115 116 120 4595	115 116 120 4740	

TODATA_350SFO_IMP_F20_DRY_ECS_4K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-13 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
34000 V _{FTO} = 149	-2	113 116	113 116	113 116	113 116	112 115	112 115	
		124 3880	124 3945	124 4040	123 4165	122 4320	122 4395	
	-1	113 116	113 116	113 116	113 116	112 116	113 116	
		123 3880	123 3945	123 4045	122 4175	122 4340	122 4450	
	0	113 116	113 116	113 116	113 116	114 117	114 117	
		122 3885	122 3950	122 4050	122 4215	122 4505	122 4635	
	1	114 116	113 116	114 116	115 117	116 117	116 118	
		122 3955	122 4020	122 4140	122 4380	122 4690	122 4825	
	2	115 117	115 117	115 117	116 118	117 118	118 118	
		122 4100	122 4170	122 4300	122 4550	122 4895	122 5055	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	112 117	113 117	
		125 3920	125 3985	125 4085	124 4210	124 4385	124 4510	
	-1	113 117	113 118	113 118	113 117	114 118	115 118	
		124 3925	124 3990	124 4090	124 4285	124 4575	124 4705	
	0	114 118	114 118	114 118	115 118	116 119	117 119	
		124 4030	124 4100	124 4220	124 4460	124 4765	124 4905	
	1	116 118	116 118	116 118	117 119	118 119	118 120	
		124 4180	124 4250	124 4380	124 4635	124 4960	124 5115	
	2	118 119	118 119	118 119	119 120	120 120	120 120	
		124 4335	124 4405	124 4550	124 4825	124 5205	124 5390	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	114 119	115 119	115 120	
		126 3975	126 4040	126 4155	126 4350	126 4630	126 4765	
	-1	115 119	115 119	115 119	116 120	117 120	117 120	
		126 4100	126 4170	126 4290	126 4520	126 4830	126 4970	
	0	116 120	116 120	117 120	117 120	119 121	119 121	
		126 4245	126 4320	126 4450	126 4705	126 5035	126 5185	
	1	118 120	118 121	118 121	119 121	120 122	121 122	
		126 4410	126 4485	126 4625	126 4895	126 5260	126 5435	
	2	120 121	120 121	120 121	121 122	122 122	123 123	
		126 4580	126 4655	126 4810	126 5125	126 5575	126 5830	
38000 V _{FTO} = 157	-2	117 122	117 122	117 122	118 123	119 123	120 124	
		129 4350	129 4425	129 4555	129 4810	129 5140	129 5280	
	-1	119 123	119 123	119 123	120 124	121 124	122 124	
		129 4530	129 4605	129 4745	129 5015	129 5365	129 5520	
	0	121 124	121 124	121 124	122 124	123 125	124 125	
		129 4710	129 4790	129 4940	129 5225	129 5600	129 5790	
	1	123 125	123 125	123 125	124 125	125 126	126 126	
		129 4890	129 4975	129 5135	129 5470	129 5900	129 6105	
	2	125 125	125 125	125 125	126 126	126 126	127 127	
		129 5135	129 5220	129 5395	129 5820	129 6455	129 6735	

TODATA_350SFO_IMP_F20_DRY_ECS_4K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-13 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	115 115 126 3000	115 115 126 3050	114 115 126 3105	114 115 126 3155	114 115 126 3205	114 115 126 3255
	-1	114 115 126 2990	114 115 126 3040	114 115 125 3090	114 115 125 3145	114 115 125 3195	114 115 125 3245
	0	114 115 125 2980	114 115 125 3035	114 115 125 3085	114 115 125 3135	114 115 124 3185	114 115 124 3240
	1	114 115 124 2975	114 115 124 3030	114 115 124 3080	114 115 124 3130	114 115 124 3180	114 115 124 3235
	2	114 115 123 2975	114 115 123 3025	114 115 123 3075	114 115 123 3125	114 115 123 3180	114 115 123 3230
30000 V _{FTO} = 140	-2	114 115 125 3065	114 115 125 3115	114 115 125 3170	114 115 125 3220	114 115 125 3275	114 115 125 3325
	-1	114 115 125 3055	114 115 125 3110	114 115 124 3160	114 115 124 3215	114 115 124 3265	114 115 124 3320
	0	114 115 124 3050	114 115 124 3105	114 115 124 3155	114 115 123 3210	114 115 123 3265	114 115 123 3315
	1	114 115 123 3050	114 115 123 3105	114 115 123 3155	113 115 123 3210	113 115 123 3260	113 115 122 3315
	2	113 115 122 3050	113 115 122 3105	113 115 122 3155	113 115 122 3210	113 115 122 3265	113 115 122 3315
32000 V _{FTO} = 145	-2	114 115 124 3125	114 115 124 3180	114 115 124 3235	114 115 124 3290	114 115 124 3345	114 115 124 3400
	-1	114 115 124 3125	114 115 124 3180	114 115 123 3230	114 115 123 3285	114 115 123 3340	113 115 123 3395
	0	113 115 123 3125	113 115 123 3180	113 115 122 3230	113 115 122 3285	113 115 122 3340	113 115 122 3395
	1	113 115 122 3125	113 115 122 3180	113 115 122 3235	113 115 122 3290	113 115 121 3345	113 115 121 3400
	2	113 115 121 3135	113 115 121 3190	113 115 121 3245	113 115 121 3295	113 115 121 3350	113 115 120 3405
33000 V _{FTO} = 147	-2	114 115 124 3160	114 115 124 3215	114 115 124 3270	114 115 124 3325	114 115 124 3380	114 115 123 3435
	-1	114 115 123 3155	113 115 123 3215	113 115 123 3270	113 115 123 3325	113 115 123 3380	113 115 123 3435
	0	113 115 122 3160	113 115 122 3215	113 115 122 3270	113 115 122 3325	113 115 122 3380	113 115 122 3435
	1	113 115 121 3165	113 115 121 3220	113 115 121 3275	113 115 121 3330	113 115 121 3385	113 115 121 3445
	2	114 115 120 3210	114 115 120 3265	113 115 120 3320	113 115 120 3370	113 115 120 3425	113 115 120 3480

TODATA_350SFO_IMP_F20_DRY_ALL_SL_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-14 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3190	114 115 124 3245	114 115 124 3300	113 115 124 3360	113 115 124 3415	113 115 124 3470
	-1	113 115 123 3190	113 115 123 3250	113 115 123 3305	113 115 123 3360	113 115 123 3415	113 115 123 3470
	0	113 115 123 3195	113 115 122 3255	113 115 122 3310	113 115 122 3365	113 116 122 3420	113 116 122 3475
	1	114 116 122 3255	114 116 122 3315	114 116 122 3375	114 116 122 3435	114 116 122 3490	114 116 122 3550
	2	116 116 122 3375	116 116 122 3440	116 117 122 3500	116 117 122 3560	116 117 122 3620	116 117 122 3685
35000 V _{FTO} = 151	-2	113 117 125 3225	113 117 125 3280	113 117 125 3335	113 117 125 3395	113 117 125 3450	113 117 125 3505
	-1	113 117 124 3225	113 117 124 3285	113 117 124 3340	113 117 124 3395	113 117 124 3455	113 117 124 3510
	0	115 117 124 3320	115 117 124 3380	115 117 124 3440	115 117 124 3500	115 117 124 3555	115 117 124 3615
	1	116 118 124 3440	116 118 124 3505	116 118 124 3565	116 118 124 3625	116 118 124 3690	116 118 124 3750
	2	118 119 124 3565	118 119 124 3635	118 119 124 3695	118 119 124 3760	118 119 124 3825	118 119 124 3890
36000 V _{FTO} = 153	-2	114 118 126 3275	114 118 126 3335	114 118 126 3390	114 118 126 3450	114 118 126 3510	114 119 126 3565
	-1	115 118 126 3375	115 119 126 3440	115 119 126 3500	115 119 126 3560	115 119 126 3620	115 119 126 3680
	0	117 119 125 3495	117 119 125 3560	117 119 125 3620	117 119 125 3685	117 119 125 3750	117 119 125 3810
	1	119 120 125 3625	119 120 125 3695	119 120 125 3760	119 120 125 3825	119 120 125 3890	119 120 125 3960
	2	121 121 125 3770	121 121 125 3845	121 121 125 3915	121 121 125 3980	121 121 125 4050	121 121 125 4120
38000 V _{FTO} = 157	-2	118 122 129 3580	118 122 129 3645	118 122 129 3710	118 122 129 3770	118 122 129 3835	118 122 129 3900
	-1	120 122 129 3720	120 122 129 3790	120 122 129 3855	120 123 129 3925	120 123 129 3990	120 123 129 4060
	0	122 123 129 3865	122 123 129 3940	122 123 129 4010	122 123 129 4080	122 123 129 4150	121 124 129 4225
	1	123 124 129 4015	123 124 129 4095	123 124 129 4170	123 124 129 4240	123 124 129 4315	123 124 129 4390
	2	125 125 129 4315	125 125 129 4390	125 125 129 4460	125 125 129 4530	125 125 129 4605	125 125 129 4675

TODATA_350SFO_IMP_F20_DRY_ALL_SL_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-14 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	115 115 126 3045	114 115 126 3100	114 115 126 3150	114 115 126 3200	114 115 126 3255	114 115 126 3305
	-1	114 115 126 3035	114 115 125 3090	114 115 125 3140	114 115 125 3190	114 115 125 3245	114 115 125 3295
	0	114 115 125 3025	114 115 125 3080	114 115 125 3130	114 115 124 3185	114 115 124 3235	114 115 124 3285
	1	114 115 124 3020	114 115 124 3075	114 115 124 3125	114 115 124 3180	114 115 124 3230	114 115 124 3280
	2	114 115 123 3020	114 115 123 3070	114 115 123 3125	114 115 123 3175	114 115 123 3225	114 115 123 3280
30000 V _{FTO} = 140	-2	114 115 125 3110	114 115 125 3165	114 115 125 3215	114 115 125 3270	114 115 125 3325	114 115 125 3380
	-1	114 115 125 3105	114 115 124 3155	114 115 124 3210	114 115 124 3265	114 115 124 3315	114 115 124 3370
	0	114 115 124 3100	114 115 124 3150	114 115 124 3205	114 115 123 3260	114 115 123 3315	114 115 123 3365
	1	114 115 123 3095	114 115 123 3150	113 115 123 3205	113 115 123 3260	113 115 122 3310	113 115 122 3365
	2	113 115 122 3100	113 115 122 3150	113 115 122 3205	113 115 122 3260	113 115 122 3315	113 115 122 3365
32000 V _{FTO} = 145	-2	114 115 124 3175	114 115 124 3230	114 115 124 3285	114 115 124 3340	114 115 124 3395	114 115 124 3450
	-1	114 115 124 3170	114 115 123 3225	114 115 123 3280	114 115 123 3335	113 115 123 3390	113 115 123 3445
	0	113 115 123 3170	113 115 123 3225	113 115 122 3280	113 115 122 3335	113 115 122 3395	113 115 122 3450
	1	113 115 122 3175	113 115 122 3230	113 115 122 3285	113 115 121 3340	113 115 121 3395	113 115 121 3450
	2	113 115 121 3180	113 115 121 3235	113 115 121 3290	113 115 121 3350	113 115 121 3405	113 115 120 3460
33000 V _{FTO} = 147	-2	114 115 124 3205	114 115 124 3265	114 115 124 3320	114 115 124 3375	114 115 124 3430	113 115 123 3485
	-1	114 115 123 3205	113 115 123 3265	113 115 123 3320	113 115 123 3375	113 115 123 3430	113 115 123 3485
	0	113 115 122 3210	113 115 122 3265	113 115 122 3320	113 115 122 3375	113 115 122 3435	113 115 122 3490
	1	113 115 121 3215	113 115 121 3270	113 115 121 3325	113 115 121 3385	113 115 121 3440	113 115 121 3495
	2	114 115 120 3255	113 115 120 3310	113 115 120 3365	113 115 120 3420	113 115 120 3475	113 115 120 3530

TODATA_350SFO_IMP_F20_DRY_ALL_500_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-15 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON, ENGINE & WING A/I ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3240	114 115 124 3295	113 115 124 3355	113 115 124 3410	113 115 124 3465	113 115 124 3525
	-1	113 115 123 3240	113 115 123 3300	113 115 123 3355	113 115 123 3410	113 115 123 3470	113 115 123 3525
	0	113 115 123 3245	113 115 122 3305	113 115 122 3360	113 116 122 3415	113 116 122 3475	113 116 122 3530
	1	114 116 122 3305	114 116 122 3365	114 116 122 3425	114 116 122 3485	114 116 122 3545	114 116 122 3605
	2	116 116 122 3430	116 117 122 3490	116 117 122 3555	116 117 122 3615	116 117 122 3675	116 117 122 3735
35000 V _{FTO} = 151	-2	113 117 125 3275	113 117 125 3330	113 117 125 3390	113 117 125 3445	113 117 125 3505	113 117 125 3560
	-1	113 117 124 3275	113 117 124 3335	113 117 124 3390	113 117 124 3450	113 117 124 3510	113 117 124 3565
	0	115 117 124 3370	115 117 124 3435	115 117 124 3490	115 117 124 3550	115 117 124 3610	114 117 124 3670
	1	116 118 124 3495	116 118 124 3555	116 118 124 3620	116 118 124 3685	116 118 124 3745	116 118 124 3805
	2	118 119 124 3620	118 119 124 3690	118 119 124 3755	118 119 124 3820	118 119 124 3885	118 119 124 3950
36000 V _{FTO} = 153	-2	114 118 126 3325	114 118 126 3385	114 118 126 3445	114 118 126 3505	114 119 126 3560	113 119 126 3620
	-1	115 119 126 3430	115 119 126 3490	115 119 126 3550	115 119 126 3610	115 119 126 3675	115 119 126 3735
	0	117 119 125 3545	117 119 125 3615	117 119 125 3675	117 119 125 3740	117 119 125 3805	117 119 125 3870
	1	119 120 125 3685	119 120 125 3750	119 120 125 3820	119 120 125 3885	119 120 125 3950	119 120 125 4015
	2	121 121 125 3830	121 121 125 3900	121 121 125 3970	121 121 125 4040	121 121 125 4110	120 121 125 4180
38000 V _{FTO} = 157	-2	118 122 129 3635	118 122 129 3700	118 122 129 3765	118 122 129 3830	117 122 129 3895	117 122 129 3960
	-1	120 122 129 3780	120 122 129 3850	120 123 129 3915	120 123 129 3985	120 123 129 4055	120 123 129 4120
	0	122 123 129 3930	122 123 129 4000	121 123 129 4070	121 123 129 4145	121 123 129 4215	121 124 129 4285
	1	123 124 129 4080	123 124 129 4155	123 124 129 4230	123 124 129 4305	123 124 129 4380	123 124 129 4455
	2	125 125 129 4370	125 125 129 4445	125 125 129 4515	125 125 129 4585	125 125 129 4655	125 125 129 4720

TODATA_350SFO_IMP_F20_DRY_ALL_500_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-15 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3090	114 115 126 3145	114 115 126 3200	114 115 126 3250	114 115 126 3305	114 115 126 3355
	-1	114 115 126 3080	114 115 125 3135	114 115 125 3185	114 115 125 3240	114 115 125 3295	114 115 125 3345
	0	114 115 125 3075	114 115 125 3125	114 115 125 3180	114 115 124 3230	114 115 124 3285	114 115 124 3335
	1	114 115 124 3065	114 115 124 3120	114 115 124 3175	114 115 124 3225	114 115 124 3280	114 115 124 3330
	2	114 115 123 3065	114 115 123 3115	114 115 123 3170	114 115 123 3225	114 115 123 3275	113 115 123 3325
30000 V _{FTO} = 140	-2	114 115 125 3155	114 115 125 3210	114 115 125 3265	114 115 125 3320	114 115 125 3375	114 115 125 3430
	-1	114 115 124 3150	114 115 124 3205	114 115 124 3260	114 115 124 3315	114 115 124 3365	114 115 124 3420
	0	114 115 124 3145	114 115 124 3200	114 115 123 3255	114 115 123 3310	114 115 123 3365	114 115 123 3415
	1	114 115 123 3145	114 115 123 3200	113 115 123 3255	113 115 123 3305	113 115 122 3360	113 115 122 3415
	2	113 115 122 3145	113 115 122 3200	113 115 122 3255	113 115 122 3310	113 115 122 3365	113 115 122 3420
32000 V _{FTO} = 145	-2	114 115 124 3225	114 115 124 3280	114 115 124 3335	114 115 124 3390	114 115 124 3445	114 115 124 3500
	-1	114 115 123 3220	114 115 123 3275	114 115 123 3330	113 115 123 3390	113 115 123 3445	113 115 123 3500
	0	113 115 123 3220	113 115 122 3275	113 115 122 3330	113 115 122 3390	113 115 122 3445	113 115 122 3500
	1	113 115 122 3225	113 115 122 3280	113 115 122 3335	113 115 121 3390	113 115 121 3450	113 115 121 3505
	2	113 115 121 3230	113 115 121 3285	113 115 121 3340	113 115 121 3400	113 115 120 3455	113 115 120 3510
33000 V _{FTO} = 147	-2	114 115 124 3255	114 115 124 3315	114 115 124 3370	114 115 124 3425	114 115 123 3485	113 115 123 3540
	-1	113 115 123 3255	113 115 123 3310	113 115 123 3370	113 115 123 3425	113 115 123 3485	113 115 123 3540
	0	113 115 122 3260	113 115 122 3315	113 115 122 3370	113 115 122 3430	113 115 122 3485	113 115 122 3540
	1	113 115 121 3265	113 115 121 3320	113 115 121 3375	113 115 121 3435	113 115 121 3490	113 115 121 3550
	2	113 115 120 3300	113 115 120 3360	113 115 120 3415	113 115 120 3470	113 115 120 3525	113 115 120 3580

TODATA_350SFO_IMP_F20_DRY_ALL_1K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-16 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 1000 FT

ENGINE BLEED ON, ENGINE & WING A/I ON

V₁ (KIAS) V_R (KIAS)

V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3290	114 115 124 3350	113 115 124 3405	113 115 124 3465	113 115 124 3520	113 115 124 3575
	-1	113 115 123 3290	113 115 123 3350	113 115 123 3405	113 115 123 3465	113 115 123 3520	113 115 123 3580
	0	113 115 123 3295	113 115 123 3355	113 116 122 3410	113 116 122 3470	113 116 122 3525	113 116 122 3585
	1	114 116 122 3355	114 116 122 3415	114 116 122 3475	114 116 122 3535	114 116 122 3595	114 116 122 3650
	2	116 116 122 3480	116 117 122 3540	116 117 122 3605	116 117 122 3665	116 117 122 3730	116 117 122 3790
35000 V _{FTO} = 151	-2	113 117 125 3325	113 117 125 3385	113 117 125 3440	113 117 125 3500	113 117 125 3555	113 117 125 3615
	-1	113 117 125 3330	113 117 124 3385	113 117 124 3445	113 117 124 3505	113 117 124 3560	113 117 124 3620
	0	115 117 124 3425	115 117 124 3485	115 117 124 3545	115 117 124 3605	114 117 124 3665	114 117 124 3725
	1	116 118 124 3545	116 118 124 3610	116 118 124 3670	116 118 124 3735	116 118 124 3800	116 118 124 3860
	2	118 119 124 3675	118 119 124 3740	118 119 124 3810	118 119 124 3875	118 119 124 3940	118 119 124 4005
36000 V _{FTO} = 153	-2	114 118 126 3375	114 118 126 3435	114 118 126 3495	113 119 126 3555	113 119 126 3615	113 119 126 3670
	-1	115 119 126 3480	115 119 126 3545	115 119 126 3605	115 119 126 3665	115 119 126 3725	115 119 126 3785
	0	117 119 125 3600	117 119 125 3665	117 119 125 3730	117 119 125 3795	117 119 125 3860	117 119 125 3920
	1	119 120 125 3740	119 120 125 3805	119 120 125 3875	119 120 125 3940	119 120 125 4005	119 120 125 4070
	2	121 121 125 3885	120 121 125 3955	120 121 125 4025	120 121 125 4095	120 121 125 4165	120 121 125 4235
38000 V _{FTO} = 157	-2	118 122 129 3690	118 122 129 3755	118 122 129 3820	117 122 129 3885	117 122 129 3950	117 122 129 4015
	-1	120 122 129 3835	120 122 129 3905	120 123 129 3975	119 123 129 4040	119 123 129 4110	119 123 129 4180
	0	121 123 129 3985	121 123 129 4060	121 123 129 4130	121 123 129 4205	121 124 129 4275	121 124 129 4345
	1	123 124 129 4140	123 124 129 4215	123 124 129 4290	123 124 129 4365	123 124 129 4440	123 124 129 4515
	2	125 125 129 4420	125 125 129 4490	125 125 129 4565	125 125 129 4630	125 125 129 4700	125 125 129 4770

TODATA_350SFO_IMP_F20_DRY_ALL_1K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-16 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3190	114 115 126 3240	114 115 126 3295	114 115 126 3350	114 115 126 3405	114 115 125 3470
	-1	114 115 125 3175	114 115 125 3230	114 115 125 3285	114 115 125 3340	114 115 125 3395	114 115 125 3460
	0	114 115 125 3170	114 115 125 3225	114 115 124 3275	114 115 124 3330	114 115 124 3385	114 115 124 3450
	1	114 115 124 3160	114 115 124 3215	114 115 124 3270	114 115 124 3325	114 115 124 3380	114 115 123 3445
	2	114 115 123 3160	114 115 123 3215	114 115 123 3270	114 115 123 3320	113 115 123 3375	113 115 122 3440
30000 V _{FTO} = 140	-2	114 115 125 3255	114 115 125 3310	114 115 125 3365	114 115 125 3425	114 115 125 3480	114 115 124 3545
	-1	114 115 124 3250	114 115 124 3305	114 115 124 3360	114 115 124 3415	114 115 124 3470	114 115 124 3540
	0	114 115 124 3245	114 115 123 3300	114 115 123 3355	114 115 123 3410	114 115 123 3465	113 115 123 3535
	1	114 115 123 3240	113 115 123 3300	113 115 123 3355	113 115 122 3410	113 115 122 3465	113 115 122 3535
	2	113 115 122 3245	113 115 122 3300	113 115 122 3355	113 115 122 3410	113 115 122 3470	113 115 121 3535
32000 V _{FTO} = 145	-2	114 115 124 3325	114 115 124 3380	114 115 124 3440	114 115 124 3495	114 115 124 3555	114 115 124 3625
	-1	114 115 123 3320	114 115 123 3380	113 115 123 3435	113 115 123 3495	113 115 123 3550	113 115 123 3620
	0	113 115 123 3320	113 115 122 3380	113 115 122 3435	113 115 122 3495	113 115 122 3550	113 115 122 3620
	1	113 115 122 3325	113 115 122 3380	113 115 121 3440	113 115 121 3495	113 115 121 3555	113 115 121 3625
	2	113 115 121 3330	113 115 121 3390	113 115 121 3445	113 115 121 3505	113 115 120 3560	113 115 120 3635
33000 V _{FTO} = 147	-2	114 115 124 3360	114 115 124 3415	114 115 124 3475	113 115 123 3535	113 115 123 3595	113 115 123 3660
	-1	113 115 123 3360	113 115 123 3415	113 115 123 3475	113 115 123 3535	113 115 123 3590	113 115 122 3660
	0	113 115 122 3360	113 115 122 3420	113 115 122 3475	113 115 122 3535	113 115 122 3595	113 115 121 3665
	1	113 115 121 3365	113 115 121 3425	113 115 121 3485	113 115 121 3540	113 115 121 3600	113 115 121 3675
	2	113 115 120 3395	113 115 120 3450	113 115 120 3510	113 115 120 3565	113 115 120 3620	113 115 120 3715

TODATA_350SFO_IMP_F20_DRY_ALL_2K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-17 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 3395	113 115 124 3455	113 115 124 3510	113 115 124 3570	113 115 124 3630	113 115 124 3700
	-1	113 115 123 3395	113 115 123 3455	113 115 123 3515	113 115 123 3575	113 116 123 3630	113 116 123 3705
	0	113 116 123 3400	113 116 123 3460	113 116 123 3520	113 116 123 3580	113 116 123 3635	113 116 122 3710
	1	114 116 122 3460	114 116 122 3520	114 116 122 3580	114 116 122 3640	114 116 122 3700	114 116 122 3795
	2	116 117 122 3580	115 117 122 3645	115 117 122 3710	115 117 122 3770	115 117 122 3835	116 117 122 3935
35000 V _{FTO} = 151	-2	113 117 125 3430	113 117 125 3490	113 117 125 3550	113 117 125 3610	113 117 125 3670	113 117 125 3740
	-1	113 117 125 3435	113 117 125 3495	113 117 125 3555	113 117 124 3615	113 117 124 3675	113 117 124 3750
	0	114 117 124 3525	114 117 124 3585	114 117 124 3650	114 117 124 3710	114 117 124 3770	114 117 124 3860
	1	116 118 124 3650	116 118 124 3715	116 118 124 3780	116 118 124 3840	116 118 124 3905	116 118 124 4010
	2	118 119 124 3785	118 119 124 3850	118 119 124 3920	118 119 124 3985	118 119 124 4050	118 119 124 4160
36000 V _{FTO} = 153	-2	113 118 127 3475	113 119 127 3540	113 119 126 3600	113 119 126 3660	113 119 126 3720	113 119 126 3810
	-1	115 119 126 3585	115 119 126 3650	115 119 126 3710	115 119 126 3775	115 119 126 3835	115 119 126 3930
	0	117 119 125 3705	117 119 125 3770	117 119 125 3840	117 119 125 3905	117 119 125 3970	117 120 125 4075
	1	119 120 125 3850	119 120 125 3915	118 120 125 3985	118 120 125 4055	118 120 125 4120	119 120 125 4230
	2	120 121 125 3995	120 121 125 4070	120 121 125 4140	120 121 125 4210	120 121 125 4280	120 121 125 4405
38000 V _{FTO} = 157	-2	117 122 129 3800	117 122 129 3870	117 122 129 3935	117 122 129 4000	117 122 129 4070	117 122 129 4170
	-1	119 122 129 3950	119 123 129 4020	119 123 129 4090	119 123 129 4160	119 123 129 4230	119 123 129 4345
	0	121 123 129 4105	121 123 129 4180	121 123 129 4250	121 124 129 4325	121 124 129 4400	121 124 129 4515
	1	123 124 129 4265	123 124 129 4340	123 124 129 4415	123 124 129 4495	123 124 129 4570	123 125 129 4695
	2	125 125 129 4515	125 125 129 4590	125 125 129 4660	125 125 129 4730	125 125 129 4800	125 125 129 4955

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-17 (Sheet 2 of 2)



DRY RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 3000 FT

ENGINE BLEED ON, ENGINE & WING A/I ON

V₁ (KIAS)V_R (KIAS)V₂ (KIAS)

TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115
		126 3290	126 3345	126 3405	126 3460	125 3520	125 3620
	-1	114 115	114 115	114 115	114 115	114 115	114 115
		125 3280	125 3335	125 3390	125 3450	125 3510	124 3615
	0	114 115	114 115	114 115	114 115	114 115	113 115
		124 3270	124 3325	124 3385	124 3440	124 3500	123 3610
	1	114 115	114 115	114 115	114 115	114 115	113 115
		124 3265	124 3320	124 3375	123 3435	123 3495	122 3605
	2	114 115	114 115	113 115	113 115	113 115	113 115
		123 3260	123 3320	123 3375	123 3430	122 3495	122 3610
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	113 115
		125 3360	125 3420	125 3475	125 3535	124 3600	124 3705
	-1	114 115	114 115	114 115	114 115	114 115	113 115
		124 3355	124 3410	124 3470	124 3530	124 3590	123 3705
	0	114 115	114 115	114 115	113 115	113 115	113 115
		123 3350	123 3410	123 3465	123 3525	123 3590	122 3705
	1	113 115	113 115	113 115	113 115	113 115	113 115
		123 3350	122 3405	122 3465	122 3520	122 3585	121 3710
	2	113 115	113 115	113 115	113 115	113 115	113 115
		122 3350	122 3410	122 3465	121 3525	121 3590	121 3715
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	113 115	113 115
		124 3435	124 3495	124 3555	124 3610	124 3680	123 3795
	-1	113 115	113 115	113 115	113 115	113 115	113 115
		123 3430	123 3490	123 3550	123 3610	123 3675	122 3795
	0	113 115	113 115	113 115	113 115	113 115	113 115
		122 3430	122 3490	122 3550	122 3610	122 3675	121 3800
	1	113 115	113 115	113 115	113 115	113 115	113 115
		121 3435	121 3495	121 3555	121 3615	121 3680	120 3810
	2	113 115	113 115	113 115	113 115	113 115	113 115
		121 3440	121 3500	120 3560	120 3620	120 3690	120 3860
33000 V _{FTO} = 147	-2	114 115	113 115	113 115	113 115	113 115	113 115
		124 3470	123 3530	123 3590	123 3650	123 3720	122 3835
	-1	113 115	113 115	113 115	113 115	113 115	113 115
		123 3470	123 3530	123 3590	122 3650	122 3720	122 3840
	0	113 115	113 115	113 115	113 115	113 115	113 115
		122 3470	122 3530	122 3590	122 3655	121 3720	121 3850
	1	113 115	113 115	113 115	113 115	113 115	113 115
		121 3475	121 3540	121 3600	121 3660	121 3730	120 3865
	2	113 115	113 115	113 115	113 115	113 115	114 115
		120 3505	120 3560	120 3620	120 3680	120 3760	120 4005

TODATA_350SFO_IMP_F20_DRY_ALL_3K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-18 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 3505	113 115 124 3570	113 115 124 3630	113 115 124 3690	113 115 124 3760	113 115 123 3880
	-1	113 115 123 3510	113 115 123 3570	113 116 123 3630	113 116 123 3690	113 116 123 3760	113 116 122 3890
	0	113 116 123 3515	113 116 123 3575	113 116 123 3635	113 116 123 3695	113 116 122 3765	113 116 122 3935
	1	114 116 122 3575	114 116 122 3635	114 116 122 3700	114 116 122 3760	114 116 122 3840	115 117 122 4085
	2	115 117 122 3705	115 117 122 3770	115 117 122 3835	115 117 122 3900	115 117 122 3980	117 118 122 4240
35000 V _{FTO} = 151	-2	113 117 125 3545	113 117 125 3605	113 117 125 3665	113 117 125 3730	113 117 125 3800	113 117 124 3925
	-1	113 117 125 3545	113 117 125 3610	113 117 124 3670	113 117 124 3735	113 117 124 3805	114 117 124 4000
	0	114 117 124 3645	114 117 124 3710	114 117 124 3770	114 118 124 3835	114 118 124 3915	116 118 124 4160
	1	116 118 124 3775	116 118 124 3840	116 118 124 3905	116 118 124 3970	116 118 124 4060	117 119 124 4320
	2	118 119 124 3915	118 119 124 3985	118 119 124 4050	118 119 124 4120	118 119 124 4210	119 120 124 4510
36000 V _{FTO} = 153	-2	113 119 127 3595	113 119 126 3655	113 119 126 3720	113 119 126 3780	113 119 126 3860	114 119 126 4060
	-1	115 119 126 3705	115 119 126 3770	115 119 126 3835	115 119 126 3900	115 119 126 3980	116 119 125 4220
	0	117 119 125 3835	117 119 125 3900	117 119 125 3970	117 119 125 4035	117 120 125 4125	118 120 125 4390
	1	118 120 125 3980	118 120 125 4050	118 120 125 4120	118 120 125 4190	118 120 125 4280	120 121 125 4560
	2	120 121 125 4130	120 121 125 4205	120 121 125 4280	120 121 125 4350	120 121 125 4450	122 122 125 4785
38000 V _{FTO} = 157	-2	117 122 129 3930	117 122 129 4000	117 122 129 4065	117 122 129 4135	117 122 129 4225	119 123 129 4490
	-1	119 123 129 4085	119 123 129 4155	119 123 129 4230	119 123 129 4300	119 123 129 4395	121 124 129 4675
	0	121 123 129 4245	121 124 129 4325	121 124 129 4400	121 124 129 4475	121 124 129 4570	122 124 129 4865
	1	123 124 129 4410	123 124 129 4490	123 124 129 4570	123 124 129 4645	123 125 129 4750	124 125 129 5100
	2	125 125 129 4650	125 125 129 4725	125 125 129 4795	125 125 129 4880	125 125 129 4990	126 126 129 5535

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-18 (Sheet 2 of 2)

**DRY RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3400	114 115 126 3460	114 115 125 3515	114 115 125 3580	114 115 125 3680	113 115 124 3795
	-1	114 115 125 3390	114 115 125 3445	114 115 125 3505	114 115 125 3565	114 115 124 3670	113 115 123 3790
	0	114 115 124 3380	114 115 124 3440	114 115 124 3495	114 115 124 3560	113 115 123 3665	113 115 122 3790
	1	114 115 123 3375	114 115 123 3435	114 115 123 3490	114 115 123 3550	113 115 122 3665	113 115 122 3795
	2	113 115 123 3370	113 115 123 3430	113 115 122 3490	113 115 122 3550	113 115 122 3665	113 115 121 3800
30000 V _{FTO} = 140	-2	114 115 125 3475	114 115 125 3535	114 115 124 3595	114 115 124 3655	113 115 124 3765	113 115 123 3890
	-1	114 115 124 3465	114 115 124 3525	114 115 124 3590	114 115 124 3650	113 115 123 3760	113 115 122 3890
	0	114 115 123 3465	113 115 123 3525	113 115 123 3585	113 115 123 3645	113 115 122 3760	113 115 121 3895
	1	113 115 122 3460	113 115 122 3520	113 115 122 3585	113 115 122 3645	113 115 121 3765	113 115 121 3905
	2	113 115 122 3465	113 115 121 3525	113 115 121 3585	113 115 121 3645	113 115 121 3775	113 115 120 3940
32000 V _{FTO} = 145	-2	114 115 124 3550	114 115 124 3610	113 115 124 3675	113 115 124 3740	113 115 123 3855	113 115 122 3985
	-1	113 115 123 3545	113 115 123 3610	113 115 123 3670	113 115 123 3735	113 115 122 3855	113 115 121 3995
	0	113 115 122 3545	113 115 122 3610	113 115 122 3670	113 115 122 3735	113 115 121 3860	113 115 120 4005
	1	113 115 121 3550	113 115 121 3615	113 115 121 3675	113 115 121 3740	113 115 120 3870	113 115 120 4035
	2	113 115 120 3560	113 115 120 3620	113 115 120 3685	113 115 120 3750	113 115 120 3910	114 115 119 4165
33000 V _{FTO} = 147	-2	113 115 123 3590	113 115 123 3650	113 115 123 3715	113 115 123 3780	113 115 122 3900	113 115 122 4035
	-1	113 115 123 3585	113 115 122 3650	113 115 122 3715	113 115 122 3780	113 115 122 3900	113 115 121 4045
	0	113 115 122 3590	113 115 122 3655	113 115 121 3715	113 115 121 3780	113 115 121 3910	112 115 120 4060
	1	113 115 121 3595	113 115 121 3660	113 115 121 3725	113 115 121 3790	113 115 120 3925	114 115 120 4180
	2	113 115 120 3625	113 115 120 3690	113 115 120 3755	113 115 120 3820	114 115 120 4055	115 116 120 4350

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-19 (Sheet 1 of 2)

DRY RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 3625	113 115 124 3690	113 115 124 3755	113 116 124 3820	113 115 123 3940	113 115 122 4085
	-1	113 116 123 3630	113 116 123 3690	113 116 123 3755	113 116 123 3820	113 116 122 3950	112 116 122 4100
	0	113 116 123 3635	113 116 122 3700	113 116 122 3760	113 116 122 3830	113 116 122 3990	114 117 122 4260
	1	114 116 122 3700	114 116 122 3770	114 116 122 3835	114 116 122 3900	115 117 122 4140	116 117 122 4425
	2	115 117 122 3840	115 117 122 3910	115 117 122 3975	115 117 122 4045	116 118 122 4295	118 118 122 4635
35000 V _{FTO} = 151	-2	113 117 125 3665	113 117 125 3730	113 117 125 3795	113 117 125 3860	113 117 124 3985	113 117 124 4160
	-1	113 117 124 3670	113 117 124 3735	113 117 124 3800	113 117 124 3865	113 117 124 4055	115 118 124 4330
	0	114 117 124 3775	114 118 124 3840	114 118 124 3905	114 118 124 3975	115 118 124 4215	117 119 124 4505
	1	116 118 124 3910	116 118 124 3980	116 118 124 4050	116 118 124 4120	117 119 124 4375	118 120 124 4685
	2	118 119 124 4060	118 119 124 4130	118 119 124 4200	118 119 124 4275	119 120 124 4565	120 120 124 4970
36000 V _{FTO} = 153	-2	113 119 126 3720	113 119 126 3790	113 119 126 3855	113 119 126 3920	114 119 126 4120	115 119 126 4385
	-1	115 119 126 3840	115 119 126 3905	115 119 126 3975	115 119 126 4045	116 119 126 4275	117 120 126 4565
	0	117 119 126 3975	117 120 126 4045	117 120 126 4115	117 120 126 4190	118 120 126 4445	119 121 126 4750
	1	119 120 126 4130	118 120 126 4200	118 120 126 4275	118 120 126 4350	119 121 126 4620	121 122 126 4975
	2	120 121 126 4290	120 121 126 4365	120 121 126 4440	120 121 126 4520	122 122 126 4845	122 122 126 5375
38000 V _{FTO} = 157	-2	117 122 129 4070	117 122 129 4145	117 122 129 4215	117 122 129 4290	118 123 129 4550	120 123 129 4855
	-1	119 123 129 4235	119 123 129 4315	119 123 129 4390	119 123 129 4465	120 124 129 4740	122 124 129 5060
	0	121 124 129 4405	121 124 129 4485	121 124 129 4565	121 124 129 4645	122 124 129 4930	124 125 129 5290
	1	123 124 129 4575	123 124 129 4660	123 125 129 4740	123 125 129 4825	124 125 129 5165	126 126 129 5600
	2	125 125 129 4810	125 125 129 4895	125 125 129 4980	125 125 129 5065	126 126 129 5565	127 127 129 6200

TODATA_350SFO_IMP_F20_DRY_ALL_4K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-19 (Sheet 2 of 2)

**DRY RUNWAY WIND CORRECTIONS**

	WIND (KNOTS)	UNCORRECTED V_1 (KIAS)					
		110	115	116	120	125	130
CORRECTED V_1 (KIAS)	-10	110	115	118	122	127	132
	0	110	115	116	120	125	130
	10	110	115	115	119	124	129
	20	110	115	114	118	123	128
	30	110	115	113	117	122	127

	WIND (KNOTS)	UNCORRECTED V_1 (KIAS)					
		110	115	116	120	125	130
TOFL FACTOR	-10	1.35	1.35	1.35	1.35	1.35	1.35
	0	1.00	1.00	1.00	1.00	1.00	1.00
	10	0.95	0.95	0.95	0.95	0.95	0.95
	20	0.90	0.90	0.90	0.90	0.90	0.90
	30	0.85	0.85	0.85	0.85	0.85	0.85

TODATA_350SFO_F20_DRY_WIND_CORR_22FEB19

NOTES:

1. In the tables, tailwinds are shown as negative values and headwinds as positive values.
2. If the corrected V_1 exceeds V_R for the appropriate conditions, use $V_1 = V_R$.

Figure 07-11A-01-20

TAKEOFF DISTANCE AND SPEED ON A WET RUNWAY

A runway is considered to be wet when it has a shiny appearance due to a thin layer of water, but without significant areas of standing water.

NOTE: A runway with greater than 0.125 inch (3 mm) of standing water would be a contaminated runway.

There are two types of wet runway performance. For wet smooth runways, the Wet Runway tables must be used. For wet runways that have been grooved or treated with porous friction course material, use the Wet Grooved Runway tables.

NOTE: Supplement 9 – OPERATION ON WET GROOVED RUNWAYS provides detailed information and applicable limitations for operation on wet grooved runways.

Wet runway takeoff performance accounts for the use of thrust reversers down to 40 KIAS, followed by idle reverse down to a complete stop.

Fig. 07-11A-01-21 to Fig. 07-11A-01-38 present the SFO takeoff performance data on a wet runway, for the specified engine bleed configuration and airport pressure altitude, as a function of airplane weight, ambient temperature and runway gradient. Fig. 07-11A-01-39 provides corrections on TOFL and on V_1 speed for the effect of reported wind and for dispatch with one thrust reverser inoperative, as permitted by the applicable MEL (Minimum Equipment List).

Fig. 07-11A-01-40 to Fig. 07-11A-01-57 present the SFO takeoff performance data on a wet grooved runway, for the specified engine bleed configuration and airport pressure altitude, as a function of airplane weight, ambient temperature and runway gradient. Fig. 07-11A-01-58 provides corrections on TOFL and on V_1 speed for the effect of reported wind and for dispatch with one thrust reverser inoperative, as permitted by the applicable MEL.

- NOTE:**
1. If the takeoff weight obtained for a wet runway or for a wet grooved runway is higher than the takeoff weight for a dry runway, use the takeoff weight for a dry runway. In this situation, the V_1 speed must be determined for the wet runway or wet grooved runway condition (as applicable) at the limiting weight.
 2. If corrections for reported wind and one thrust reverser inoperative are both required, apply the wind corrections first, and then apply the thrust reverser corrections on the wind corrected values.

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED OFF****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
28000 V _{FTO} = 136	-2	114 115 126 3780	114 115 126 3850	114 115 126 3915	114 115 126 3980	114 115 126 4045	114 115 126 4115	114 115 125 4220	
	-1	114 115 125 3745	114 115 125 3810	114 115 125 3875	114 115 125 3940	114 115 125 4005	114 115 125 4070	114 115 125 4185	
	0	114 115 125 3720	114 115 124 3785	114 115 124 3845	114 115 124 3905	114 115 124 3970	114 115 124 4035	113 115 124 4150	
	1	114 115 124 3700	114 115 124 3760	114 115 124 3820	114 115 124 3880	114 115 123 3940	114 115 123 4005	113 115 123 4120	
	2	114 115 123 3680	114 115 123 3740	114 115 123 3800	114 115 123 3860	113 115 123 3920	113 115 123 3985	113 115 122 4100	
30000 V _{FTO} = 140	-2	114 115 125 3885	114 115 125 3950	114 115 125 4020	114 115 125 4085	114 115 125 4155	114 115 125 4225	113 115 124 4340	
	-1	114 115 124 3845	114 115 124 3915	114 115 124 3980	114 115 124 4050	114 115 124 4115	114 115 124 4185	113 115 124 4305	
	0	114 115 123 3820	114 115 123 3885	114 115 123 3950	114 115 123 4015	113 115 123 4080	113 115 123 4150	113 115 123 4275	
	1	113 115 123 3800	113 115 123 3865	113 115 122 3930	113 115 122 3990	113 115 122 4055	113 115 122 4120	113 115 122 4250	
	2	113 115 122 3785	113 115 122 3850	113 115 122 3910	113 115 122 3975	113 115 121 4035	113 115 121 4100	113 115 121 4230	
32000 V _{FTO} = 145	-2	114 115 124 3980	114 115 124 4050	114 115 124 4120	114 115 124 4190	114 115 124 4260	114 115 124 4335	113 115 124 4460	
	-1	114 115 123 3950	113 115 123 4020	113 115 123 4085	113 115 123 4155	113 115 123 4225	113 115 123 4295	113 115 123 4425	
	0	113 115 122 3925	113 115 122 3990	113 115 122 4055	113 115 122 4125	113 115 122 4195	113 115 122 4265	113 115 122 4395	
	1	113 115 122 3905	113 115 121 3970	113 115 121 4035	113 115 121 4100	113 115 121 4170	113 115 121 4240	113 115 121 4375	
	2	113 115 121 3890	113 115 121 3955	113 115 121 4020	113 115 120 4085	113 115 120 4155	113 115 120 4220	112 115 120 4365	
33000 V _{FTO} = 147	-2	114 115 124 4030	114 115 124 4100	114 115 123 4175	113 115 123 4245	113 115 123 4315	113 115 123 4390	113 115 123 4515	
	-1	113 115 123 4000	113 115 123 4070	113 115 123 4140	113 115 123 4210	113 115 122 4280	113 115 122 4350	113 115 122 4485	
	0	113 115 122 3970	113 115 122 4040	113 115 122 4110	113 115 122 4180	113 115 122 4250	113 115 122 4320	113 115 121 4460	
	1	113 115 121 3955	113 115 121 4025	113 115 121 4090	113 115 121 4160	113 115 121 4225	113 115 121 4295	113 115 121 4440	
	2	113 115 120 3945	113 115 120 4010	113 115 120 4080	113 115 120 4145	113 115 120 4210	113 115 120 4280	112 115 120 4430	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-21 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE SEA LEVEL****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED OFF****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 4080	124 4150	124 4225	124 4295	124 4370	124 4440	124 4515	124 4575
	-1	113 115	113 115	113 115	113 115	113 116	113 116	113 116	113 116
		123 4050	123 4120	123 4190	123 4260	123 4335	123 4405	123 4475	123 4545
	0	113 116	113 116	113 116	113 116	113 116	113 116	113 116	113 116
		122 4025	122 4095	122 4165	122 4235	122 4305	122 4380	122 4450	122 4520
	1	113 116	113 116	113 116	113 116	113 116	113 116	112 116	112 116
		122 4010	122 4080	122 4145	122 4215	122 4285	122 4355	122 4425	122 4505
	2	113 117	113 117	113 117	113 117	113 117	113 117	112 117	112 117
		122 4000	122 4070	122 4135	122 4200	122 4270	122 4340	122 4410	122 4495
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	113 117
		125 4125	125 4200	125 4275	125 4345	125 4420	125 4495	125 4565	125 4630
	-1	113 117	113 117	113 117	113 117	113 117	113 117	113 117	113 117
		124 4095	124 4170	124 4240	124 4315	124 4390	124 4460	124 4530	124 4600
	0	113 117	113 117	113 117	113 117	113 117	113 117	112 117	112 117
		124 4075	124 4145	124 4220	124 4290	124 4360	124 4435	124 4505	124 4580
	1	113 118	113 118	113 118	113 118	113 118	113 118	112 118	112 118
		124 4060	124 4130	124 4200	124 4270	124 4340	124 4415	124 4485	124 4570
	2	113 119	113 119	112 119	112 119	112 119	112 119	112 119	112 119
		124 4055	124 4125	124 4190	124 4260	124 4330	124 4405	124 4475	124 4560
36000 V _{FTO} = 153	-2	113 118	113 119	113 119	113 119	113 119	113 119	113 119	113 119
		126 4175	126 4250	126 4325	126 4395	126 4470	126 4550	126 4625	126 4690
	-1	113 119	113 119	113 119	113 119	113 119	113 119	113 119	113 119
		126 4145	126 4220	126 4295	126 4365	126 4440	126 4515	126 4590	126 4660
	0	113 119	113 119	113 119	113 119	113 119	113 119	112 120	112 120
		125 4125	125 4200	125 4270	125 4345	125 4415	125 4490	125 4560	125 4640
	1	113 120	113 120	113 120	113 120	113 120	112 120	112 120	112 120
		125 4110	125 4185	125 4255	125 4325	125 4400	125 4475	125 4550	125 4630
	2	113 121	113 121	113 121	113 121	113 121	113 121	113 121	113 121
		125 4170	125 4245	125 4310	125 4380	125 4450	125 4520	125 4590	125 4730
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	113 122	113 122	113 122	113 122
		129 4270	129 4345	129 4420	129 4500	129 4575	129 4655	129 4800	129 4880
	-1	113 123	113 123	113 123	113 123	113 123	113 123	112 123	112 123
		129 4245	129 4320	129 4395	129 4470	129 4550	129 4625	129 4780	129 4860
	0	113 123	113 123	113 123	113 124	113 124	113 124	113 124	113 124
		129 4275	129 4355	129 4425	129 4495	129 4570	129 4645	129 4840	129 4920
	1	116 124	116 124	116 124	116 124	115 124	115 124	116 124	116 124
		129 4465	129 4545	129 4620	129 4695	129 4770	129 4845	129 5065	129 5145
	2	118 125	118 125	118 125	118 125	118 125	118 125	118 125	118 125
		129 4670	129 4755	129 4830	129 4910	129 4990	129 5070	129 5310	129 5390

TODATA_350SFO_IMP_F20_WET_ZERO_SL_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-21 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
28000 V _{FTO} = 136	-2	114 115 126 3850	114 115 126 3915	114 115 126 3985	114 115 126 4050	114 115 126 4120	114 115 125 4200	114 115 125 4295	
	-1	114 115 125 3810	114 115 125 3880	114 115 125 3945	114 115 125 4010	114 115 125 4075	114 115 125 4160	114 115 125 4255	
	0	114 115 124 3785	114 115 124 3845	114 115 124 3910	114 115 124 3975	114 115 124 4040	114 115 124 4125	113 115 124 4225	
	1	114 115 124 3760	114 115 124 3825	114 115 124 3885	114 115 123 3945	114 115 123 4010	113 115 123 4090	113 115 123 4195	
	2	114 115 123 3740	114 115 123 3805	114 115 123 3865	113 115 123 3925	113 115 123 3990	113 115 123 4070	113 115 122 4175	
30000 V _{FTO} = 140	-2	114 115 125 3950	114 115 125 4020	114 115 125 4090	114 115 125 4160	114 115 125 4230	114 115 124 4315	113 115 124 4420	
	-1	114 115 124 3915	114 115 124 3985	114 115 124 4050	114 115 124 4120	114 115 124 4190	114 115 124 4275	113 115 124 4385	
	0	114 115 123 3885	114 115 123 3955	114 115 123 4020	113 115 123 4085	113 115 123 4155	113 115 123 4240	113 115 123 4350	
	1	113 115 123 3865	113 115 122 3930	113 115 122 3995	113 115 122 4060	113 115 122 4125	113 115 122 4215	113 115 122 4325	
	2	113 115 122 3850	113 115 122 3915	113 115 122 3975	113 115 121 4040	113 115 121 4105	113 115 121 4190	113 115 121 4310	
32000 V _{FTO} = 145	-2	114 115 124 4050	114 115 124 4125	114 115 124 4195	114 115 124 4265	114 115 124 4340	113 115 124 4430	113 115 123 4540	
	-1	113 115 123 4020	113 115 123 4090	113 115 123 4160	113 115 123 4230	113 115 123 4300	113 115 123 4395	113 115 123 4505	
	0	113 115 122 3990	113 115 122 4060	113 115 122 4130	113 115 122 4200	113 115 122 4270	113 115 122 4360	113 115 122 4480	
	1	113 115 121 3970	113 115 121 4040	113 115 121 4105	113 115 121 4175	113 115 121 4245	113 115 121 4335	113 115 121 4460	
	2	113 115 121 3955	113 115 121 4025	113 115 120 4090	113 115 120 4160	113 115 120 4225	113 115 120 4320	112 115 120 4445	
33000 V _{FTO} = 147	-2	114 115 124 4100	114 115 124 4175	113 115 123 4250	113 115 123 4320	113 115 123 4395	113 115 123 4485	113 115 123 4600	
	-1	113 115 123 4070	113 115 123 4140	113 115 123 4210	113 115 122 4285	113 115 122 4355	113 115 122 4450	113 115 122 4565	
	0	113 115 122 4040	113 115 122 4115	113 115 122 4185	113 115 122 4255	113 115 122 4325	113 115 122 4420	113 115 121 4540	
	1	113 115 121 4025	113 115 121 4095	113 115 121 4160	113 115 121 4230	113 115 121 4300	113 115 121 4400	112 115 120 4525	
	2	113 115 120 4010	113 115 120 4080	113 115 120 4150	113 115 120 4215	113 115 120 4285	113 115 120 4380	112 115 120 4515	

TODATA_350SFO_IMP_F20_WET_ZERO_500_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-22 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
34000 V _{FTO} = 149	-2	113 115 124 4150	113 115 124 4225	113 115 124 4300	113 115 124 4375	113 115 124 4450	113 115 124 4540	113 115 123 4660	
	-1	113 115 123 4120	113 115 123 4195	113 115 123 4265	113 116 123 4340	113 116 123 4415	113 116 123 4505	113 116 123 4630	
	0	113 116 122 4095	113 116 122 4165	113 116 122 4240	113 116 122 4310	113 116 122 4385	113 116 122 4480	113 116 122 4605	
	1	113 116 122 4080	113 116 122 4145	113 116 122 4215	113 116 122 4290	113 116 122 4360	113 116 122 4460	112 116 122 4590	
	2	113 117 122 4070	113 117 122 4140	113 117 122 4205	113 117 122 4275	113 117 122 4345	112 117 122 4445	112 117 122 4580	
35000 V _{FTO} = 151	-2	113 117 125 4200	113 117 125 4275	113 117 125 4350	113 117 125 4425	113 117 125 4500	113 117 125 4600	113 117 125 4715	
	-1	113 117 124 4170	113 117 124 4245	113 117 124 4320	113 117 124 4395	113 117 124 4465	113 117 124 4565	113 117 124 4690	
	0	113 117 124 4145	113 117 124 4220	113 117 124 4295	113 117 124 4365	113 117 124 4440	113 117 124 4540	112 118 124 4670	
	1	113 118 124 4130	113 118 124 4205	113 118 124 4275	113 118 124 4345	113 118 124 4420	112 118 124 4520	112 118 124 4655	
	2	113 119 124 4125	112 119 124 4195	112 119 124 4265	112 119 124 4335	112 119 124 4405	112 119 124 4510	112 119 124 4650	
36000 V _{FTO} = 153	-2	113 119 126 4250	113 119 126 4325	113 119 126 4400	113 119 126 4480	113 119 126 4555	113 119 126 4650	113 119 126 4775	
	-1	113 119 126 4220	113 119 126 4295	113 119 126 4370	113 119 126 4445	113 119 126 4520	113 119 126 4620	113 119 125 4750	
	0	113 119 125 4200	113 119 125 4275	113 119 125 4345	113 119 125 4420	113 119 125 4495	113 120 125 4595	112 120 125 4730	
	1	113 120 125 4185	113 120 125 4260	113 120 125 4330	113 120 125 4405	112 120 125 4480	112 120 125 4580	112 120 125 4720	
	2	113 121 125 4235	113 121 125 4310	113 121 125 4380	113 121 125 4450	113 121 125 4525	113 121 125 4640	113 121 125 4845	
38000 V _{FTO} = 157	-2	113 122 129 4345	113 122 129 4425	113 122 129 4500	113 122 129 4580	113 122 129 4660	113 122 129 4760	112 122 129 4890	
	-1	113 123 129 4320	113 123 129 4400	113 123 129 4475	113 123 129 4550	113 123 129 4630	113 123 129 4735	112 123 129 4870	
	0	113 123 129 4350	113 123 129 4425	113 124 129 4495	113 124 129 4570	113 124 129 4645	113 124 129 4760	113 124 129 4960	
	1	116 124 129 4540	116 124 129 4620	116 124 129 4690	115 124 129 4770	115 124 129 4850	115 124 129 4975	116 125 129 5190	
	2	118 125 129 4745	118 125 129 4830	118 125 129 4905	118 125 129 4990	118 125 129 5070	118 125 129 5205	118 125 129 5445	

TODATA_350SFO_IMP_F20_WET_ZERO_500_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-22 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
28000 V _{FTO} = 136	-2	114 115 126 3915	114 115 126 3985	114 115 126 4055	114 115 126 4125	114 115 125 4190	114 115 125 4295	114 115 125 4370	
	-1	114 115 125 3880	114 115 125 3945	114 115 125 4010	114 115 125 4080	114 115 125 4150	114 115 125 4255	113 115 124 4335	
	0	114 115 124 3850	114 115 124 3910	114 115 124 3975	114 115 124 4045	114 115 124 4110	113 115 124 4220	113 115 124 4300	
	1	114 115 124 3825	114 115 124 3890	114 115 124 3950	114 115 123 4015	114 115 123 4080	113 115 123 4190	113 115 123 4270	
	2	114 115 123 3805	114 115 123 3865	113 115 123 3930	113 115 123 3990	113 115 123 4055	113 115 122 4165	113 115 122 4250	
30000 V _{FTO} = 140	-2	114 115 125 4020	114 115 125 4095	114 115 125 4165	114 115 125 4235	114 115 124 4305	114 115 124 4415	113 115 124 4500	
	-1	114 115 124 3985	114 115 124 4055	114 115 124 4125	114 115 124 4195	114 115 124 4265	113 115 124 4380	113 115 123 4460	
	0	114 115 123 3955	114 115 123 4020	114 115 123 4090	113 115 123 4160	113 115 123 4230	113 115 123 4345	113 115 123 4430	
	1	113 115 123 3930	113 115 122 3995	113 115 122 4060	113 115 122 4130	113 115 122 4200	113 115 122 4315	113 115 122 4410	
	2	113 115 122 3915	113 115 122 3980	113 115 122 4045	113 115 121 4110	113 115 121 4175	113 115 121 4295	113 115 121 4390	
32000 V _{FTO} = 145	-2	114 115 124 4125	114 115 124 4200	114 115 124 4270	114 115 124 4345	114 115 124 4420	113 115 124 4535	113 115 123 4625	
	-1	113 115 123 4090	113 115 123 4160	113 115 123 4230	113 115 123 4305	113 115 123 4375	113 115 123 4500	113 115 122 4590	
	0	113 115 122 4060	113 115 122 4130	113 115 122 4200	113 115 122 4270	113 115 122 4345	113 115 122 4470	113 115 122 4565	
	1	113 115 121 4040	113 115 121 4105	113 115 121 4175	113 115 121 4245	113 115 121 4320	113 115 121 4445	113 115 121 4545	
	2	113 115 121 4025	113 115 121 4095	113 115 120 4160	113 115 120 4230	113 115 120 4295	113 115 120 4430	112 115 120 4530	
33000 V _{FTO} = 147	-2	114 115 124 4175	113 115 123 4250	113 115 123 4325	113 115 123 4400	113 115 123 4475	113 115 123 4595	113 115 123 4685	
	-1	113 115 123 4140	113 115 123 4215	113 115 123 4285	113 115 122 4360	113 115 122 4435	113 115 122 4560	113 115 122 4650	
	0	113 115 122 4110	113 115 122 4185	113 115 122 4255	113 115 122 4330	113 115 122 4405	113 115 121 4530	113 115 121 4630	
	1	113 115 121 4090	113 115 121 4160	113 115 121 4230	113 115 121 4305	113 115 121 4380	113 115 121 4510	112 115 120 4610	
	2	113 115 120 4080	113 115 120 4150	113 115 120 4215	113 115 120 4285	113 115 120 4360	112 115 120 4495	112 115 120 4600	

TODATA_350SFO_IMP_F20_WET_ZERO_1K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-23 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 4225	124 4300	124 4375	124 4450	124 4530	124 4650	123 4745	
	-1	113 115	113 115	113 116	113 116	113 116	113 116	113 116	113 116
		123 4190	123 4265	123 4340	123 4415	123 4490	123 4620	123 4715	
	0	113 116	113 116	113 116	113 116	113 116	113 116	112 116	112 116
		123 4165	123 4240	123 4310	122 4385	122 4460	122 4595	122 4695	
	1	113 116	113 116	113 116	113 116	113 116	112 116	112 116	112 116
		122 4145	122 4220	122 4290	122 4365	122 4440	122 4575	122 4680	
	2	113 117	113 117	113 117	113 117	113 117	112 117	112 117	112 117
		122 4135	122 4210	122 4275	122 4350	122 4420	122 4560	122 4670	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	113 117
		125 4275	125 4350	125 4430	125 4505	125 4580	125 4710	125 4805	
	-1	113 117	113 117	113 117	113 117	113 117	113 117	113 117	113 117
		124 4245	124 4320	124 4395	124 4470	124 4545	124 4680	124 4775	
	0	113 117	113 117	113 117	113 117	113 118	113 118	112 118	112 118
		124 4220	124 4295	124 4365	124 4445	124 4520	124 4655	124 4760	
	1	113 118	113 118	113 118	113 118	113 118	112 118	112 119	112 119
		124 4200	124 4275	124 4350	124 4425	124 4495	124 4635	124 4745	
	2	113 119	112 119	112 119	112 119	112 119	112 119	112 119	112 119
		124 4195	124 4265	124 4335	124 4410	124 4485	124 4630	124 4745	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	113 119	113 119	113 119
		126 4325	126 4405	126 4480	126 4560	126 4635	126 4770	126 4865	
	-1	113 119	113 119	113 119	113 119	113 119	113 119	112 119	112 119
		126 4295	126 4370	126 4450	126 4525	126 4600	126 4740	125 4840	
	0	113 119	113 119	113 119	113 119	113 120	112 120	112 120	112 120
		125 4270	125 4350	125 4420	125 4500	125 4575	125 4715	125 4820	
	1	113 120	113 120	113 120	113 120	112 120	112 120	112 121	112 121
		125 4255	125 4330	125 4405	125 4480	125 4555	125 4700	125 4815	
	2	113 121	113 121	113 121	113 121	113 121	113 121	114 121	114 121
		125 4300	125 4375	125 4445	125 4520	125 4595	125 4775	125 4970	
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	113 122	113 122	112 122	112 122
		129 4425	129 4505	129 4585	129 4665	129 4745	129 4880	129 4985	
	-1	113 123	113 123	113 123	113 123	113 123	112 123	112 123	112 123
		129 4395	129 4475	129 4555	129 4635	129 4715	129 4855	129 4965	
	0	113 123	113 124	113 124	113 124	113 124	113 124	114 124	114 124
		129 4415	129 4490	129 4565	129 4645	129 4720	129 4895	129 5080	
	1	116 124	115 124	115 124	115 124	115 124	115 124	116 125	116 125
		129 4605	129 4685	129 4765	129 4845	129 4925	129 5115	129 5320	
	2	118 125	118 125	118 125	118 125	118 125	118 125	119 126	119 126
		129 4820	129 4900	129 4980	129 5065	129 5150	129 5365	129 5590	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-23 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
28000 V _{FTO} = 136	-2	114 115 126 4060	114 115 126 4130	114 115 126 4200	114 115 125 4275	114 115 125 4365	114 115 125 4500	113 115 125 4530	
	-1	114 115 125 4015	114 115 125 4085	114 115 125 4155	114 115 125 4230	114 115 125 4320	113 115 124 4460	113 115 124 4490	
	0	114 115 124 3985	114 115 124 4050	114 115 124 4120	114 115 124 4190	114 115 124 4285	113 115 123 4430	113 115 123 4460	
	1	114 115 124 3955	114 115 124 4020	114 115 123 4085	114 115 123 4155	113 115 123 4250	113 115 123 4400	113 115 123 4430	
	2	114 115 123 3935	113 115 123 4000	113 115 123 4065	113 115 123 4130	113 115 122 4220	113 115 122 4375	113 115 122 4410	
30000 V _{FTO} = 140	-2	114 115 125 4170	114 115 125 4240	114 115 125 4315	114 115 124 4390	114 115 124 4485	113 115 124 4635	113 115 124 4665	
	-1	114 115 124 4125	114 115 124 4200	114 115 124 4275	114 115 124 4345	113 115 124 4445	113 115 123 4595	113 115 123 4630	
	0	114 115 123 4095	114 115 123 4165	113 115 123 4235	113 115 123 4310	113 115 123 4410	113 115 122 4565	113 115 122 4600	
	1	113 115 122 4070	113 115 122 4135	113 115 122 4205	113 115 122 4275	113 115 122 4380	113 115 122 4540	113 115 122 4575	
	2	113 115 122 4050	113 115 122 4115	113 115 121 4185	113 115 121 4250	113 115 121 4355	113 115 121 4525	112 115 121 4560	
32000 V _{FTO} = 145	-2	114 115 124 4275	114 115 124 4350	114 115 124 4425	113 115 124 4505	113 115 124 4605	113 115 123 4765	113 115 123 4795	
	-1	113 115 123 4235	113 115 123 4310	113 115 123 4385	113 115 123 4460	113 115 123 4565	113 115 122 4730	113 115 122 4765	
	0	113 115 122 4205	113 115 122 4275	113 115 122 4350	113 115 122 4425	113 115 122 4535	113 115 121 4700	113 115 121 4735	
	1	113 115 121 4180	113 115 121 4250	113 115 121 4325	113 115 121 4400	113 115 121 4505	112 115 121 4680	112 115 121 4720	
	2	113 115 121 4165	113 115 120 4235	113 115 120 4305	113 115 120 4375	113 115 120 4490	112 115 120 4670	112 115 120 4710	
33000 V _{FTO} = 147	-2	113 115 123 4325	113 115 123 4405	113 115 123 4480	113 115 123 4560	113 115 123 4665	113 115 123 4825	113 115 123 4860	
	-1	113 115 123 4290	113 115 123 4365	113 115 122 4440	113 115 122 4520	113 115 122 4630	113 115 122 4795	113 115 122 4830	
	0	113 115 122 4260	113 115 122 4335	113 115 122 4410	113 115 122 4485	113 115 121 4595	112 115 121 4770	112 115 121 4805	
	1	113 115 121 4235	113 115 121 4310	113 115 121 4385	113 115 121 4460	113 115 121 4570	112 115 120 4755	112 115 120 4790	
	2	113 115 120 4220	113 115 120 4295	113 115 120 4365	113 115 120 4440	112 115 120 4555	112 115 120 4745	112 115 120 4785	

TODATA_350SFO_IMP_F20_WET_ZERO_2K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-24 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 116	113 115	113 115	
		124 4380	124 4460	124 4535	124 4615	124 4725	123 4890	123 4925	
	-1	113 116	113 116	113 116	113 116	113 116	113 116	112 116	
		123 4345	123 4420	123 4500	123 4575	123 4690	123 4860	122 4895	
	0	113 116	113 116	113 116	113 116	113 116	112 116	112 116	
		123 4315	123 4390	123 4470	123 4545	123 4660	122 4835	122 4875	
	1	113 116	113 116	113 116	113 116	113 116	112 116	112 117	
		122 4295	122 4365	122 4445	122 4520	122 4635	122 4825	122 4865	
	2	113 117	113 117	113 117	113 117	112 117	112 117	112 117	
		122 4280	122 4350	122 4425	122 4505	122 4620	122 4820	122 4860	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		125 4430	125 4510	125 4590	125 4670	125 4785	125 4955	124 4990	
	-1	113 117	113 117	113 117	113 117	113 117	112 117	112 117	
		125 4400	125 4475	125 4555	124 4635	124 4750	124 4925	124 4960	
	0	113 117	113 118	113 118	113 118	113 118	112 118	112 118	
		124 4370	124 4445	124 4525	124 4605	124 4720	124 4905	124 4945	
	1	113 118	113 118	113 118	113 118	112 118	112 119	112 119	
		124 4350	124 4425	124 4505	124 4580	124 4700	124 4895	124 4935	
	2	112 119	112 119	112 119	112 119	112 119	112 119	112 120	
		124 4340	124 4410	124 4490	124 4565	124 4690	124 4890	124 4935	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	113 119	112 119	
		127 4485	126 4565	126 4645	126 4725	126 4840	126 5015	126 5055	
	-1	113 119	113 119	113 119	113 119	113 119	112 119	112 119	
		126 4450	126 4530	126 4610	126 4690	126 4805	125 4990	125 5030	
	0	113 119	113 119	113 119	113 120	112 120	112 120	112 120	
		125 4425	125 4505	125 4585	125 4660	125 4780	125 4970	125 5010	
	1	113 120	113 120	112 120	112 120	112 120	112 121	112 121	
		125 4405	125 4485	125 4560	125 4640	125 4765	125 4965	125 5005	
	2	113 121	113 121	113 121	113 121	113 121	114 122	114 122	
		125 4430	125 4505	125 4580	125 4660	125 4805	125 5140	125 5220	
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	113 122	112 122	112 123	
		129 4585	129 4670	129 4750	129 4835	129 4955	129 5140	129 5180	
	-1	113 123	113 123	113 123	113 123	112 123	112 123	112 123	
		129 4555	129 4640	129 4720	129 4805	129 4925	129 5120	129 5160	
	0	113 124	113 124	113 124	113 124	113 124	114 124	114 124	
		129 4550	129 4630	129 4710	129 4790	129 4935	129 5250	129 5325	
	1	115 124	115 124	115 124	115 124	115 124	116 125	116 125	
		129 4750	129 4830	129 4915	129 5000	129 5155	129 5505	129 5585	
	2	118 125	118 125	118 125	118 125	118 125	119 126	119 126	
		129 4965	129 5050	129 5135	129 5225	129 5395	129 5790	129 5885	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-24 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	113 115	
		126 4210	125 4285	125 4360	125 4445	125 4570	124 4695	
	-1	114 115	114 115	114 115	114 115	113 115	113 115	
		125 4165	125 4240	125 4315	125 4400	124 4530	124 4655	
	0	114 115	114 115	114 115	114 115	113 115	113 115	
		124 4125	124 4200	124 4270	124 4360	124 4490	123 4625	
	1	114 115	114 115	114 115	113 115	113 115	113 115	
		123 4100	123 4165	123 4235	123 4325	123 4460	122 4595	
	2	113 115	113 115	113 115	113 115	113 115	113 115	
		123 4075	123 4140	122 4210	122 4295	122 4435	121 4580	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	113 115	113 115	
		125 4325	124 4400	124 4480	124 4570	124 4705	123 4840	
	-1	114 115	114 115	114 115	113 115	113 115	113 115	
		124 4285	124 4355	124 4435	124 4525	123 4665	123 4800	
	0	113 115	113 115	113 115	113 115	113 115	113 115	
		123 4245	123 4320	123 4395	123 4485	123 4630	122 4770	
	1	113 115	113 115	113 115	113 115	113 115	112 115	
		122 4215	122 4285	122 4360	122 4455	122 4600	121 4750	
	2	113 115	113 115	113 115	113 115	113 115	112 115	
		121 4195	121 4265	121 4335	121 4430	121 4580	120 4735	
32000 V _{FTO} = 145	-2	114 115	113 115	113 115	113 115	113 115	113 115	
		124 4435	124 4515	124 4595	123 4695	123 4835	123 4975	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	
		123 4395	123 4475	123 4555	123 4650	122 4795	122 4945	
	0	113 115	113 115	113 115	113 115	113 115	112 115	
		122 4360	122 4440	122 4515	122 4615	122 4765	121 4920	
	1	113 115	113 115	113 115	113 115	112 115	112 115	
		121 4335	121 4410	121 4485	121 4585	121 4745	120 4905	
	2	113 115	113 115	113 115	113 115	112 115	112 115	
		120 4315	120 4385	120 4465	120 4565	120 4725	119 4895	
33000 V _{FTO} = 147	-2	113 115	113 115	113 115	113 115	113 115	113 115	
		123 4495	123 4570	123 4655	123 4755	123 4900	122 5045	
	-1	113 115	113 115	113 115	113 115	113 115	112 115	
		122 4450	122 4530	122 4615	122 4710	122 4860	121 5015	
	0	113 115	113 115	113 115	113 115	113 115	112 115	
		122 4420	122 4500	121 4575	121 4675	121 4835	121 4995	
	1	113 115	113 115	113 115	113 115	112 115	112 115	
		121 4395	121 4470	121 4550	121 4650	120 4815	120 4980	
	2	113 115	113 115	113 115	112 115	112 115	112 115	
		120 4375	120 4450	120 4530	120 4630	120 4800	120 4975	

TODATA_350SFO_IMP_F20_WET_ZERO_3K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-25 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
34000 V _{FTO} = 149	-2	113 115 124 4545	113 116 124 4630	113 116 124 4710	113 116 124 4815	113 116 123 4965	113 115 123 5115	
	-1	113 116 123 4510	113 116 123 4590	113 116 123 4670	113 116 123 4770	113 116 123 4930	112 116 122 5085	
	0	113 116 123 4480	113 116 123 4555	113 116 123 4640	113 116 123 4740	112 116 122 4900	112 116 122 5065	
	1	113 116 122 4455	113 116 122 4530	113 116 122 4610	113 116 122 4715	112 116 122 4885	112 117 122 5055	
	2	113 117 122 4440	113 117 122 4515	112 117 122 4595	112 117 122 4700	112 117 122 4875	112 118 122 5055	
35000 V _{FTO} = 151	-2	113 117 125 4600	113 117 125 4685	113 117 125 4770	113 117 125 4870	113 117 125 5025	112 117 124 5180	
	-1	113 117 125 4565	113 117 125 4645	113 117 124 4730	113 117 124 4835	113 117 124 4995	112 118 124 5155	
	0	113 118 124 4535	113 118 124 4615	113 118 124 4700	113 118 124 4805	112 118 124 4970	112 118 124 5140	
	1	113 118 124 4515	113 118 124 4590	113 118 124 4675	112 118 124 4780	112 119 124 4955	112 119 124 5130	
	2	112 119 124 4500	112 119 124 4575	112 119 124 4660	112 119 124 4765	112 119 124 4945	112 120 124 5165	
36000 V _{FTO} = 153	-2	113 119 126 4655	113 119 126 4740	113 119 126 4825	113 119 126 4930	113 119 126 5090	112 119 125 5250	
	-1	113 119 126 4620	113 119 126 4705	113 119 126 4785	113 119 126 4895	112 119 125 5060	112 120 125 5225	
	0	113 119 125 4595	113 120 125 4675	113 120 125 4760	113 120 125 4865	112 120 125 5035	112 120 125 5210	
	1	112 120 125 4575	112 120 125 4655	112 120 125 4735	112 120 125 4845	112 121 125 5025	112 121 125 5235	
	2	113 121 125 4590	113 121 125 4665	113 121 125 4750	113 121 125 4875	113 122 125 5155	115 122 125 5485	
38000 V _{FTO} = 157	-2	113 122 129 4765	113 122 129 4850	113 122 129 4935	113 122 129 5045	112 122 129 5215	112 123 129 5385	
	-1	113 123 129 4730	113 123 129 4815	113 123 129 4905	112 123 129 5015	112 123 129 5190	112 124 129 5365	
	0	113 124 129 4715	112 124 129 4795	112 124 129 4885	112 124 129 5005	113 124 129 5275	114 124 129 5595	
	1	115 124 129 4920	115 124 129 5005	115 125 129 5095	115 125 129 5225	116 125 129 5525	117 125 129 5880	
	2	118 125 129 5145	117 125 129 5230	117 125 129 5325	118 125 129 5470	118 126 129 5795	120 126 129 6210	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-25 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTD} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	27		
28000 V _{FTD} = 136	-2	114 115 125 4375	114 115 125 4450	114 115 125 4535	114 115 125 4655	113 115 124 4800	113 115 124 4870		
		114 115 125 4325	114 115 124 4405	114 115 124 4485	113 115 124 4610	113 115 124 4760	113 115 123 4830		
	0	114 115 124 4285	114 115 124 4360	114 115 124 4445	113 115 123 4570	113 115 123 4725	113 115 123 4795		
		114 115 123 4250	113 115 123 4325	113 115 123 4405	113 115 123 4535	113 115 122 4695	113 115 122 4770		
	2	113 115 122 4225	113 115 122 4295	113 115 122 4375	113 115 122 4510	113 115 121 4675	112 115 121 4750		
		30000 V _{FTD} = 140	-2	114 115 124 4490	114 115 124 4575	114 115 124 4660	113 115 124 4790	113 115 123 4945	113 115 123 5015
	114 115 124 4450			114 115 124 4525	113 115 123 4615	113 115 123 4745	113 115 123 4905	113 115 122 4980	
	0		113 115 123 4410	113 115 123 4485	113 115 123 4575	113 115 122 4710	113 115 122 4875	112 115 122 4955	
			113 115 122 4375	113 115 122 4455	113 115 122 4540	113 115 122 4680	112 115 121 4850	112 115 121 4930	
	2		113 115 121 4350	113 115 121 4425	113 115 121 4510	113 115 121 4655	112 115 120 4835	112 115 120 4920	
32000 V _{FTD} = 145			-2	113 115 123 4610	113 115 123 4695	113 115 123 4785	113 115 123 4925	113 115 122 5090	113 115 122 5165
	113 115 123 4570			113 115 123 4650	113 115 123 4740	113 115 122 4880	113 115 122 5055	112 115 121 5130	
	0		113 115 122 4530	113 115 122 4610	113 115 122 4705	113 115 122 4850	112 115 121 5025	112 115 121 5110	
			113 115 121 4500	113 115 121 4580	113 115 121 4670	113 115 121 4820	112 115 120 5005	112 115 120 5095	
	2		113 115 120 4480	113 115 120 4555	113 115 120 4650	112 115 120 4805	112 115 119 4995	112 115 119 5085	
		33000 V _{FTD} = 147	-2	113 115 123 4670	113 115 123 4755	113 115 123 4845	113 115 123 4990	113 115 122 5160	112 115 122 5235
	113 115 122 4625			113 115 122 4710	113 115 122 4805	113 115 122 4950	112 115 121 5125	112 115 121 5205	
	0		113 115 121 4590	113 115 121 4675	113 115 121 4770	113 115 121 4915	112 115 120 5100	112 115 120 5185	
			113 115 121 4565	113 115 121 4645	113 115 121 4740	112 115 120 4890	112 115 120 5085	112 115 120 5175	
	2		113 115 120 4545	113 115 120 4625	112 115 120 4720	112 115 120 4875	112 116 120 5080	112 116 120 5170	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-26 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
34000 V _{FTO} = 149	-2	113 116 124 4725	113 116 124 4810	113 116 124 4910	113 116 123 5055	113 116 123 5230	112 115 122 5310	
	-1	113 116 123 4685	113 116 123 4770	113 116 123 4865	113 116 123 5015	112 116 122 5195	112 116 122 5280	
	0	113 116 123 4650	113 116 123 4735	113 116 122 4830	112 116 122 4985	112 116 122 5175	112 116 122 5265	
	1	113 116 122 4625	113 116 122 4710	113 116 122 4805	112 116 122 4965	112 117 122 5160	112 117 122 5255	
	2	112 117 122 4605	112 117 122 4690	112 117 122 4785	112 117 122 4950	112 118 122 5160	112 118 122 5255	
35000 V _{FTO} = 151	-2	113 117 125 4785	113 117 125 4870	113 117 125 4970	113 117 125 5115	112 117 124 5300	112 117 124 5380	
	-1	113 117 124 4745	113 118 124 4830	113 118 124 4930	113 118 124 5080	112 118 124 5270	112 118 124 5355	
	0	113 118 124 4715	113 118 124 4800	113 118 124 4895	112 118 124 5055	112 118 124 5250	112 119 124 5340	
	1	113 118 124 4690	112 118 124 4775	112 118 124 4870	112 119 124 5035	112 119 124 5240	112 119 124 5335	
	2	112 119 124 4675	112 119 124 4755	112 119 124 4855	112 119 124 5025	112 120 124 5275	113 120 124 5445	
36000 V _{FTO} = 153	-2	113 119 126 4840	113 119 126 4930	113 119 126 5030	113 119 126 5180	112 119 126 5365	112 119 126 5450	
	-1	113 119 126 4805	113 119 126 4890	113 119 126 4990	112 119 126 5145	112 120 126 5340	112 120 126 5430	
	0	113 120 126 4775	113 120 126 4860	113 120 126 4960	112 120 126 5120	112 121 126 5325	112 121 126 5415	
	1	112 120 126 4750	112 120 126 4840	112 121 126 4935	112 121 126 5105	112 121 126 5345	113 121 126 5510	
	2	113 121 126 4775	113 121 126 4860	113 121 126 4965	113 122 126 5210	115 122 126 5605	115 122 126 5785	
38000 V _{FTO} = 157	-2	113 122 129 4955	113 122 129 5045	113 122 129 5150	112 123 129 5310	112 123 129 5500	112 123 129 5595	
	-1	113 123 129 4920	113 123 129 5010	112 123 129 5110	112 123 129 5275	112 124 129 5480	112 124 129 5615	
	0	113 124 129 4905	112 124 129 4995	112 124 129 5100	113 124 129 5335	114 125 129 5715	115 125 129 5890	
	1	115 125 129 5120	115 125 129 5210	115 125 129 5325	115 125 129 5580	117 125 129 6000	117 126 129 6185	
	2	118 125 129 5350	118 125 129 5450	118 125 129 5570	118 126 129 5855	120 126 129 6340	120 126 129 6565	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-26 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED ON****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
28000 V _{FTO} = 136	-2	114 115 126 3785	114 115 126 3850	114 115 126 3915	114 115 126 3980	114 115 126 4045	114 115 125 4120	114 115 125 4235	
	-1	114 115 125 3745	114 115 125 3810	114 115 125 3875	114 115 125 3940	114 115 125 4005	114 115 125 4080	114 115 124 4195	
	0	114 115 124 3720	114 115 124 3785	114 115 124 3845	114 115 124 3905	114 115 124 3970	114 115 124 4045	113 115 124 4165	
	1	114 115 124 3700	114 115 124 3760	114 115 124 3820	114 115 124 3885	114 115 123 3940	114 115 123 4010	113 115 123 4140	
	2	114 115 123 3680	114 115 123 3740	114 115 123 3800	113 115 123 3860	113 115 123 3920	113 115 123 3990	113 115 122 4115	
30000 V _{FTO} = 140	-2	114 115 125 3885	114 115 125 3955	114 115 125 4020	114 115 125 4090	114 115 125 4155	114 115 125 4230	113 115 124 4355	
	-1	114 115 124 3850	114 115 124 3915	114 115 124 3985	114 115 124 4050	114 115 124 4115	114 115 124 4190	113 115 124 4320	
	0	114 115 123 3825	114 115 123 3885	114 115 123 3950	114 115 123 4015	113 115 123 4085	113 115 123 4160	113 115 123 4290	
	1	113 115 123 3800	113 115 122 3865	113 115 122 3930	113 115 122 3995	113 115 122 4055	113 115 122 4130	113 115 122 4265	
	2	113 115 122 3785	113 115 122 3850	113 115 122 3910	113 115 122 3975	113 115 121 4040	113 115 121 4110	113 115 121 4250	
32000 V _{FTO} = 145	-2	114 115 124 3985	114 115 124 4055	114 115 124 4125	114 115 124 4195	114 115 124 4265	113 115 124 4340	113 115 123 4475	
	-1	114 115 123 3950	113 115 123 4020	113 115 123 4090	113 115 123 4155	113 115 123 4225	113 115 123 4305	113 115 123 4440	
	0	113 115 122 3925	113 115 122 3990	113 115 122 4060	113 115 122 4125	113 115 122 4195	113 115 122 4275	113 115 122 4415	
	1	113 115 121 3905	113 115 121 3975	113 115 121 4040	113 115 121 4105	113 115 121 4170	113 115 121 4250	113 115 121 4395	
	2	113 115 121 3895	113 115 121 3960	113 115 120 4025	113 115 120 4090	113 115 120 4155	113 115 120 4230	112 115 120 4385	
33000 V _{FTO} = 147	-2	114 115 124 4030	114 115 124 4105	113 115 123 4175	113 115 123 4245	113 115 123 4315	113 115 123 4395	113 115 123 4530	
	-1	113 115 123 4000	113 115 123 4070	113 115 123 4140	113 115 123 4210	113 115 122 4280	113 115 122 4360	113 115 122 4500	
	0	113 115 122 3975	113 115 122 4045	113 115 122 4110	113 115 122 4180	113 115 122 4250	113 115 122 4330	113 115 121 4475	
	1	113 115 121 3960	113 115 121 4025	113 115 121 4090	113 115 121 4160	113 115 121 4230	113 115 121 4310	112 115 120 4460	
	2	113 115 120 3945	113 115 120 4015	113 115 120 4080	113 115 120 4145	113 115 120 4215	113 115 120 4295	112 115 120 4450	

TODATA_350SFO_IMP_F20_WET_ECS_SL_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-27 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		124 4080	124 4155	124 4225	124 4295	124 4370	124 4450	123 4590	
	-1	113 115	113 115	113 115	113 115	113 116	113 116	113 115	
		123 4050	123 4120	123 4190	123 4265	123 4335	123 4415	123 4560	
	0	113 116	113 116	113 116	113 116	113 116	113 116	113 116	
		122 4025	122 4095	122 4165	122 4235	122 4310	122 4390	122 4540	
	1	113 116	113 116	113 116	113 116	113 116	113 116	112 116	
		122 4010	122 4080	122 4145	122 4215	122 4285	122 4370	122 4525	
	2	113 117	113 117	113 117	113 117	113 117	113 117	112 117	
		122 4000	122 4070	122 4135	122 4205	122 4270	122 4355	122 4520	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		125 4130	125 4205	125 4275	125 4350	125 4420	125 4505	125 4650	
	-1	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		124 4100	124 4175	124 4245	124 4315	124 4390	124 4470	124 4620	
	0	113 117	113 117	113 117	113 117	113 117	113 117	112 118	
		124 4075	124 4150	124 4220	124 4290	124 4365	124 4445	124 4600	
	1	113 118	113 118	113 118	113 118	113 118	113 118	112 118	
		124 4060	124 4135	124 4205	124 4275	124 4345	124 4430	124 4590	
	2	113 119	113 119	112 119	112 119	112 119	112 119	112 119	
		124 4055	124 4125	124 4195	124 4260	124 4335	124 4415	124 4585	
36000 V _{FTO} = 153	-2	113 118	113 119	113 119	113 119	113 119	113 119	113 119	
		126 4175	126 4250	126 4325	126 4400	126 4475	126 4560	126 4705	
	-1	113 119	113 119	113 119	113 119	113 119	113 119	113 119	
		126 4150	126 4225	126 4295	126 4370	126 4445	126 4525	125 4680	
	0	113 119	113 119	113 119	113 119	113 119	113 120	112 120	
		125 4130	125 4200	125 4275	125 4345	125 4420	125 4505	125 4665	
	1	113 120	113 120	113 120	113 120	113 120	112 120	112 121	
		125 4115	125 4185	125 4260	125 4330	125 4400	125 4485	125 4655	
	2	113 121	113 121	113 121	113 121	113 121	113 121	114 121	
		125 4175	125 4250	125 4320	125 4385	125 4455	125 4545	125 4810	
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	113 122	113 122	113 122	
		129 4270	129 4350	129 4425	129 4500	129 4580	129 4665	129 4820	
	-1	113 123	113 123	113 123	113 123	113 123	113 123	112 123	
		129 4245	129 4325	129 4400	129 4475	129 4550	129 4635	129 4800	
	0	113 123	113 123	113 124	113 124	113 124	113 124	114 124	
		129 4285	129 4365	129 4430	129 4505	129 4575	129 4665	129 4920	
	1	116 124	116 124	116 124	116 124	116 124	116 124	116 125	
		129 4475	129 4555	129 4625	129 4700	129 4775	129 4870	129 5150	
	2	118 125	118 125	118 125	118 125	118 125	118 125	119 126	
		129 4680	129 4765	129 4840	129 4915	129 4995	129 5095	129 5415	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-27 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115	114 115	
		126 3850	126 3920	126 3985	126 4050	125 4120	125 4210	125 4310	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	113 115	
		125 3815	125 3880	125 3945	125 4010	125 4075	125 4170	124 4270	
	0	114 115	114 115	114 115	114 115	114 115	114 115	113 115	
		124 3785	124 3850	124 3910	124 3975	124 4040	124 4135	124 4240	
	1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	
		124 3760	124 3825	124 3885	123 3950	123 4010	123 4105	123 4215	
	2	114 115	114 115	113 115	113 115	113 115	113 115	113 115	
		123 3740	123 3805	123 3865	123 3925	123 3990	122 4080	122 4190	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	114 115	113 115	
		125 3955	125 4025	125 4090	125 4160	125 4230	124 4330	124 4435	
	-1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	
		124 3915	124 3985	124 4055	124 4120	124 4190	124 4290	123 4400	
	0	114 115	114 115	114 115	113 115	113 115	113 115	113 115	
		123 3890	123 3955	123 4020	123 4090	123 4155	123 4255	123 4370	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		123 3870	122 3935	122 3995	122 4060	122 4125	122 4230	122 4345	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		122 3850	122 3915	122 3980	121 4045	121 4110	121 4210	121 4330	
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	
		124 4055	124 4125	124 4195	124 4270	124 4340	124 4445	123 4555	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		123 4020	123 4090	123 4160	123 4230	123 4305	123 4410	122 4525	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		122 3990	122 4060	122 4130	122 4200	122 4270	122 4380	122 4500	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		121 3975	121 4040	121 4105	121 4175	121 4245	121 4355	121 4480	
	2	113 115	113 115	113 115	113 115	113 115	113 115	112 115	
		121 3960	120 4025	120 4095	120 4160	120 4225	120 4340	120 4465	
33000 V _{FTO} = 147	-2	114 115	113 115	113 115	113 115	113 115	113 115	113 115	
		124 4105	123 4175	123 4250	123 4320	123 4395	123 4500	123 4615	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		123 4070	123 4145	123 4215	122 4285	122 4360	122 4465	122 4585	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		122 4045	122 4115	122 4185	122 4255	122 4330	121 4440	121 4560	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	
		121 4025	121 4095	121 4165	121 4235	121 4305	121 4415	120 4545	
	2	113 115	113 115	113 115	113 115	113 115	112 115	112 115	
		120 4015	120 4085	120 4150	120 4215	120 4285	120 4400	120 4535	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-28 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 4155	124 4230	124 4300	124 4375	124 4450	124 4560	123 4675	
	-1	113 115	113 115	113 115	113 116	113 116	113 116	113 116	113 116
		123 4120	123 4195	123 4265	123 4340	123 4415	123 4525	122 4645	
	0	113 116	113 116	113 116	113 116	113 116	113 116	112 116	112 116
		122 4095	122 4170	122 4240	122 4310	122 4385	122 4500	122 4625	
	1	113 116	113 116	113 116	113 116	113 116	113 116	112 116	112 116
		122 4080	122 4150	122 4220	122 4290	122 4365	122 4480	122 4615	
	2	113 117	113 117	113 117	113 117	113 117	112 117	112 117	112 117
		122 4070	122 4140	122 4210	122 4275	122 4350	122 4465	122 4605	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	113 117
		125 4205	125 4280	125 4350	125 4425	125 4505	125 4615	124 4735	
	-1	113 117	113 117	113 117	113 117	113 117	113 117	113 117	113 117
		124 4175	124 4245	124 4320	124 4395	124 4470	124 4580	124 4710	
	0	113 117	113 117	113 117	113 117	113 117	113 117	112 118	112 118
		124 4150	124 4225	124 4295	124 4370	124 4440	124 4560	124 4690	
	1	113 118	113 118	113 118	113 118	113 118	112 118	112 119	112 119
		124 4135	124 4205	124 4275	124 4350	124 4420	124 4540	124 4680	
	2	113 119	112 119	112 119	112 119	112 119	112 119	112 119	112 119
		124 4125	124 4195	124 4265	124 4335	124 4410	124 4530	124 4675	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	113 119	113 119	113 119
		126 4250	126 4330	126 4405	126 4480	126 4555	126 4670	126 4795	
	-1	113 119	113 119	113 119	113 119	113 119	113 119	112 119	112 119
		126 4225	126 4300	126 4370	126 4450	126 4525	126 4640	125 4770	
	0	113 119	113 119	113 119	113 119	113 120	113 120	112 120	112 120
		125 4200	125 4275	125 4350	125 4425	125 4500	125 4620	125 4755	
	1	113 120	113 120	113 120	113 120	112 120	112 120	112 121	112 121
		125 4185	125 4260	125 4330	125 4405	125 4480	125 4605	125 4745	
	2	113 121	113 121	113 121	113 121	113 121	113 121	114 122	114 122
		125 4245	125 4320	125 4385	125 4460	125 4530	125 4680	125 4935	
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	113 122	113 122	112 122	112 122
		129 4350	129 4425	129 4505	129 4585	129 4660	129 4780	129 4915	
	-1	113 123	113 123	113 123	113 123	113 123	112 123	112 123	112 123
		129 4325	129 4400	129 4475	129 4555	129 4630	129 4755	129 4890	
	0	113 123	113 124	113 124	113 124	113 124	113 124	114 124	114 124
		129 4355	129 4435	129 4505	129 4580	129 4655	129 4800	129 5045	
	1	116 124	116 124	116 124	116 124	115 124	116 124	117 125	117 125
		129 4545	129 4625	129 4700	129 4780	129 4860	129 5015	129 5285	
	2	118 125	118 125	118 125	118 125	118 125	118 125	119 126	119 126
		129 4755	129 4840	129 4915	129 5000	129 5080	129 5250	129 5565	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-28 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
28000 V _{FTO} = 136	-2	114 115 126 3920	114 115 126 3985	114 115 126 4055	114 115 126 4125	114 115 125 4190	114 115 125 4310	114 115 125 4385	
	-1	114 115 125 3880	114 115 125 3945	114 115 125 4015	114 115 125 4080	114 115 125 4150	114 115 124 4270	113 115 124 4350	
	0	114 115 124 3850	114 115 124 3915	114 115 124 3975	114 115 124 4045	114 115 124 4110	113 115 124 4235	113 115 123 4315	
	1	114 115 124 3825	114 115 124 3890	114 115 123 3950	114 115 123 4015	114 115 123 4080	113 115 123 4205	113 115 123 4290	
	2	114 115 123 3805	114 115 123 3865	113 115 123 3930	113 115 123 3995	113 115 123 4055	113 115 122 4180	113 115 122 4270	
30000 V _{FTO} = 140	-2	114 115 125 4025	114 115 125 4095	114 115 125 4165	114 115 125 4235	114 115 124 4305	113 115 124 4430	113 115 124 4515	
	-1	114 115 124 3985	114 115 124 4055	114 115 124 4125	114 115 124 4195	114 115 124 4265	113 115 124 4395	113 115 123 4480	
	0	114 115 123 3955	114 115 123 4020	114 115 123 4090	113 115 123 4160	113 115 123 4230	113 115 123 4360	113 115 122 4450	
	1	113 115 122 3935	113 115 122 4000	113 115 122 4065	113 115 122 4130	113 115 122 4200	113 115 122 4335	113 115 122 4430	
	2	113 115 122 3915	113 115 122 3980	113 115 121 4045	113 115 121 4110	113 115 121 4175	113 115 121 4315	113 115 121 4410	
32000 V _{FTO} = 145	-2	114 115 124 4125	114 115 124 4200	114 115 124 4270	114 115 124 4345	114 115 124 4420	113 115 123 4555	113 115 123 4640	
	-1	113 115 123 4090	113 115 123 4160	113 115 123 4235	113 115 123 4305	113 115 123 4380	113 115 123 4515	113 115 122 4610	
	0	113 115 122 4060	113 115 122 4130	113 115 122 4205	113 115 122 4275	113 115 122 4345	113 115 122 4490	113 115 121 4585	
	1	113 115 121 4040	113 115 121 4110	113 115 121 4175	113 115 121 4250	113 115 121 4320	113 115 121 4465	112 115 121 4565	
	2	113 115 121 4025	113 115 120 4095	113 115 120 4160	113 115 120 4230	113 115 120 4300	112 115 120 4450	112 115 120 4555	
33000 V _{FTO} = 147	-2	114 115 124 4175	113 115 123 4250	113 115 123 4325	113 115 123 4400	113 115 123 4475	113 115 123 4610	113 115 123 4705	
	-1	113 115 123 4140	113 115 123 4215	113 115 122 4290	113 115 122 4360	113 115 122 4435	113 115 122 4580	113 115 122 4670	
	0	113 115 122 4115	113 115 122 4185	113 115 122 4260	113 115 122 4330	113 115 122 4405	113 115 121 4550	113 115 121 4650	
	1	113 115 121 4095	113 115 121 4165	113 115 121 4235	113 115 121 4305	113 115 121 4380	113 115 120 4530	112 115 120 4635	
	2	113 115 120 4080	113 115 120 4150	113 115 120 4220	113 115 120 4290	113 115 120 4360	112 115 120 4520	112 115 120 4625	

TODATA_350SFO_JMP_F20_WET_ECS_1K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-29 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		124 4230	124 4300	124 4375	124 4455	124 4530	123 4670	123 4765	
	-1	113 115	113 115	113 116	113 116	113 116	113 116	113 116	
		123 4195	123 4270	123 4340	123 4420	123 4490	123 4640	122 4735	
	0	113 116	113 116	113 116	113 116	113 116	113 116	112 116	
		122 4170	122 4240	122 4315	122 4390	122 4465	122 4615	122 4715	
	1	113 116	113 116	113 116	113 116	113 116	112 116	112 117	
		122 4150	122 4220	122 4290	122 4365	122 4440	122 4595	122 4705	
	2	113 117	113 117	113 117	113 117	113 117	112 117	112 117	
		122 4140	122 4210	122 4280	122 4350	122 4425	122 4585	122 4700	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		125 4280	125 4355	125 4430	125 4505	125 4585	125 4730	124 4825	
	-1	113 117	113 117	113 117	113 117	113 117	113 117	112 117	
		124 4245	124 4320	124 4395	124 4470	124 4550	124 4700	124 4800	
	0	113 117	113 117	113 117	113 117	113 118	112 118	112 118	
		124 4220	124 4295	124 4370	124 4445	124 4520	124 4675	124 4780	
	1	113 118	113 118	113 118	113 118	113 118	112 118	112 119	
		124 4205	124 4275	124 4350	124 4425	124 4500	124 4660	124 4770	
	2	113 119	112 119	112 119	112 119	112 119	112 119	112 120	
		124 4195	124 4265	124 4340	124 4410	124 4485	124 4655	124 4770	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	113 119	113 119	
		126 4330	126 4405	126 4480	126 4560	126 4640	126 4790	126 4885	
	-1	113 119	113 119	113 119	113 119	113 119	113 119	112 119	
		126 4295	126 4375	126 4450	126 4525	126 4605	125 4760	125 4865	
	0	113 119	113 119	113 119	113 119	113 120	112 120	112 120	
		125 4275	125 4350	125 4425	125 4500	125 4580	125 4740	125 4850	
	1	113 120	113 120	113 120	112 120	112 120	112 121	112 121	
		125 4260	125 4335	125 4410	125 4485	125 4560	125 4725	125 4840	
	2	113 121	113 121	113 121	113 121	113 121	113 121	114 122	
		125 4310	125 4380	125 4450	125 4530	125 4605	125 4845	125 5065	
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	113 122	113 122	112 123	
		129 4425	129 4505	129 4585	129 4665	129 4745	129 4905	129 5010	
	-1	113 123	113 123	113 123	113 123	113 123	112 123	112 123	
		129 4400	129 4480	129 4555	129 4635	129 4715	129 4880	129 4990	
	0	113 123	113 124	113 124	113 124	113 124	113 124	114 124	
		129 4425	129 4500	129 4575	129 4650	129 4730	129 4960	129 5170	
	1	116 124	116 124	115 124	115 124	115 124	116 125	117 125	
		129 4615	129 4695	129 4770	129 4855	129 4935	129 5190	129 5420	
	2	118 125	118 125	118 125	118 125	118 125	118 125	119 126	
		129 4830	129 4910	129 4990	129 5075	129 5160	129 5445	129 5715	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-29 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
28000 V _{FTO} = 136	-2	114 115 126 4060	114 115 126 4130	114 115 125 4200	114 115 125 4275	114 115 125 4380	113 115 125 4520	113 115 124 4550	
	-1	114 115 125 4020	114 115 125 4090	114 115 125 4160	114 115 125 4230	114 115 125 4340	113 115 124 4480	113 115 124 4510	
	0	114 115 124 3985	114 115 124 4050	114 115 124 4120	114 115 124 4190	113 115 124 4300	113 115 123 4450	113 115 123 4480	
	1	114 115 124 3955	114 115 123 4025	114 115 123 4090	114 115 123 4155	113 115 123 4270	113 115 122 4420	113 115 122 4455	
	2	114 115 123 3935	113 115 123 4000	113 115 123 4065	113 115 123 4130	113 115 122 4245	113 115 122 4400	113 115 121 4435	
30000 V _{FTO} = 140	-2	114 115 125 4170	114 115 125 4240	114 115 125 4315	114 115 124 4390	113 115 124 4505	113 115 124 4650	113 115 124 4685	
	-1	114 115 124 4130	114 115 124 4200	114 115 124 4275	114 115 124 4345	113 115 124 4465	113 115 123 4615	113 115 123 4650	
	0	114 115 123 4095	113 115 123 4165	113 115 123 4235	113 115 123 4310	113 115 123 4430	113 115 122 4590	113 115 122 4620	
	1	113 115 122 4070	113 115 122 4140	113 115 122 4205	113 115 122 4280	113 115 122 4400	113 115 121 4565	113 115 121 4600	
	2	113 115 122 4050	113 115 122 4115	113 115 121 4185	113 115 121 4255	113 115 121 4380	112 115 121 4550	112 115 120 4585	
32000 V _{FTO} = 145	-2	114 115 124 4275	114 115 124 4350	114 115 124 4430	113 115 124 4505	113 115 123 4625	113 115 123 4785	113 115 123 4815	
	-1	113 115 123 4240	113 115 123 4315	113 115 123 4385	113 115 123 4465	113 115 123 4590	113 115 122 4750	113 115 122 4785	
	0	113 115 122 4205	113 115 122 4280	113 115 122 4355	113 115 122 4430	113 115 122 4560	113 115 121 4725	112 115 121 4760	
	1	113 115 121 4180	113 115 121 4255	113 115 121 4325	113 115 121 4400	113 115 121 4530	112 115 120 4710	112 115 120 4745	
	2	113 115 120 4165	113 115 120 4235	113 115 120 4305	113 115 120 4380	112 115 120 4515	112 115 120 4700	112 115 119 4740	
33000 V _{FTO} = 147	-2	113 115 123 4330	113 115 123 4405	113 115 123 4485	113 115 123 4560	113 115 123 4685	113 115 122 4850	113 115 122 4885	
	-1	113 115 123 4290	113 115 122 4370	113 115 122 4445	113 115 122 4520	113 115 122 4650	113 115 122 4820	113 115 121 4855	
	0	113 115 122 4260	113 115 122 4335	113 115 122 4410	113 115 121 4490	113 115 121 4620	112 115 121 4795	112 115 121 4830	
	1	113 115 121 4240	113 115 121 4310	113 115 121 4385	113 115 121 4460	113 115 121 4600	112 115 120 4780	112 115 120 4820	
	2	113 115 120 4225	113 115 120 4295	113 115 120 4365	113 115 120 4440	112 115 120 4585	112 115 120 4775	112 115 120 4815	

TODATA_350SFO_IMP_F20_WET_ECS_2K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-30 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
34000 V _{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		124 4380	124 4460	124 4540	124 4615	124 4745	123 4915	123 4950	
	-1	113 116	113 116	113 116	113 116	113 116	112 116	112 116	
		123 4345	123 4420	123 4500	123 4580	123 4710	122 4885	122 4920	
	0	113 116	113 116	113 116	113 116	113 116	112 116	112 116	
		123 4315	123 4390	123 4470	123 4545	122 4685	122 4865	122 4900	
	1	113 116	113 116	113 116	113 116	112 116	112 117	112 117	
		122 4295	122 4370	122 4445	122 4520	122 4665	122 4855	122 4895	
	2	113 117	113 117	113 117	113 117	112 117	112 118	112 118	
		122 4280	122 4355	122 4430	122 4505	122 4650	122 4850	122 4890	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		125 4435	125 4515	125 4590	125 4675	125 4805	124 4980	124 5015	
	-1	113 117	113 117	113 117	113 117	113 117	112 117	112 117	
		125 4400	125 4475	124 4555	124 4635	124 4775	124 4950	124 4990	
	0	113 117	113 118	113 118	113 118	113 118	112 118	112 118	
		124 4370	124 4450	124 4525	124 4605	124 4745	124 4935	124 4975	
	1	113 118	113 118	113 118	113 118	112 118	112 119	112 119	
		124 4350	124 4430	124 4505	124 4585	124 4730	124 4925	124 4965	
	2	112 119	112 119	112 119	112 119	112 119	112 120	112 120	
		124 4340	124 4415	124 4490	124 4570	124 4720	124 4945	124 5020	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	112 119	112 119	
		126 4485	126 4565	126 4645	126 4730	126 4865	126 5040	125 5080	
	-1	113 119	113 119	113 119	113 119	113 119	112 119	112 120	
		126 4455	126 4530	126 4610	126 4695	126 4835	125 5015	125 5055	
	0	113 119	113 119	113 120	113 120	112 120	112 120	112 120	
		125 4425	125 4505	125 4585	125 4665	125 4810	125 5000	125 5045	
	1	113 120	113 120	112 120	112 120	112 120	112 121	112 121	
		125 4410	125 4485	125 4565	125 4645	125 4795	125 5015	125 5090	
	2	113 121	113 121	113 121	113 121	113 121	115 122	115 122	
		125 4440	125 4510	125 4590	125 4670	125 4875	125 5255	125 5330	
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	113 122	112 123	112 123	
		129 4590	129 4670	129 4755	129 4840	129 4980	129 5170	129 5210	
	-1	113 123	113 123	113 123	113 123	112 123	112 124	112 124	
		129 4560	129 4640	129 4725	129 4805	129 4955	129 5150	129 5195	
	0	113 124	113 124	113 124	113 124	113 124	114 124	115 124	
		129 4560	129 4635	129 4715	129 4800	129 5000	129 5365	129 5440	
	1	115 124	115 124	115 124	115 124	115 125	117 125	117 125	
		129 4760	129 4840	129 4920	129 5010	129 5225	129 5625	129 5710	
	2	118 125	118 125	118 125	118 125	118 125	120 126	120 126	
		129 4975	129 5060	129 5145	129 5235	129 5475	129 5940	129 6040	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-30 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)**

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)									
WT (LB) V_{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	29		
28000 V_{FTO} = 136	-2	114 115	114 115	114 115	114 115	113 115	113 115		
		125 4210	125 4285	125 4360	125 4465	125 4590	124 4715		
	-1	114 115	114 115	114 115	114 115	113 115	113 115		
		125 4170	125 4240	125 4315	124 4420	124 4550	123 4680		
	0	114 115	114 115	114 115	113 115	113 115	113 115		
		124 4130	124 4200	124 4275	124 4380	123 4515	123 4650		
	1	114 115	114 115	114 115	113 115	113 115	113 115		
		123 4100	123 4165	123 4235	123 4345	122 4485	122 4625		
	2	113 115	113 115	113 115	113 115	113 115	112 115		
		123 4075	123 4145	122 4210	122 4315	122 4460	121 4605		
30000 V_{FTO} = 140	-2	114 115	114 115	114 115	114 115	113 115	113 115		
		125 4325	124 4405	124 4480	124 4590	124 4725	123 4860		
	-1	114 115	114 115	114 115	113 115	113 115	113 115		
		124 4285	124 4360	124 4435	124 4545	123 4690	122 4825		
	0	113 115	113 115	113 115	113 115	113 115	113 115		
		123 4245	123 4320	123 4395	123 4510	122 4655	122 4800		
	1	113 115	113 115	113 115	113 115	113 115	112 115		
		122 4215	122 4290	122 4365	122 4480	121 4630	121 4780		
	2	113 115	113 115	113 115	113 115	112 115	112 115		
		121 4195	121 4265	121 4335	121 4455	121 4610	120 4770		
32000 V_{FTO} = 145	-2	114 115	113 115	113 115	113 115	113 115	113 115		
		124 4440	124 4515	123 4600	123 4715	123 4860	122 5000		
	-1	113 115	113 115	113 115	113 115	113 115	112 115		
		123 4395	123 4475	123 4555	123 4670	122 4820	121 4970		
	0	113 115	113 115	113 115	113 115	113 115	112 115		
		122 4365	122 4440	122 4520	122 4640	121 4795	121 4950		
	1	113 115	113 115	113 115	113 115	112 115	112 115		
		121 4335	121 4410	121 4490	121 4610	120 4775	120 4935		
	2	113 115	113 115	113 115	113 115	112 115	112 115		
		120 4320	120 4390	120 4465	120 4590	120 4760	119 4930		
33000 V_{FTO} = 147	-2	113 115	113 115	113 115	113 115	113 115	113 115		
		123 4495	123 4575	123 4655	123 4775	122 4925	122 5075		
	-1	113 115	113 115	113 115	113 115	113 115	112 115		
		122 4455	122 4535	122 4615	122 4735	122 4890	121 5045		
	0	113 115	113 115	113 115	113 115	112 115	112 115		
		122 4420	122 4500	121 4580	121 4705	121 4865	120 5025		
	1	113 115	113 115	113 115	113 115	112 115	112 115		
		121 4395	121 4470	121 4550	121 4680	120 4845	120 5015		
	2	113 115	113 115	113 115	112 115	112 115	112 116		
		120 4380	120 4450	120 4530	120 4660	120 4835	120 5010		

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-31 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
34000 V _{FTO} = 149	-2	113 115	113 116	113 116	113 116	113 116	112 115	
		124 4550	124 4630	124 4715	124 4835	123 4990	122 5140	
	-1	113 116	113 116	113 116	113 116	113 116	112 116	
		123 4510	123 4590	123 4670	123 4795	122 4955	122 5115	
	0	113 116	113 116	113 116	113 116	112 116	112 116	
		123 4480	123 4560	123 4640	122 4765	122 4935	122 5100	
	1	113 116	113 116	113 116	112 116	112 117	112 117	
		122 4455	122 4535	122 4615	122 4745	122 4915	122 5090	
	2	113 117	113 117	112 117	112 117	112 118	112 118	
		122 4440	122 4515	122 4595	122 4730	122 4910	122 5095	
35000 V _{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	112 117	
		125 4605	125 4685	125 4770	125 4895	124 5055	124 5210	
	-1	113 117	113 117	113 117	113 117	112 117	112 118	
		125 4565	124 4650	124 4730	124 4860	124 5025	124 5185	
	0	113 118	113 118	113 118	113 118	112 118	112 119	
		124 4535	124 4615	124 4700	124 4830	124 5000	124 5175	
	1	113 118	113 118	113 118	112 118	112 119	112 119	
		124 4515	124 4595	124 4675	124 4810	124 4990	124 5170	
	2	112 119	112 119	112 119	112 119	112 120	113 120	
		124 4500	124 4580	124 4660	124 4800	124 4985	124 5295	
36000 V _{FTO} = 153	-2	113 119	113 119	113 119	113 119	113 119	112 119	
		126 4660	126 4740	126 4830	126 4955	126 5120	125 5280	
	-1	113 119	113 119	113 119	113 119	112 119	112 120	
		126 4620	126 4705	126 4790	126 4920	125 5090	125 5260	
	0	113 120	113 120	113 120	112 120	112 120	112 121	
		125 4595	125 4675	125 4760	125 4895	125 5070	125 5245	
	1	112 120	112 120	112 120	112 121	112 121	113 121	
		125 4575	125 4655	125 4740	125 4875	125 5060	125 5360	
	2	113 121	113 121	113 121	113 121	114 122	116 122	
		125 4595	125 4675	125 4760	125 4935	125 5285	125 5635	
38000 V _{FTO} = 157	-2	113 122	113 122	113 122	113 122	112 123	112 123	
		129 4765	129 4850	129 4940	129 5075	129 5245	129 5415	
	-1	113 123	113 123	113 123	112 123	112 124	113 124	
		129 4735	129 4820	129 4905	129 5045	129 5220	129 5460	
	0	113 124	113 124	113 124	113 124	114 124	115 125	
		129 4725	129 4805	129 4890	129 5060	129 5400	129 5725	
	1	115 124	115 124	115 125	115 125	117 125	118 126	
		129 4930	129 5015	129 5105	129 5290	129 5660	129 6015	
	2	118 125	118 125	118 125	118 125	119 126	121 126	
		129 5155	129 5240	129 5335	129 5535	129 5960	129 6385	

TODATA_350SFO_IMP_F20_WET_ECS_3K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-31 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED ON****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
28000 V _{FTO} = 136	-2	114 115 125 4375	114 115 125 4450	114 115 125 4555	114 115 124 4675	113 115 124 4825	113 115 124 4895	
	-1	114 115 125 4325	114 115 124 4405	114 115 124 4505	113 115 124 4630	113 115 123 4785	113 115 123 4855	
	0	114 115 124 4285	114 115 124 4360	113 115 124 4465	113 115 123 4595	113 115 122 4755	113 115 122 4825	
	1	114 115 123 4250	113 115 123 4325	113 115 123 4430	113 115 122 4560	113 115 122 4725	112 115 121 4800	
	2	113 115 122 4225	113 115 122 4295	113 115 122 4400	113 115 122 4535	112 115 121 4705	112 115 121 4785	
30000 V _{FTO} = 140	-2	114 115 124 4495	114 115 124 4575	114 115 124 4680	113 115 124 4815	113 115 123 4970	113 115 123 5045	
	-1	114 115 124 4450	113 115 124 4530	113 115 123 4635	113 115 123 4770	113 115 122 4935	113 115 122 5010	
	0	113 115 123 4410	113 115 123 4490	113 115 123 4595	113 115 122 4735	113 115 121 4905	112 115 121 4985	
	1	113 115 122 4375	113 115 122 4455	113 115 122 4565	113 115 121 4710	112 115 121 4885	112 115 120 4965	
	2	113 115 121 4350	113 115 121 4425	113 115 121 4540	113 115 121 4685	112 115 120 4870	112 115 120 4955	
32000 V _{FTO} = 145	-2	113 115 123 4610	113 115 123 4695	113 115 123 4805	113 115 123 4945	113 115 122 5120	113 115 122 5195	
	-1	113 115 123 4570	113 115 123 4650	113 115 123 4765	113 115 122 4910	112 115 121 5085	112 115 121 5165	
	0	113 115 122 4530	113 115 122 4615	113 115 122 4730	113 115 121 4875	112 115 121 5060	112 115 120 5145	
	1	113 115 121 4505	113 115 121 4585	113 115 121 4700	112 115 120 4850	112 115 120 5045	112 115 119 5130	
	2	113 115 120 4480	113 115 120 4560	113 115 120 4680	112 115 120 4835	112 115 119 5040	112 115 119 5130	
33000 V _{FTO} = 147	-2	113 115 123 4670	113 115 123 4755	113 115 123 4870	113 115 122 5015	113 115 122 5190	112 115 121 5270	
	-1	113 115 122 4630	113 115 122 4710	113 115 122 4830	113 115 121 4975	112 115 121 5160	112 115 121 5240	
	0	113 115 121 4595	113 115 121 4675	113 115 121 4795	113 115 121 4945	112 115 120 5135	112 115 120 5225	
	1	113 115 121 4565	113 115 121 4650	113 115 120 4765	112 115 120 4925	112 115 120 5125	112 115 120 5215	
	2	113 115 120 4545	113 115 120 4625	112 115 120 4750	112 115 120 4910	112 116 120 5120	112 116 120 5215	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-32 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB)	RWY	TEMPERATURE (°C)						
V _{FTO} (KIAS)	GRD (%)	5 & BELOW	10	15	20	25	27	
34000 V _{FTO} = 149	-2	113 116 124 4730	113 116 124 4815	113 116 124 4930	113 116 123 5080	112 115 122 5260	112 115 122 5340	
	-1	113 116 123 4685	113 116 123 4770	113 116 123 4890	113 116 122 5045	112 116 122 5230	112 116 122 5320	
	0	113 116 122 4655	113 116 122 4740	113 116 122 4860	112 116 122 5015	112 117 122 5215	112 117 122 5300	
	1	113 116 122 4630	113 116 122 4710	112 116 122 4835	112 117 122 5000	112 117 122 5205	112 118 122 5300	
	2	112 117 122 4610	112 117 122 4695	112 117 122 4820	112 118 122 4990	112 118 122 5205	112 118 122 5305	
35000 V _{FTO} = 151	-2	113 117 125 4785	113 117 125 4875	113 117 125 4995	113 117 124 5145	112 117 124 5330	112 117 124 5415	
	-1	113 117 124 4745	113 118 124 4830	113 118 124 4955	112 117 124 5110	112 118 124 5305	112 118 124 5390	
	0	113 118 124 4715	113 118 124 4800	113 118 124 4925	112 118 124 5085	112 119 124 5290	112 119 124 5380	
	1	113 118 124 4690	112 118 124 4775	112 118 124 4900	112 119 124 5070	112 119 124 5285	112 120 124 5380	
	2	112 119 124 4675	112 119 124 4760	112 119 124 4890	112 120 124 5065	113 120 124 5415	114 120 124 5590	
36000 V _{FTO} = 153	-2	113 119 126 4845	113 119 126 4930	113 119 126 5055	113 119 126 5210	112 119 126 5400	112 120 126 5490	
	-1	113 119 126 4805	113 119 126 4895	113 119 126 5015	112 120 126 5180	112 120 126 5375	112 120 126 5470	
	0	113 120 126 4775	113 120 126 4865	112 120 126 4990	112 120 126 5155	112 121 126 5365	112 121 126 5460	
	1	112 120 126 4755	112 121 126 4840	112 121 126 4970	112 121 126 5145	113 122 126 5485	114 122 126 5660	
	2	113 121 126 4785	113 121 126 4870	113 121 126 5020	114 122 126 5345	116 122 126 5765	116 123 126 5970	
38000 V _{FTO} = 157	-2	113 122 129 4955	113 122 129 5045	113 122 129 5175	112 123 129 5340	112 123 129 5540	112 124 129 5630	
	-1	113 123 129 4920	113 123 129 5010	112 123 129 5140	112 124 129 5310	113 124 129 5590	113 124 129 5755	
	0	113 124 129 4915	113 124 129 5005	113 124 129 5155	114 124 129 5465	115 125 129 5860	116 125 129 6040	
	1	115 125 129 5130	115 125 129 5220	115 125 129 5380	116 125 129 5720	118 126 129 6155	119 126 129 6370	
	2	118 125 129 5360	118 125 129 5460	118 125 129 5635	119 126 129 6025	121 126 129 6530	121 127 129 6760	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-32 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	115 115 126 3525	115 115 126 3590	114 115 126 3655	114 115 126 3720	114 115 126 3785	114 115 126 3850
	-1	114 115 126 3500	114 115 126 3560	114 115 125 3625	114 115 125 3685	114 115 125 3750	114 115 125 3815
	0	114 115 125 3475	114 115 125 3535	114 115 125 3600	114 115 125 3660	114 115 124 3725	114 115 124 3785
	1	114 115 124 3455	114 115 124 3515	114 115 124 3575	114 115 124 3640	114 115 124 3700	114 115 124 3760
	2	114 115 123 3435	114 115 123 3495	114 115 123 3560	114 115 123 3620	114 115 123 3680	114 115 123 3745
30000 V _{FTO} = 140	-2	114 115 125 3615	114 115 125 3680	114 115 125 3750	114 115 125 3815	114 115 125 3885	114 115 125 3955
	-1	114 115 125 3590	114 115 125 3655	114 115 124 3720	114 115 124 3785	114 115 124 3850	114 115 124 3920
	0	114 115 124 3565	114 115 124 3630	114 115 124 3695	114 115 123 3760	114 115 123 3825	114 115 123 3890
	1	114 115 123 3545	114 115 123 3610	114 115 123 3675	113 115 123 3740	113 115 123 3805	113 115 122 3870
	2	113 115 122 3530	113 115 122 3595	113 115 122 3660	113 115 122 3725	113 115 122 3790	113 115 122 3850
32000 V _{FTO} = 145	-2	114 115 124 3700	114 115 124 3770	114 115 124 3840	114 115 124 3915	114 115 124 3985	114 115 124 4055
	-1	114 115 124 3680	114 115 124 3745	114 115 123 3815	114 115 123 3880	114 115 123 3950	113 115 123 4020
	0	113 115 123 3660	113 115 123 3725	113 115 122 3790	113 115 122 3860	113 115 122 3925	113 115 122 3995
	1	113 115 122 3640	113 115 122 3710	113 115 122 3775	113 115 122 3840	113 115 121 3905	113 115 121 3975
	2	113 115 121 3630	113 115 121 3695	113 115 121 3760	113 115 121 3830	113 115 121 3895	113 115 120 3960
33000 V _{FTO} = 147	-2	114 115 124 3745	114 115 124 3815	114 115 124 3890	114 115 124 3960	114 115 124 4030	114 115 123 4105
	-1	114 115 123 3720	113 115 123 3790	113 115 123 3860	113 115 123 3930	113 115 123 4000	113 115 123 4075
	0	113 115 122 3705	113 115 122 3770	113 115 122 3840	113 115 122 3910	113 115 122 3975	113 115 122 4045
	1	113 115 121 3690	113 115 121 3755	113 115 121 3825	113 115 121 3890	113 115 121 3960	113 115 121 4030
	2	113 115 120 3680	113 115 120 3745	113 115 120 3815	113 115 120 3880	113 115 120 3950	113 115 120 4015

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-33 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3790	114 115 124 3865	114 115 124 3935	113 115 124 4010	113 115 124 4080	113 115 124 4155
	-1	113 115 123 3765	113 115 123 3835	113 115 123 3905	113 115 123 3980	113 115 123 4050	113 115 123 4125
	0	113 115 123 3750	113 115 122 3820	113 115 122 3885	113 115 122 3955	113 116 122 4025	113 116 122 4100
	1	113 116 122 3735	113 116 122 3805	113 116 122 3875	113 116 122 3940	113 116 122 4010	113 116 122 4080
	2	113 116 122 3730	113 116 122 3795	113 117 122 3865	113 117 122 3935	113 117 122 4005	113 117 122 4070
35000 V _{FTO} = 151	-2	113 117 125 3835	113 117 125 3910	113 117 125 3980	113 117 125 4055	113 117 125 4130	113 117 125 4205
	-1	113 117 124 3810	113 117 124 3880	113 117 124 3955	113 117 124 4025	113 117 124 4100	113 117 124 4175
	0	113 117 124 3795	113 117 124 3865	113 117 124 3935	113 117 124 4005	113 117 124 4080	113 117 124 4150
	1	113 118 124 3785	113 118 124 3855	113 118 124 3925	113 118 124 3995	113 118 124 4065	113 118 124 4135
	2	113 119 124 3780	113 119 124 3850	113 119 124 3920	113 119 124 3990	113 119 124 4055	113 119 124 4130
36000 V _{FTO} = 153	-2	113 118 126 3875	113 118 126 3955	113 118 126 4030	113 118 126 4100	113 118 126 4180	113 119 126 4255
	-1	113 118 126 3855	113 119 126 3930	113 119 126 4000	113 119 126 4075	113 119 126 4150	113 119 126 4225
	0	113 119 125 3840	113 119 125 3910	113 119 125 3985	113 119 125 4055	113 119 125 4130	113 119 125 4205
	1	113 120 125 3830	113 120 125 3905	113 120 125 3975	113 120 125 4045	113 120 125 4115	113 120 125 4190
	2	114 121 125 3890	114 121 125 3965	114 121 125 4040	114 121 125 4110	114 121 125 4185	113 121 125 4260
38000 V _{FTO} = 157	-2	113 122 129 3965	113 122 129 4040	113 122 129 4120	113 122 129 4195	113 122 129 4275	113 122 129 4350
	-1	113 122 129 3945	113 122 129 4020	113 122 129 4095	113 123 129 4170	113 123 129 4250	113 123 129 4325
	0	114 123 129 3985	114 123 129 4065	114 123 129 4140	113 123 129 4215	113 123 129 4295	113 124 129 4375
	1	116 124 129 4160	116 124 129 4240	116 124 129 4320	116 124 129 4400	116 124 129 4485	116 124 129 4565
	2	119 125 129 4350	119 125 129 4440	118 125 129 4525	118 125 129 4605	118 125 129 4695	118 125 129 4780

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-33 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	115 115 126 3590	114 115 126 3650	114 115 126 3715	114 115 126 3785	114 115 126 3855	114 115 126 3920
		114 115 126 3560	114 115 125 3625	114 115 125 3685	114 115 125 3750	114 115 125 3815	114 115 125 3880
	-1	114 115 125 3535	114 115 125 3600	114 115 125 3660	114 115 124 3725	114 115 124 3790	114 115 124 3850
		114 115 124 3510	114 115 124 3575	114 115 124 3640	114 115 124 3700	114 115 124 3765	114 115 124 3825
	0	114 115 123 3495	114 115 123 3555	114 115 123 3620	114 115 123 3680	114 115 123 3745	114 115 123 3805
30000 V _{FTO} = 140	-2	114 115 125 3675	114 115 125 3745	114 115 125 3815	114 115 125 3885	114 115 125 3955	114 115 125 4025
		114 115 125 3650	114 115 124 3720	114 115 124 3780	114 115 124 3850	114 115 124 3920	114 115 124 3990
	-1	114 115 124 3630	114 115 124 3695	114 115 124 3760	114 115 123 3825	114 115 123 3890	114 115 123 3955
		114 115 123 3610	114 115 123 3675	113 115 123 3740	113 115 123 3805	113 115 122 3870	113 115 122 3935
	0	113 115 122 3595	113 115 122 3655	113 115 122 3720	113 115 122 3785	113 115 122 3855	113 115 122 3915
32000 V _{FTO} = 145	-2	114 115 124 3765	114 115 124 3840	114 115 124 3910	114 115 124 3985	114 115 124 4055	114 115 124 4130
		114 115 124 3740	114 115 123 3810	114 115 123 3880	114 115 123 3950	113 115 123 4020	113 115 123 4095
	-1	113 115 123 3720	113 115 123 3790	113 115 122 3855	113 115 122 3925	113 115 122 3995	113 115 122 4065
		113 115 122 3705	113 115 122 3775	113 115 122 3840	113 115 121 3905	113 115 121 3975	113 115 121 4045
	0	113 115 121 3695	113 115 121 3760	113 115 121 3825	113 115 121 3895	113 115 121 3960	113 115 120 4030
33000 V _{FTO} = 147	-2	114 115 124 3815	114 115 124 3885	114 115 124 3960	114 115 124 4030	114 115 124 4105	113 115 123 4180
		114 115 123 3790	113 115 123 3855	113 115 123 3930	113 115 123 4000	113 115 123 4075	113 115 123 4145
	-1	113 115 122 3765	113 115 122 3835	113 115 122 3905	113 115 122 3975	113 115 122 4045	113 115 122 4115
		113 115 121 3755	113 115 121 3825	113 115 121 3890	113 115 121 3960	113 115 121 4030	113 115 121 4095
	0	113 115 120 3740	113 115 120 3810	113 115 120 3880	113 115 120 3950	113 115 120 4015	113 115 120 4085

TODATA_350SFO_IMP_F20_WET_ALL_500_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-34 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3860	114 115 124 3930	113 115 124 4005	113 115 124 4080	113 115 124 4155	113 115 124 4230
	-1	113 115 123 3835	113 115 123 3905	113 115 123 3975	113 115 123 4050	113 115 123 4125	113 115 123 4195
	0	113 115 123 3815	113 115 122 3885	113 115 122 3955	113 116 122 4025	113 116 122 4100	113 116 122 4170
	1	113 116 122 3800	113 116 122 3870	113 116 122 3940	113 116 122 4010	113 116 122 4080	113 116 122 4150
	2	113 116 122 3790	113 117 122 3860	113 117 122 3935	113 117 122 4005	113 117 122 4070	113 117 122 4140
35000 V _{FTO} = 151	-2	113 117 125 3905	113 117 125 3980	113 117 125 4055	113 117 125 4130	113 117 125 4205	113 117 125 4280
	-1	113 117 124 3875	113 117 124 3950	113 117 124 4025	113 117 124 4100	113 117 124 4175	113 117 124 4250
	0	113 117 124 3860	113 117 124 3935	113 117 124 4005	113 117 124 4075	113 117 124 4150	113 117 124 4225
	1	113 118 124 3850	113 118 124 3920	113 118 124 3990	113 118 124 4065	113 118 124 4135	113 118 124 4210
	2	113 119 124 3840	113 119 124 3915	113 119 124 3985	113 119 124 4055	113 119 124 4130	112 119 124 4200
36000 V _{FTO} = 153	-2	113 118 126 3945	113 118 126 4025	113 118 126 4100	113 118 126 4175	113 119 126 4255	113 119 126 4330
	-1	113 119 126 3920	113 119 126 3995	113 119 126 4075	113 119 126 4150	113 119 126 4225	113 119 126 4300
	0	113 119 125 3905	113 119 125 3980	113 119 125 4055	113 119 125 4130	113 119 125 4205	113 119 125 4280
	1	113 120 125 3900	113 120 125 3970	113 120 125 4045	113 120 125 4115	113 120 125 4190	113 120 125 4265
	2	113 121 125 3955	113 121 125 4030	113 121 125 4105	113 121 125 4180	113 121 125 4255	113 121 125 4330
38000 V _{FTO} = 157	-2	113 122 129 4035	113 122 129 4115	113 122 129 4195	113 122 129 4270	113 122 129 4350	113 122 129 4430
	-1	113 122 129 4015	113 122 129 4090	113 123 129 4170	113 123 129 4250	113 123 129 4325	113 123 129 4405
	0	113 123 129 4050	113 123 129 4130	113 123 129 4210	113 123 129 4285	113 123 129 4365	113 124 129 4445
	1	116 124 129 4230	116 124 129 4310	116 124 129 4395	116 124 129 4475	116 124 129 4555	116 124 129 4635
	2	118 125 129 4425	118 125 129 4510	118 125 129 4595	118 125 129 4685	118 125 129 4765	118 125 129 4850

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-34 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3650	114 115 126 3715	114 115 126 3785	114 115 126 3850	114 115 126 3920	114 115 126 3990
	-1	114 115 126 3620	114 115 125 3685	114 115 125 3750	114 115 125 3815	114 115 125 3880	114 115 125 3950
	0	114 115 125 3595	114 115 125 3660	114 115 125 3725	114 115 124 3790	114 115 124 3850	114 115 124 3915
	1	114 115 124 3570	114 115 124 3635	114 115 124 3700	114 115 124 3760	114 115 124 3825	114 115 124 3890
	2	114 115 123 3555	114 115 123 3615	114 115 123 3680	114 115 123 3745	114 115 123 3805	113 115 123 3870
30000 V _{FTO} = 140	-2	114 115 125 3740	114 115 125 3810	114 115 125 3885	114 115 125 3955	114 115 125 4025	114 115 125 4095
	-1	114 115 124 3715	114 115 124 3780	114 115 124 3850	114 115 124 3915	114 115 124 3990	114 115 124 4060
	0	114 115 124 3690	114 115 124 3755	114 115 123 3825	114 115 123 3890	114 115 123 3955	114 115 123 4025
	1	114 115 123 3670	114 115 123 3735	113 115 123 3800	113 115 123 3870	113 115 122 3935	113 115 122 4000
	2	113 115 122 3650	113 115 122 3720	113 115 122 3785	113 115 122 3850	113 115 122 3915	113 115 122 3985
32000 V _{FTO} = 145	-2	114 115 124 3835	114 115 124 3910	114 115 124 3980	114 115 124 4055	114 115 124 4130	114 115 124 4200
	-1	114 115 123 3805	114 115 123 3875	114 115 123 3945	113 115 123 4020	113 115 123 4095	113 115 123 4165
	0	113 115 123 3785	113 115 122 3855	113 115 122 3920	113 115 122 3990	113 115 122 4065	113 115 122 4135
	1	113 115 122 3770	113 115 122 3835	113 115 122 3905	113 115 121 3975	113 115 121 4040	113 115 121 4110
	2	113 115 121 3755	113 115 121 3825	113 115 121 3890	113 115 121 3960	113 115 120 4030	113 115 120 4095
33000 V _{FTO} = 147	-2	114 115 124 3880	114 115 124 3955	114 115 124 4030	114 115 124 4105	114 115 123 4180	113 115 123 4255
	-1	113 115 123 3850	113 115 123 3925	113 115 123 3995	113 115 123 4070	113 115 123 4145	113 115 123 4215
	0	113 115 122 3835	113 115 122 3905	113 115 122 3970	113 115 122 4045	113 115 122 4115	113 115 122 4190
	1	113 115 121 3820	113 115 121 3885	113 115 121 3955	113 115 121 4025	113 115 121 4095	113 115 121 4165
	2	113 115 120 3805	113 115 120 3875	113 115 120 3945	113 115 120 4015	113 115 120 4085	113 115 120 4155

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-35 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3925	114 115 124 4005	113 115 124 4075	113 115 124 4155	113 115 124 4230	113 115 124 4305
	-1	113 115 123 3900	113 115 123 3970	113 115 123 4045	113 115 123 4120	113 115 123 4195	113 115 123 4270
	0	113 115 123 3880	113 115 123 3950	113 116 122 4025	113 116 122 4095	113 116 122 4170	113 116 122 4245
	1	113 116 122 3865	113 116 122 3935	113 116 122 4010	113 116 122 4080	113 116 122 4150	113 116 122 4220
	2	113 116 122 3855	113 117 122 3930	113 117 122 4000	113 117 122 4070	113 117 122 4140	113 117 122 4210
35000 V _{FTO} = 151	-2	113 117 125 3975	113 117 125 4050	113 117 125 4125	113 117 125 4205	113 117 125 4280	113 117 125 4355
	-1	113 117 125 3945	113 117 124 4020	113 117 124 4095	113 117 124 4170	113 117 124 4250	113 117 124 4325
	0	113 117 124 3930	113 117 124 4000	113 117 124 4075	113 117 124 4150	113 117 124 4225	113 117 124 4300
	1	113 118 124 3915	113 118 124 3990	113 118 124 4060	113 118 124 4135	113 118 124 4205	113 118 124 4280
	2	113 119 124 3910	113 119 124 3980	113 119 124 4050	113 119 124 4125	112 119 124 4200	112 119 124 4270
36000 V _{FTO} = 153	-2	113 118 126 4020	113 118 126 4095	113 118 126 4175	113 119 126 4250	113 119 126 4330	113 119 126 4405
	-1	113 119 126 3990	113 119 126 4070	113 119 126 4145	113 119 126 4225	113 119 126 4300	113 119 126 4375
	0	113 119 125 3975	113 119 125 4050	113 119 125 4125	113 119 125 4200	113 119 125 4275	113 119 125 4355
	1	113 120 125 3965	113 120 125 4040	113 120 125 4115	113 120 125 4185	113 120 125 4260	113 120 125 4335
	2	113 121 125 4015	113 121 125 4090	113 121 125 4165	113 121 125 4240	113 121 125 4320	113 121 125 4395
38000 V _{FTO} = 157	-2	113 122 129 4110	113 122 129 4190	113 122 129 4270	113 122 129 4350	113 122 129 4430	113 122 129 4510
	-1	113 122 129 4085	113 122 129 4165	113 123 129 4245	113 123 129 4320	113 123 129 4400	113 123 129 4480
	0	113 123 129 4115	113 123 129 4195	113 123 129 4275	113 123 129 4355	113 124 129 4435	113 124 129 4510
	1	116 124 129 4295	116 124 129 4380	116 124 129 4460	116 124 129 4545	116 124 129 4625	116 124 129 4705
	2	118 125 129 4495	118 125 129 4580	118 125 129 4665	118 125 129 4755	118 125 129 4840	118 125 129 4925

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-35 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3780	114 115 126 3850	114 115 126 3920	114 115 126 3990	114 115 126 4060	114 115 125 4145
	-1	114 115 125 3745	114 115 125 3815	114 115 125 3880	114 115 125 3950	114 115 125 4020	114 115 125 4100
	0	114 115 125 3720	114 115 125 3785	114 115 124 3850	114 115 124 3920	114 115 124 3985	114 115 124 4065
	1	114 115 124 3695	114 115 124 3760	114 115 124 3825	114 115 124 3895	114 115 124 3960	114 115 123 4035
	2	114 115 123 3675	114 115 123 3740	114 115 123 3805	114 115 123 3870	113 115 123 3935	113 115 122 4015
30000 V _{FTO} = 140	-2	114 115 125 3875	114 115 125 3950	114 115 125 4025	114 115 125 4095	114 115 125 4170	114 115 124 4255
	-1	114 115 124 3845	114 115 124 3915	114 115 124 3985	114 115 124 4055	114 115 124 4130	114 115 124 4215
	0	114 115 124 3820	114 115 123 3885	114 115 123 3955	114 115 123 4025	114 115 123 4095	113 115 123 4180
	1	114 115 123 3795	113 115 123 3865	113 115 123 3935	113 115 122 4000	113 115 122 4070	113 115 122 4150
	2	113 115 122 3780	113 115 122 3850	113 115 122 3915	113 115 122 3985	113 115 122 4055	113 115 121 4130
32000 V _{FTO} = 145	-2	114 115 124 3975	114 115 124 4050	114 115 124 4125	114 115 124 4200	114 115 124 4280	113 115 124 4365
	-1	114 115 123 3940	114 115 123 4015	113 115 123 4090	113 115 123 4165	113 115 123 4240	113 115 123 4330
	0	113 115 123 3920	113 115 122 3990	113 115 122 4060	113 115 122 4135	113 115 122 4210	113 115 122 4295
	1	113 115 122 3900	113 115 122 3970	113 115 121 4040	113 115 121 4110	113 115 121 4185	113 115 121 4270
	2	113 115 121 3885	113 115 121 3955	113 115 121 4025	113 115 121 4100	113 115 120 4165	113 115 120 4255
33000 V _{FTO} = 147	-2	114 115 124 4020	114 115 124 4100	114 115 124 4175	113 115 123 4255	113 115 123 4330	113 115 123 4420
	-1	113 115 123 3990	113 115 123 4065	113 115 123 4140	113 115 123 4220	113 115 123 4295	113 115 122 4385
	0	113 115 122 3965	113 115 122 4040	113 115 122 4115	113 115 122 4190	113 115 122 4265	113 115 121 4355
	1	113 115 121 3950	113 115 121 4025	113 115 121 4095	113 115 121 4165	113 115 121 4240	113 115 121 4330
	2	113 115 120 3940	113 115 120 4010	113 115 120 4080	113 115 120 4155	113 115 120 4225	113 115 120 4315

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-36 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 4070	113 115 124 4150	113 115 124 4225	113 115 124 4305	113 115 124 4385	113 115 124 4475
	-1	113 115 123 4040	113 115 123 4115	113 115 123 4195	113 115 123 4270	113 116 123 4350	113 116 123 4440
	0	113 116 123 4015	113 116 123 4090	113 116 123 4165	113 116 123 4245	113 116 123 4320	113 116 122 4410
	1	113 116 122 4000	113 116 122 4075	113 116 122 4150	113 116 122 4225	113 116 122 4295	113 116 122 4390
	2	113 117 122 3990	113 117 122 4065	113 117 122 4140	113 117 122 4210	113 117 122 4285	113 117 122 4375
35000 V _{FTO} = 151	-2	113 117 125 4120	113 117 125 4195	113 117 125 4275	113 117 125 4355	113 117 125 4435	113 117 125 4530
	-1	113 117 125 4090	113 117 125 4165	113 117 125 4245	113 117 124 4325	113 117 124 4400	113 117 124 4495
	0	113 117 124 4065	113 117 124 4140	113 117 124 4220	113 117 124 4295	113 117 124 4375	113 117 124 4470
	1	113 118 124 4055	113 118 124 4125	113 118 124 4205	113 118 124 4280	113 118 124 4355	113 118 124 4450
	2	113 119 124 4045	113 119 124 4120	113 119 124 4195	112 119 124 4270	112 119 124 4345	112 119 124 4435
36000 V _{FTO} = 153	-2	113 118 127 4165	113 119 127 4245	113 119 126 4325	113 119 126 4405	113 119 126 4490	113 119 126 4585
	-1	113 119 126 4135	113 119 126 4215	113 119 126 4295	113 119 126 4375	113 119 126 4455	113 119 126 4550
	0	113 119 125 4115	113 119 125 4195	113 119 125 4270	113 119 125 4350	113 119 125 4430	113 120 125 4525
	1	113 120 125 4105	113 120 125 4180	113 120 125 4255	113 120 125 4335	113 120 125 4410	112 120 125 4510
	2	113 121 125 4140	113 121 125 4220	113 121 125 4295	113 121 125 4370	113 121 125 4450	113 121 125 4580
38000 V _{FTO} = 157	-2	113 122 129 4260	113 122 129 4340	113 122 129 4425	113 122 129 4510	113 122 129 4590	113 122 129 4690
	-1	113 122 129 4235	113 123 129 4315	113 123 129 4395	113 123 129 4480	113 123 129 4560	113 123 129 4660
	0	113 123 129 4250	113 123 129 4330	113 123 129 4410	113 124 129 4490	113 124 129 4570	113 124 129 4700
	1	116 124 129 4435	116 124 129 4520	115 124 129 4600	115 124 129 4685	115 124 129 4770	116 125 129 4905
	2	118 125 129 4635	118 125 129 4725	118 125 129 4810	118 125 129 4900	118 125 129 4990	118 125 129 5135

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07–11A–01–36 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3915	114 115 126 3990	114 115 126 4065	114 115 126 4140	114 115 125 4220	114 115 125 4340
	-1	114 115 125 3885	114 115 125 3950	114 115 125 4025	114 115 125 4095	114 115 125 4175	114 115 124 4300
	0	114 115 124 3855	114 115 124 3920	114 115 124 3990	114 115 124 4060	114 115 124 4135	113 115 123 4260
	1	114 115 124 3830	114 115 124 3895	114 115 124 3965	114 115 123 4035	114 115 123 4110	113 115 122 4235
	2	114 115 123 3805	114 115 123 3875	113 115 123 3940	113 115 123 4010	113 115 122 4085	113 115 122 4210
30000 V _{FTO} = 140	-2	114 115 125 4020	114 115 125 4100	114 115 125 4175	114 115 125 4250	114 115 124 4335	113 115 124 4465
	-1	114 115 124 3985	114 115 124 4060	114 115 124 4135	114 115 124 4210	114 115 124 4290	113 115 123 4425
	0	114 115 123 3960	114 115 123 4030	114 115 123 4100	113 115 123 4175	113 115 123 4255	113 115 122 4390
	1	113 115 123 3935	113 115 122 4005	113 115 122 4075	113 115 122 4150	113 115 122 4225	113 115 121 4365
	2	113 115 122 3915	113 115 122 3985	113 115 122 4060	113 115 121 4130	113 115 121 4205	113 115 121 4345
32000 V _{FTO} = 145	-2	114 115 124 4125	114 115 124 4205	114 115 124 4280	114 115 124 4360	113 115 124 4445	113 115 123 4585
	-1	113 115 123 4090	113 115 123 4165	113 115 123 4245	113 115 123 4320	113 115 123 4405	113 115 122 4545
	0	113 115 122 4060	113 115 122 4135	113 115 122 4210	113 115 122 4290	113 115 122 4375	113 115 121 4520
	1	113 115 121 4040	113 115 121 4115	113 115 121 4190	113 115 121 4260	113 115 121 4345	113 115 120 4495
	2	113 115 121 4025	113 115 121 4100	113 115 120 4175	113 115 120 4245	113 115 120 4330	112 115 120 4480
33000 V _{FTO} = 147	-2	114 115 124 4175	113 115 123 4255	113 115 123 4335	113 115 123 4415	113 115 123 4505	113 115 122 4645
	-1	113 115 123 4140	113 115 123 4220	113 115 123 4300	113 115 122 4375	113 115 122 4465	113 115 122 4610
	0	113 115 122 4115	113 115 122 4190	113 115 122 4265	113 115 122 4345	113 115 121 4430	113 115 121 4580
	1	113 115 121 4095	113 115 121 4170	113 115 121 4245	113 115 121 4320	113 115 121 4405	113 115 120 4560
	2	113 115 120 4080	113 115 120 4155	113 115 120 4230	113 115 120 4305	113 115 120 4390	112 115 120 4550

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-37 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 4225	113 115 124 4305	113 115 124 4390	113 115 124 4470	113 115 124 4560	113 115 123 4700
	-1	113 115 123 4190	113 115 123 4270	113 116 123 4350	113 116 123 4430	113 116 123 4520	113 116 122 4670
	0	113 116 123 4165	113 116 123 4245	113 116 123 4320	113 116 123 4400	113 116 122 4490	113 116 122 4645
	1	113 116 122 4150	113 116 122 4225	113 116 122 4300	113 116 122 4380	113 116 122 4465	112 117 122 4625
	2	113 117 122 4140	113 117 122 4215	113 117 122 4290	113 117 122 4365	112 117 122 4450	112 118 122 4615
35000 V _{FTO} = 151	-2	113 117 125 4275	113 117 125 4355	113 117 125 4440	113 117 125 4525	113 117 125 4615	113 117 124 4760
	-1	113 117 125 4240	113 117 125 4325	113 117 124 4405	113 117 124 4485	113 117 124 4575	113 117 124 4730
	0	113 117 124 4220	113 117 124 4300	113 117 124 4380	113 118 124 4460	113 118 124 4550	112 118 124 4705
	1	113 118 124 4200	113 118 124 4280	113 118 124 4360	113 118 124 4440	113 118 124 4525	112 119 124 4690
	2	113 119 124 4195	112 119 124 4270	112 119 124 4350	112 119 124 4425	112 119 124 4515	112 120 124 4685
36000 V _{FTO} = 153	-2	113 119 127 4325	113 119 126 4410	113 119 126 4490	113 119 126 4575	113 119 126 4670	113 119 126 4820
	-1	113 119 126 4295	113 119 126 4375	113 119 126 4460	113 119 126 4540	113 119 126 4635	113 119 125 4790
	0	113 119 125 4270	113 119 125 4350	113 119 125 4435	113 119 125 4515	113 120 125 4605	112 120 125 4770
	1	113 120 125 4255	113 120 125 4335	113 120 125 4415	113 120 125 4495	112 120 125 4590	112 121 125 4755
	2	113 121 125 4290	113 121 125 4370	113 121 125 4450	113 121 125 4530	113 121 125 4635	115 122 125 4975
38000 V _{FTO} = 157	-2	113 122 129 4420	113 122 129 4510	113 122 129 4595	113 122 129 4680	113 122 129 4775	113 123 129 4935
	-1	113 123 129 4395	113 123 129 4480	113 123 129 4565	113 123 129 4650	113 123 129 4745	112 124 129 4910
	0	113 123 129 4405	113 124 129 4490	113 124 129 4570	113 124 129 4655	113 124 129 4760	114 124 129 5090
	1	115 124 129 4595	115 124 129 4685	115 124 129 4770	115 124 129 4855	115 125 129 4970	117 125 129 5325
	2	118 125 129 4805	118 125 129 4900	118 125 129 4990	118 125 129 5080	118 125 129 5200	120 126 129 5615

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-37 (Sheet 2 of 2)

**WET RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 4070	114 115 126 4145	114 115 125 4220	114 115 125 4300	114 115 125 4420	113 115 124 4560
	-1	114 115 125 4025	114 115 125 4100	114 115 125 4180	114 115 125 4255	114 115 124 4380	113 115 123 4520
	0	114 115 124 3995	114 115 124 4065	114 115 124 4140	114 115 124 4215	113 115 123 4340	113 115 122 4485
	1	114 115 123 3970	114 115 123 4040	114 115 123 4110	114 115 123 4185	113 115 122 4310	113 115 122 4460
	2	113 115 123 3945	113 115 123 4015	113 115 122 4085	113 115 122 4160	113 115 122 4285	113 115 121 4440
30000 V _{FTO} = 140	-2	114 115 125 4175	114 115 125 4255	114 115 124 4335	114 115 124 4420	113 115 124 4545	113 115 123 4695
	-1	114 115 124 4135	114 115 124 4215	114 115 124 4295	114 115 124 4375	113 115 123 4505	113 115 122 4655
	0	114 115 123 4105	113 115 123 4180	113 115 123 4255	113 115 123 4335	113 115 122 4475	113 115 121 4630
	1	113 115 122 4080	113 115 122 4155	113 115 122 4230	113 115 122 4305	113 115 121 4445	113 115 121 4605
	2	113 115 122 4060	113 115 121 4135	113 115 121 4210	113 115 121 4285	113 115 121 4425	112 115 120 4590
32000 V _{FTO} = 145	-2	114 115 124 4285	114 115 124 4365	113 115 124 4450	113 115 124 4535	113 115 123 4670	113 115 122 4825
	-1	113 115 123 4245	113 115 123 4330	113 115 123 4410	113 115 123 4490	113 115 122 4635	113 115 121 4795
	0	113 115 122 4215	113 115 122 4295	113 115 122 4375	113 115 122 4455	113 115 121 4600	113 115 120 4770
	1	113 115 121 4195	113 115 121 4270	113 115 121 4345	113 115 121 4430	113 115 120 4580	112 115 120 4750
	2	113 115 120 4175	113 115 120 4255	113 115 120 4330	113 115 120 4410	112 115 120 4560	112 115 119 4740
33000 V _{FTO} = 147	-2	113 115 123 4335	113 115 123 4420	113 115 123 4505	113 115 123 4590	113 115 122 4730	113 115 122 4895
	-1	113 115 123 4300	113 115 122 4380	113 115 122 4465	113 115 122 4550	113 115 122 4695	113 115 121 4860
	0	113 115 122 4270	113 115 122 4350	113 115 121 4435	113 115 121 4515	113 115 121 4665	112 115 120 4840
	1	113 115 121 4250	113 115 121 4330	113 115 121 4405	113 115 121 4490	113 115 120 4645	112 115 120 4825
	2	113 115 120 4235	113 115 120 4315	113 115 120 4390	113 115 120 4470	112 115 120 4630	112 116 120 4815

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-38 (Sheet 1 of 2)

WET RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 4390	113 115 124 4475	113 115 124 4560	113 116 124 4650	113 115 123 4795	113 115 122 4960
	-1	113 116 123 4355	113 116 123 4440	113 116 123 4520	113 116 123 4610	113 116 122 4760	112 116 122 4930
	0	113 116 123 4325	113 116 122 4410	113 116 122 4490	113 116 122 4575	113 116 122 4730	112 117 122 4905
	1	113 116 122 4305	113 116 122 4385	113 116 122 4465	113 116 122 4550	112 117 122 4710	112 117 122 4895
	2	113 117 122 4295	113 117 122 4375	113 117 122 4455	112 117 122 4535	112 118 122 4700	112 118 122 4890
35000 V _{FTO} = 151	-2	113 117 125 4440	113 117 125 4530	113 117 125 4615	113 117 125 4705	113 117 124 4855	113 117 124 5025
	-1	113 117 124 4410	113 117 124 4495	113 117 124 4580	113 117 124 4665	113 117 124 4820	112 118 124 4995
	0	113 117 124 4380	113 118 124 4465	113 118 124 4550	113 118 124 4635	112 118 124 4795	112 119 124 4975
	1	113 118 124 4360	113 118 124 4445	113 118 124 4525	113 118 124 4615	112 119 124 4780	112 120 124 4970
	2	112 119 124 4355	112 119 124 4435	112 119 124 4515	112 119 124 4600	112 120 124 4770	114 120 124 5130
36000 V _{FTO} = 153	-2	113 119 126 4495	113 119 126 4585	113 119 126 4670	113 119 126 4760	113 119 126 4915	112 119 126 5085
	-1	113 119 126 4460	113 119 126 4550	113 119 126 4635	113 119 126 4725	113 119 126 4880	112 120 126 5060
	0	113 119 126 4435	113 120 126 4520	113 120 126 4610	113 120 126 4695	112 120 126 4860	112 121 126 5045
	1	113 120 126 4420	112 120 126 4505	112 120 126 4590	112 120 126 4675	112 121 126 4845	114 122 126 5195
	2	113 121 126 4460	113 121 126 4545	113 121 126 4630	113 121 126 4715	114 122 126 5045	116 122 126 5465
38000 V _{FTO} = 157	-2	113 122 129 4600	113 122 129 4685	113 122 129 4780	113 122 129 4870	113 123 129 5030	112 123 129 5215
	-1	113 123 129 4570	113 123 129 4655	113 123 129 4745	113 123 129 4840	112 124 129 5005	113 124 129 5300
	0	113 124 129 4580	113 124 129 4670	113 124 129 4755	113 124 129 4845	114 124 129 5165	116 125 129 5550
	1	115 124 129 4780	115 124 129 4875	115 125 129 4965	115 125 129 5055	117 125 129 5400	119 126 129 5835
	2	118 125 129 5000	118 125 129 5095	118 125 129 5190	118 125 129 5285	120 126 129 5690	122 127 129 6170

TODATA_350SFO_IMP_F20_WET_ALL_4K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-38 (Sheet 2 of 2)

**WET RUNWAY WIND CORRECTIONS**

	WIND (KNOTS)	UNCORRECTED V_1 (KIAS)				
		110	115	116	120	125
CORRECTED V_1 (KIAS)	-10	110	115	118	122	127
	0	110	115	116	120	125
	10	110	115	115	119	124
	20	110	115	114	118	123
	30	110	115	113	117	122

	WIND (KNOTS)	UNCORRECTED V_1 (KIAS)				
		110	115	116	120	125
TOFL FACTOR	-10	1.33	1.33	1.33	1.33	1.33
	0	1.00	1.00	1.00	1.00	1.00
	10	0.95	0.95	0.95	0.95	0.95
	20	0.89	0.89	0.89	0.89	0.89
	30	0.83	0.83	0.83	0.83	0.83

TODATA_350SFO_F20_WET_WIND_CORR_22FEB19

NOTES:

1. In the tables, tailwinds are shown as negative values and headwinds as positive values.
2. If the corrected V_1 exceeds V_R for the appropriate conditions, use $V_1 = V_R$.

WET RUNWAY CORRECTIONS
DISPATCH WITH ONE THRUST REVERSER INOPERATIVE

	UNCORRECTED V_1 (KIAS)				
	110	115	116	120	125
CORRECTED V_1 (KIAS)	110	115	115	119	124
TOFL FACTOR	1.08	1.08	1.08	1.08	1.08

TODATA_350SFO_F20_WET_TREV_CORR_22FEB19

NOTE: If the corrected V_1 exceeds V_R for the appropriate conditions, use $V_1 = V_R$.

Figure 07-11A-01-39

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED OFF**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
28000 V _{FTO} = 136	-2	114 115 126 3460	114 115 126 3515	114 115 126 3565	114 115 126 3620	114 115 126 3675	114 115 126 3730	114 115 125 3825	
		114 115 125 3445	114 115 125 3500	114 115 125 3550	114 115 125 3600	114 115 125 3655	114 115 125 3710	114 115 125 3810	
	-1	114 115 125 3430	114 115 124 3480	114 115 124 3535	114 115 124 3590	114 115 124 3640	114 115 124 3695	113 115 124 3795	
		114 115 124 3415	114 115 124 3470	114 115 124 3525	114 115 124 3575	114 115 123 3630	114 115 123 3680	113 115 123 3790	
	0	114 115 123 3410	114 115 123 3460	114 115 123 3515	114 115 123 3565	113 115 123 3620	113 115 123 3675	113 115 122 3785	
		114 115 123 3400	114 115 123 3450	114 115 123 3500	114 115 123 3550	113 115 123 3600	113 115 123 3650	113 115 122 3760	
	1	114 115 123 3390	114 115 123 3440	114 115 123 3490	114 115 123 3540	113 115 123 3590	113 115 123 3640	113 115 122 3750	
		114 115 123 3380	114 115 123 3430	114 115 123 3480	114 115 123 3530	113 115 123 3580	113 115 123 3630	113 115 122 3740	
	2	114 115 123 3370	114 115 123 3420	114 115 123 3470	114 115 123 3520	113 115 123 3570	113 115 123 3620	113 115 122 3730	
		114 115 123 3360	114 115 123 3410	114 115 123 3460	114 115 123 3510	113 115 123 3560	113 115 123 3610	113 115 122 3720	
30000 V _{FTO} = 140	-2	114 115 125 3545	114 115 125 3600	114 115 125 3655	114 115 125 3710	114 115 125 3765	114 115 125 3820	113 115 124 3925	
		114 115 124 3530	114 115 124 3580	114 115 124 3640	114 115 124 3695	114 115 124 3750	114 115 124 3805	113 115 124 3915	
	-1	114 115 123 3520	114 115 123 3575	114 115 123 3630	114 115 123 3685	113 115 123 3740	113 115 123 3795	113 115 123 3905	
		114 115 123 3510	114 115 123 3560	114 115 123 3615	114 115 122 3670	113 115 122 3725	113 115 122 3780	113 115 122 3890	
	0	113 115 123 3500	113 115 123 3550	113 115 122 3600	113 115 122 3655	113 115 122 3710	113 115 122 3765	113 115 122 3875	
		113 115 122 3490	113 115 122 3540	113 115 122 3590	113 115 122 3645	113 115 121 3700	113 115 121 3755	113 115 121 3865	
	1	113 115 122 3480	113 115 122 3530	113 115 122 3580	113 115 122 3635	113 115 121 3690	113 115 121 3745	113 115 121 3855	
		113 115 122 3470	113 115 122 3520	113 115 122 3570	113 115 122 3625	113 115 121 3680	113 115 121 3735	113 115 121 3845	
	2	113 115 122 3460	113 115 122 3510	113 115 122 3560	113 115 122 3615	113 115 121 3670	113 115 121 3725	113 115 121 3780	
		113 115 122 3450	113 115 122 3500	113 115 122 3550	113 115 122 3605	113 115 121 3660	113 115 121 3715	113 115 121 3770	
32000 V _{FTO} = 145	-2	114 115 124 3630	114 115 124 3690	114 115 124 3745	114 115 124 3800	114 115 124 3855	114 115 124 3915	113 115 124 4025	
		114 115 123 3620	114 115 123 3680	114 115 123 3730	114 115 123 3790	113 115 123 3845	113 115 123 3905	113 115 123 4020	
	-1	113 115 122 3610	113 115 122 3670	113 115 122 3725	113 115 122 3780	113 115 122 3840	113 115 122 3895	113 115 122 4015	
		113 115 122 3600	113 115 122 3660	113 115 122 3715	113 115 121 3770	113 115 121 3830	113 115 121 3885	113 115 121 4000	
	0	113 115 121 3600	113 115 121 3660	113 115 121 3715	113 115 120 3770	113 115 120 3830	113 115 120 3885	113 115 120 4000	
		113 115 121 3590	113 115 121 3650	113 115 121 3705	113 115 120 3765	113 115 120 3825	113 115 120 3880	113 115 120 3995	
	1	113 115 121 3580	113 115 121 3640	113 115 121 3695	113 115 120 3755	113 115 120 3815	113 115 120 3870	113 115 120 3985	
		113 115 121 3570	113 115 121 3630	113 115 121 3685	113 115 120 3745	113 115 120 3805	113 115 120 3860	113 115 120 3975	
	2	113 115 121 3560	113 115 121 3620	113 115 121 3675	113 115 120 3735	113 115 120 3795	113 115 120 3850	113 115 120 3965	
		113 115 121 3550	113 115 121 3610	113 115 121 3665	113 115 120 3725	113 115 120 3785	113 115 120 3840	113 115 120 3955	
33000 V _{FTO} = 147	-2	114 115 124 3675	114 115 124 3730	114 115 123 3790	113 115 123 3845	113 115 123 3905	113 115 123 3960	113 115 123 4075	
		113 115 123 3665	113 115 123 3725	113 115 123 3780	113 115 123 3835	113 115 122 3895	113 115 122 3950	113 115 122 4070	
	-1	113 115 122 3655	113 115 122 3715	113 115 122 3770	113 115 122 3830	113 115 122 3885	113 115 122 3945	113 115 121 4070	
		113 115 121 3655	113 115 121 3715	113 115 121 3770	113 115 121 3825	113 115 121 3885	113 115 121 3945	113 115 121 4075	
	0	113 115 120 3655	113 115 120 3715	113 115 120 3770	113 115 120 3830	113 115 120 3890	113 115 120 3945	113 115 120 4080	
		113 115 120 3645	113 115 120 3705	113 115 120 3765	113 115 120 3820	113 115 120 3880	113 115 120 3935	113 115 120 4075	
	1	113 115 120 3635	113 115 120 3695	113 115 120 3755	113 115 120 3815	113 115 120 3875	113 115 120 3930	113 115 120 4065	
		113 115 120 3625	113 115 120 3685	113 115 120 3745	113 115 120 3805	113 115 120 3865	113 115 120 3920	113 115 120 4060	
	2	113 115 120 3615	113 115 120 3675	113 115 120 3735	113 115 120 3795	113 115 120 3855	113 115 120 3910	113 115 120 4055	
		113 115 120 3605	113 115 120 3665	113 115 120 3725	113 115 120 3785	113 115 120 3845	113 115 120 3900	113 115 120 4050	

TODATA_350SFO_IMP_F20_WETG_ZERO_SL_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-40 (Sheet 1 of 2)



WET GROOVED RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE SEA LEVEL

V₁ (KIAS) V_R (KIAS)

ENGINE BLEED OFF

V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)									
WT (LB)	RWY	TEMPERATURE (°C)							
V _{FTO} (KIAS)	GRD (%)	5 & BELOW	10	15	20	25	30	35	
34000 V _{FTO} = 149	-2	113 115 124 3715	113 115 124 3775	113 115 124 3835	113 115 124 3890	113 115 124 3950	113 115 124 4010	113 115 124 4125	
	-1	113 115 123 3710	113 115 123 3765	113 115 123 3825	113 115 123 3880	113 116 123 3940	113 116 123 4000	113 116 123 4125	
	0	113 116 122 3700	113 116 122 3765	113 116 122 3820	113 116 122 3880	113 116 122 3935	113 116 122 3995	113 116 122 4125	
	1	113 116 122 3705	113 116 122 3765	113 116 122 3820	113 116 122 3880	113 116 122 3935	113 116 122 3995	112 116 122 4130	
	2	113 117 122 3705	113 117 122 3765	113 117 122 3825	113 117 122 3885	113 117 122 3945	113 117 122 4000	112 117 122 4140	
35000 V _{FTO} = 151	-2	113 117 125 3755	113 117 125 3820	113 117 125 3875	113 117 125 3935	113 117 125 3995	113 117 125 4055	113 117 125 4175	
	-1	113 117 124 3750	113 117 124 3810	113 117 124 3870	113 117 124 3930	113 117 124 3990	113 117 124 4050	113 117 124 4175	
	0	113 117 124 3750	113 117 124 3810	113 117 124 3870	113 117 124 3930	113 117 124 3985	113 117 124 4045	112 117 124 4180	
	1	113 118 124 3750	113 118 124 3815	113 118 124 3870	113 118 124 3930	113 118 124 3990	113 118 124 4050	112 118 124 4190	
	2	113 119 124 3785	113 119 124 3850	113 119 124 3905	113 119 124 3965	113 119 124 4025	113 119 124 4090	113 119 124 4275	
36000 V _{FTO} = 153	-2	113 118 126 3800	113 119 126 3860	113 119 126 3920	113 119 126 3980	113 119 126 4040	113 119 126 4100	113 119 126 4225	
	-1	113 119 126 3795	113 119 126 3855	113 119 126 3915	113 119 126 3975	113 119 126 4035	113 119 126 4100	113 119 126 4230	
	0	113 119 125 3795	113 119 125 3855	113 119 125 3915	113 119 125 3975	113 119 125 4035	113 119 125 4095	112 120 125 4235	
	1	113 120 125 3845	113 120 125 3910	113 120 125 3970	113 120 125 4030	113 120 125 4095	113 120 125 4155	114 120 125 4345	
	2	115 121 125 4000	116 121 125 4070	115 121 125 4130	115 121 125 4195	115 121 125 4255	115 121 125 4320	116 121 125 4530	
38000 V _{FTO} = 157	-2	113 122 129 3885	113 122 129 3945	113 122 129 4005	113 122 129 4070	113 122 129 4130	113 122 129 4195	113 122 129 4330	
	-1	114 123 129 3940	114 123 129 4010	114 123 129 4070	114 123 129 4135	114 123 129 4200	114 123 129 4265	114 123 129 4450	
	0	116 123 129 4105	116 123 129 4175	116 123 129 4240	116 124 129 4305	116 124 129 4370	116 124 129 4440	116 124 129 4640	
	1	118 124 129 4275	118 124 129 4350	118 124 129 4415	118 124 129 4485	118 124 129 4555	118 124 129 4625	118 124 129 4845	
	2	120 125 129 4460	120 125 129 4540	120 125 129 4610	120 125 129 4680	120 125 129 4755	120 125 129 4825	120 125 129 5070	

TODATA_350SFO_IMP_F20_WETG_ZERO_SL_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-40 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115	114 115	114 115
		126 3515	126 3570	126 3625	126 3680	126 3735	125 3800	125 3885	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	114 115	114 115
		125 3500	125 3555	125 3605	125 3660	125 3715	125 3785	125 3870	
	0	114 115	114 115	114 115	114 115	114 115	114 115	113 115	113 115
		124 3480	124 3535	124 3590	124 3645	124 3700	124 3770	124 3860	
	1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3470	124 3525	124 3580	123 3630	123 3685	123 3755	123 3850	
	2	114 115	114 115	114 115	113 115	113 115	113 115	113 115	113 115
		123 3460	123 3515	123 3570	123 3625	123 3675	123 3750	122 3850	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	114 115	114 115	114 115
		125 3600	125 3660	125 3715	125 3770	125 3825	124 3900	124 3990	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	113 115	113 115
		124 3590	124 3645	124 3700	124 3755	124 3810	124 3885	124 3980	
	0	114 115	114 115	114 115	113 115	113 115	113 115	113 115	113 115
		123 3575	123 3630	123 3685	123 3745	123 3800	123 3870	123 3970	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3565	122 3625	122 3675	122 3735	122 3790	122 3865	122 3970	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3560	122 3620	122 3675	121 3730	121 3785	121 3860	121 3970	
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3690	124 3745	124 3805	124 3860	124 3920	124 3995	123 4095	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3680	123 3735	123 3790	123 3850	123 3910	123 3985	123 4085	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3670	122 3725	122 3785	122 3840	122 3900	122 3975	122 4085	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		121 3665	121 3720	121 3780	121 3835	121 3895	121 3975	121 4085	
	2	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3665	121 3720	120 3780	120 3835	120 3895	120 3975	120 4090	
33000 V _{FTO} = 147	-2	114 115	114 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 3730	124 3790	123 3850	123 3905	123 3965	123 4045	123 4145	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3720	123 3780	123 3840	122 3895	122 3955	122 4035	122 4140	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3715	122 3775	122 3830	122 3890	122 3950	122 4030	121 4140	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3715	121 3770	121 3830	121 3890	121 3950	121 4030	120 4145	
	2	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		120 3715	120 3775	120 3830	120 3890	120 3950	120 4035	120 4155	

TODATA_350SFO_IMP_F20_WETG_ZERO_500_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-41 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
34000 V _{FTO} = 149	-2	113 115 124 3775	113 115 124 3835	113 115 124 3890	113 115 124 3955	113 115 124 4015	113 115 124 4095	113 115 123 4195	
	-1	113 115 123 3765	113 115 123 3825	113 115 123 3885	113 116 123 3945	113 116 123 4005	113 116 123 4085	113 116 123 4195	
	0	113 116 122 3760	113 116 122 3825	113 116 122 3880	113 116 122 3940	113 116 122 4000	113 116 122 4085	113 116 122 4195	
	1	113 116 122 3765	113 116 122 3820	113 116 122 3880	113 116 122 3940	113 116 122 4000	113 116 122 4085	112 116 122 4205	
	2	113 117 122 3765	113 117 122 3825	113 117 122 3885	113 117 122 3945	113 117 122 4005	112 117 122 4090	112 117 122 4220	
35000 V _{FTO} = 151	-2	113 117 125 3820	113 117 125 3880	113 117 125 3935	113 117 125 4000	113 117 125 4060	113 117 125 4140	113 117 125 4250	
	-1	113 117 124 3810	113 117 124 3870	113 117 124 3930	113 117 124 3990	113 117 124 4055	113 117 124 4135	113 117 124 4250	
	0	113 117 124 3810	113 117 124 3870	113 117 124 3930	113 117 124 3990	113 117 124 4050	113 117 124 4135	112 118 124 4255	
	1	113 118 124 3810	113 118 124 3870	113 118 124 3930	113 118 124 3995	113 118 124 4055	112 118 124 4140	112 118 124 4265	
	2	113 119 124 3840	113 119 124 3905	113 119 124 3965	113 119 124 4025	113 119 124 4090	113 119 124 4195	113 119 124 4380	
36000 V _{FTO} = 153	-2	113 119 126 3860	113 119 126 3925	113 119 126 3980	113 119 126 4045	113 119 126 4105	113 119 126 4190	113 119 126 4300	
	-1	113 119 126 3855	113 119 126 3915	113 119 126 3980	113 119 126 4040	113 119 126 4100	113 119 126 4185	113 119 125 4305	
	0	113 119 125 3855	113 119 125 3920	113 119 125 3975	113 119 125 4040	113 119 125 4100	113 120 125 4190	112 120 125 4310	
	1	113 120 125 3905	113 120 125 3970	113 120 125 4030	113 120 125 4095	113 120 125 4160	113 120 125 4260	114 120 125 4445	
	2	115 121 125 4060	115 121 125 4130	115 121 125 4190	115 121 125 4260	115 121 125 4325	115 121 125 4435	116 121 125 4640	
38000 V _{FTO} = 157	-2	113 122 129 3945	113 122 129 4010	113 122 129 4070	113 122 129 4135	113 122 129 4200	113 122 129 4285	112 122 129 4405	
	-1	114 123 129 4005	114 123 129 4070	114 123 129 4135	114 123 129 4200	114 123 129 4265	114 123 129 4370	114 123 129 4550	
	0	116 123 129 4170	116 123 129 4240	116 124 129 4305	116 124 129 4370	116 124 129 4440	116 124 129 4555	116 124 129 4750	
	1	118 124 129 4340	118 124 129 4415	118 124 129 4480	118 124 129 4555	118 124 129 4625	118 124 129 4745	119 125 129 4965	
	2	120 125 129 4530	120 125 129 4610	120 125 129 4680	120 125 129 4755	120 125 129 4830	120 125 129 4960	121 125 129 5195	

TODATA_350SFO_IMP_F20_WETG_ZERO_500_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-41 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115	114 115	114 115
		126 3570	126 3625	126 3680	126 3735	125 3790	125 3880	125 3950	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	113 115	113 115
		125 3555	125 3605	125 3660	125 3715	125 3775	125 3865	124 3935	
	0	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3535	124 3590	124 3645	124 3700	124 3755	124 3850	124 3925	
	1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3525	124 3580	124 3635	123 3690	123 3745	123 3840	123 3920	
	2	114 115	114 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3515	123 3570	123 3625	123 3680	123 3735	122 3835	122 3915	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	114 115	113 115	113 115
		125 3660	125 3715	125 3770	125 3830	124 3885	124 3985	124 4055	
	-1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3640	124 3700	124 3755	124 3815	124 3870	124 3970	123 4045	
	0	114 115	114 115	114 115	113 115	113 115	113 115	113 115	113 115
		123 3630	123 3690	123 3745	123 3800	123 3860	123 3960	123 4040	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3625	122 3680	122 3735	122 3790	122 3850	122 3955	122 4040	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3615	122 3675	122 3730	121 3785	121 3845	121 3955	121 4040	
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3745	124 3805	124 3865	124 3925	124 3985	124 4085	123 4165	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3735	123 3795	123 3850	123 3910	123 3970	123 4075	122 4155	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3725	122 3785	122 3840	122 3900	122 3960	122 4070	122 4155	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		121 3720	121 3780	121 3835	121 3895	121 3955	121 4070	121 4160	
	2	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3720	121 3780	120 3835	120 3895	120 3955	120 4075	120 4165	
33000 V _{FTO} = 147	-2	114 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 3790	123 3850	123 3910	123 3970	123 4030	123 4135	123 4215	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3780	123 3840	123 3900	122 3960	122 4020	122 4125	122 4210	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3775	122 3835	122 3890	122 3950	122 4010	121 4125	121 4215	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3770	121 3830	121 3890	121 3950	121 4010	121 4125	120 4220	
	2	113 115	113 115	113 115	113 115	113 115	112 115	112 115	112 115
		120 3770	120 3830	120 3890	120 3950	120 4010	120 4135	120 4230	

TODATA_350SFO_IMP_F20_WETG_ZERO_1K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-42 (Sheet 1 of 2)



WET GROOVED RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 1000 FT

ENGINE BLEED OFF

V₁ (KIAS) V_R (KIAS)V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
34000 V _{FTO} = 149	-2	113 115 124 3835	113 115 124 3895	113 115 124 3955	113 115 124 4015	113 115 124 4080	113 115 124 4185	113 115 123 4270	
	-1	113 115 123 3825	113 115 123 3885	113 116 123 3945	113 116 123 4010	113 116 123 4065	113 116 123 4180	113 116 123 4270	
	0	113 116 123 3820	113 116 123 3880	113 116 123 3940	113 116 122 4000	113 116 122 4065	113 116 122 4180	112 116 122 4270	
	1	113 116 122 3820	113 116 122 3880	113 116 122 3940	113 116 122 4000	113 116 122 4060	112 116 122 4185	112 116 122 4280	
	2	113 117 122 3825	113 117 122 3885	113 117 122 3945	113 117 122 4005	113 117 122 4070	112 117 122 4195	112 117 122 4295	
35000 V _{FTO} = 151	-2	113 117 125 3880	113 117 125 3940	113 117 125 4000	113 117 125 4060	113 117 125 4125	113 117 125 4235	113 117 125 4325	
	-1	113 117 124 3870	113 117 124 3930	113 117 124 3995	113 117 124 4055	113 117 124 4115	113 117 124 4235	113 117 124 4325	
	0	113 117 124 3870	113 117 124 3930	113 117 124 3990	113 117 124 4050	113 118 124 4115	113 118 124 4235	112 118 124 4330	
	1	113 118 124 3870	113 118 124 3930	113 118 124 3995	113 118 124 4055	113 118 124 4115	112 118 124 4245	112 119 124 4345	
	2	113 119 124 3895	113 119 124 3960	113 119 124 4020	113 119 124 4085	113 119 124 4150	113 119 124 4315	114 119 124 4480	
36000 V _{FTO} = 153	-2	113 119 126 3920	113 119 126 3985	113 119 126 4045	113 119 126 4110	113 119 126 4170	113 119 126 4285	113 119 126 4380	
	-1	113 119 126 3915	113 119 126 3980	113 119 126 4040	113 119 126 4100	113 119 126 4165	113 119 126 4285	112 119 125 4380	
	0	113 119 125 3915	113 119 125 3980	113 119 125 4040	113 119 125 4105	113 120 125 4165	112 120 125 4290	112 120 125 4390	
	1	113 120 125 3960	113 120 125 4025	113 120 125 4090	113 120 125 4155	113 120 125 4220	113 120 125 4380	114 121 125 4550	
	2	115 121 125 4120	115 121 125 4185	115 121 125 4250	115 121 125 4320	115 121 125 4390	115 121 125 4570	116 121 125 4755	
38000 V _{FTO} = 157	-2	113 122 129 4005	113 122 129 4070	113 122 129 4135	113 122 129 4200	113 122 129 4265	113 122 129 4390	112 122 129 4485	
	-1	114 123 129 4065	114 123 129 4130	114 123 129 4195	114 123 129 4265	114 123 129 4330	114 123 129 4490	114 123 129 4655	
	0	116 123 129 4230	116 124 129 4300	116 124 129 4365	116 124 129 4440	116 124 129 4510	116 124 129 4685	117 124 129 4860	
	1	118 124 129 4405	118 124 129 4480	118 124 129 4550	118 124 129 4620	118 124 129 4695	118 124 129 4890	119 125 129 5085	
	2	120 125 129 4595	120 125 129 4675	120 125 129 4745	120 125 129 4825	120 125 129 4900	120 125 129 5110	121 126 129 5330	

TODATA_350SFO_IMP_F20_WETG_ZERO_1K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-42 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
28000 V _{FTO} = 136	-2	114 115 126 3685	114 115 126 3740	114 115 126 3800	114 115 125 3855	114 115 125 3935	114 115 125 4055	113 115 125 4080	
	-1	114 115 125 3665	114 115 125 3720	114 115 125 3780	114 115 125 3835	114 115 125 3915	113 115 124 4040	113 115 124 4065	
	0	114 115 124 3650	114 115 124 3705	114 115 124 3760	114 115 124 3820	114 115 124 3900	113 115 123 4030	113 115 123 4060	
	1	114 115 124 3635	114 115 124 3690	114 115 123 3750	114 115 123 3805	113 115 123 3890	113 115 123 4025	113 115 123 4055	
	2	114 115 123 3625	113 115 123 3685	113 115 123 3740	113 115 123 3795	113 115 122 3880	113 115 122 4025	113 115 122 4055	
30000 V _{FTO} = 140	-2	114 115 125 3775	114 115 125 3835	114 115 125 3895	114 115 124 3955	114 115 124 4040	113 115 124 4170	113 115 124 4195	
	-1	114 115 124 3760	114 115 124 3820	114 115 124 3880	114 115 124 3935	113 115 124 4020	113 115 123 4155	113 115 123 4185	
	0	114 115 123 3750	114 115 123 3805	113 115 123 3865	113 115 123 3925	113 115 123 4010	113 115 122 4150	113 115 122 4180	
	1	113 115 122 3735	113 115 122 3795	113 115 122 3855	113 115 122 3915	113 115 122 4000	113 115 122 4150	113 115 122 4180	
	2	113 115 122 3730	113 115 122 3790	113 115 121 3845	113 115 121 3905	113 115 121 4000	113 115 121 4155	112 115 121 4185	
32000 V _{FTO} = 145	-2	114 115 124 3865	114 115 124 3925	114 115 124 3990	113 115 124 4050	113 115 124 4140	113 115 123 4280	113 115 123 4310	
	-1	113 115 123 3855	113 115 123 3915	113 115 123 3975	113 115 123 4035	113 115 123 4125	113 115 122 4275	113 115 122 4305	
	0	113 115 122 3845	113 115 122 3905	113 115 122 3965	113 115 122 4030	113 115 122 4120	113 115 121 4275	113 115 121 4305	
	1	113 115 121 3840	113 115 121 3900	113 115 121 3960	113 115 121 4020	113 115 121 4115	112 115 121 4275	112 115 121 4310	
	2	113 115 121 3835	113 115 120 3895	113 115 120 3960	113 115 120 4020	113 115 120 4120	112 115 120 4285	112 115 120 4325	
33000 V _{FTO} = 147	-2	113 115 123 3910	113 115 123 3975	113 115 123 4035	113 115 123 4100	113 115 123 4190	113 115 123 4335	113 115 123 4370	
	-1	113 115 123 3900	113 115 123 3965	113 115 122 4025	113 115 122 4085	113 115 122 4180	113 115 122 4330	113 115 122 4365	
	0	113 115 122 3895	113 115 122 3955	113 115 122 4015	113 115 122 4080	113 115 121 4175	112 115 121 4335	112 115 121 4365	
	1	113 115 121 3890	113 115 121 3950	113 115 121 4010	113 115 121 4075	113 115 121 4175	112 115 120 4340	112 115 120 4375	
	2	113 115 120 3890	113 115 120 3950	113 115 120 4015	113 115 120 4080	112 115 120 4180	112 115 120 4355	112 115 120 4390	

TODATA_350SFO_IMP_F20_WETG_ZERO_2K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-43 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
34000 V _{FTO} = 149	-2	113 115 124 3955	113 115 124 4020	113 115 124 4085	113 115 124 4145	113 116 124 4240	113 115 123 4395	113 115 123 4425	
	-1	113 116 123 3950	113 116 123 4010	113 116 123 4075	113 116 123 4135	113 116 123 4230	113 116 123 4390	112 116 122 4425	
	0	113 116 123 3940	113 116 123 4005	113 116 123 4070	113 116 123 4130	113 116 123 4230	112 116 122 4395	112 116 122 4430	
	1	113 116 122 3940	113 116 122 4005	113 116 122 4065	113 116 122 4130	113 116 122 4230	112 116 122 4405	112 117 122 4440	
	2	113 117 122 3945	113 117 122 4005	113 117 122 4070	113 117 122 4135	112 117 122 4240	112 117 122 4420	112 117 122 4460	
35000 V _{FTO} = 151	-2	113 117 125 4005	113 117 125 4065	113 117 125 4130	113 117 125 4195	113 117 125 4290	113 117 125 4450	113 117 124 4480	
	-1	113 117 125 3995	113 117 125 4055	113 117 125 4120	113 117 124 4185	113 117 124 4285	112 117 124 4450	112 117 124 4485	
	0	113 117 124 3990	113 118 124 4055	113 118 124 4120	113 118 124 4185	113 118 124 4285	112 118 124 4455	112 118 124 4495	
	1	113 118 124 3995	113 118 124 4055	113 118 124 4120	113 118 124 4185	112 118 124 4290	112 119 124 4470	112 119 124 4510	
	2	113 119 124 4010	113 119 124 4075	113 119 124 4140	113 119 124 4210	113 119 124 4340	114 119 124 4630	114 120 124 4700	
36000 V _{FTO} = 153	-2	113 119 127 4050	113 119 126 4110	113 119 126 4180	113 119 126 4240	113 119 126 4340	113 119 126 4505	112 119 126 4540	
	-1	113 119 126 4045	113 119 126 4105	113 119 126 4170	113 119 126 4235	113 119 126 4340	112 119 125 4505	112 119 125 4545	
	0	113 119 125 4040	113 119 125 4105	113 119 125 4170	113 120 125 4235	112 120 125 4340	112 120 125 4520	112 120 125 4565	
	1	113 120 125 4080	113 120 125 4140	113 120 125 4210	113 120 125 4280	113 120 125 4410	114 121 125 4700	114 121 125 4770	
	2	115 121 125 4240	115 121 125 4305	115 121 125 4375	115 121 125 4450	115 121 125 4595	116 122 125 4915	117 122 125 4990	
38000 V _{FTO} = 157	-2	113 122 129 4140	113 122 129 4205	113 122 129 4270	113 122 129 4335	113 122 129 4440	112 122 129 4615	112 123 129 4665	
	-1	113 123 129 4185	113 123 129 4250	113 123 129 4320	113 123 129 4395	114 123 129 4525	115 123 129 4810	115 123 129 4875	
	0	116 124 129 4355	116 124 129 4425	116 124 129 4495	116 124 129 4575	116 124 129 4715	117 124 129 5025	117 124 129 5095	
	1	118 124 129 4535	118 124 129 4605	118 124 129 4685	118 124 129 4760	118 124 129 4920	119 125 129 5255	119 125 129 5335	
	2	120 125 129 4730	120 125 129 4805	120 125 129 4885	120 125 129 4970	120 125 129 5140	121 126 129 5515	121 126 129 5610	

TODATA_350SFO_IMP_F20_WETG_ZERO_2K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-43 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
28000 V _{FTO} = 136	-2	114 115 126 3805	114 115 125 3865	114 115 125 3930	114 115 125 4000	114 115 125 4110	113 115 124 4220	
	-1	114 115 125 3790	114 115 125 3845	114 115 125 3905	114 115 125 3980	113 115 124 4090	113 115 124 4205	
	0	114 115 124 3770	114 115 124 3830	114 115 124 3890	114 115 124 3965	113 115 124 4080	113 115 123 4200	
	1	114 115 123 3755	114 115 123 3815	114 115 123 3875	113 115 123 3950	113 115 123 4070	113 115 122 4195	
	2	113 115 123 3745	113 115 123 3805	113 115 122 3865	113 115 122 3940	113 115 122 4065	113 115 121 4200	
30000 V _{FTO} = 140	-2	114 115 125 3905	114 115 124 3965	114 115 124 4025	114 115 124 4100	113 115 124 4220	113 115 123 4345	
	-1	114 115 124 3885	114 115 124 3945	114 115 124 4010	113 115 124 4085	113 115 123 4210	113 115 123 4335	
	0	113 115 123 3870	113 115 123 3935	113 115 123 3995	113 115 123 4075	113 115 123 4200	113 115 122 4330	
	1	113 115 122 3865	113 115 122 3920	113 115 122 3985	113 115 122 4065	113 115 122 4195	112 115 121 4335	
	2	113 115 121 3855	113 115 121 3915	113 115 121 3980	113 115 121 4060	113 115 121 4200	112 115 120 4340	
32000 V _{FTO} = 145	-2	114 115 124 4000	113 115 124 4060	113 115 124 4125	113 115 123 4205	113 115 123 4330	113 115 123 4465	
	-1	113 115 123 3985	113 115 123 4045	113 115 123 4110	113 115 123 4195	113 115 122 4325	113 115 122 4460	
	0	113 115 122 3975	113 115 122 4035	113 115 122 4100	113 115 122 4185	113 115 122 4320	112 115 121 4465	
	1	113 115 121 3965	113 115 121 4030	113 115 121 4095	113 115 121 4180	112 115 121 4320	112 115 120 4470	
	2	113 115 120 3965	113 115 120 4030	113 115 120 4095	113 115 120 4180	112 115 120 4330	112 115 119 4485	
33000 V _{FTO} = 147	-2	113 115 123 4045	113 115 123 4110	113 115 123 4175	113 115 123 4255	113 115 123 4385	113 115 122 4525	
	-1	113 115 122 4030	113 115 122 4095	113 115 122 4165	113 115 122 4245	113 115 122 4380	112 115 121 4525	
	0	113 115 122 4025	113 115 122 4090	113 115 121 4155	113 115 121 4240	113 115 121 4380	112 115 121 4530	
	1	113 115 121 4020	113 115 121 4085	113 115 121 4150	113 115 121 4240	112 115 120 4385	112 115 120 4540	
	2	113 115 120 4025	113 115 120 4085	113 115 120 4155	112 115 120 4240	112 115 120 4395	112 115 120 4560	

TODATA_350SFO_IMP_F20_WETG_ZERO_3K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-44 (Sheet 1 of 2)

WET GROOVED RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 3000 FT

ENGINE BLEED OFF

V₁ (KIAS) V_R (KIAS)

V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
34000 V _{FTO} = 149	-2	113 115 124 4095	113 116 124 4155	113 116 124 4225	113 116 124 4310	113 116 123 4440	113 115 123 4585	
	-1	113 116 123 4080	113 116 123 4145	113 116 123 4215	113 116 123 4300	113 116 123 4440	112 116 122 4585	
	0	113 116 123 4075	113 116 123 4140	113 116 123 4205	113 116 123 4295	112 116 122 4440	112 116 122 4595	
	1	113 116 122 4075	113 116 122 4140	113 116 122 4205	113 116 122 4295	112 116 122 4450	112 117 122 4610	
	2	113 117 122 4080	113 117 122 4145	112 117 122 4210	112 117 122 4300	112 117 122 4460	112 118 122 4650	
35000 V _{FTO} = 151	-2	113 117 125 4140	113 117 125 4205	113 117 125 4270	113 117 125 4360	113 117 125 4500	112 117 124 4645	
	-1	113 117 125 4130	113 117 125 4195	113 117 124 4265	113 117 124 4355	113 117 124 4495	112 118 124 4650	
	0	113 118 124 4130	113 118 124 4190	113 118 124 4260	113 118 124 4350	112 118 124 4500	112 118 124 4665	
	1	113 118 124 4130	113 118 124 4195	113 118 124 4265	112 118 124 4355	112 119 124 4515	112 119 124 4725	
	2	113 119 124 4150	113 119 124 4215	113 119 124 4285	113 119 124 4395	113 119 124 4645	115 120 124 4940	
36000 V _{FTO} = 153	-2	113 119 126 4185	113 119 126 4250	113 119 126 4320	113 119 126 4410	113 119 126 4555	112 119 125 4705	
	-1	113 119 126 4180	113 119 126 4245	113 119 126 4315	113 119 126 4405	112 119 125 4555	112 120 125 4715	
	0	113 119 125 4180	113 120 125 4245	113 120 125 4315	113 120 125 4405	112 120 125 4560	113 120 125 4790	
	1	113 120 125 4215	113 120 125 4285	113 120 125 4360	113 120 125 4470	114 121 125 4715	115 121 125 5005	
	2	115 121 125 4385	115 121 125 4455	115 121 125 4530	115 121 125 4650	116 122 125 4925	117 122 125 5235	
38000 V _{FTO} = 157	-2	113 122 129 4280	113 122 129 4350	113 122 129 4420	113 122 129 4510	112 122 129 4665	113 123 129 4890	
	-1	113 123 129 4325	113 123 129 4400	113 123 129 4475	113 123 129 4585	114 123 129 4830	115 124 129 5110	
	0	116 124 129 4505	116 124 129 4580	116 124 129 4655	116 124 129 4775	116 124 129 5040	117 124 129 5345	
	1	118 124 129 4690	118 124 129 4765	118 125 129 4850	118 125 129 4975	119 125 129 5270	120 125 129 5600	
	2	120 125 129 4895	120 125 129 4975	120 125 129 5060	120 125 129 5195	121 126 129 5520	122 126 129 5910	

TODATA_350SFO_IMP_F20_WETG_ZERO_3K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-44 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 4000 FT

ENGINE BLEED OFF

V₁ (KIAS) V_R (KIAS)V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{F_{TO}} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	27		
28000 V _{F_{TO}} = 136	-2	114 115 125 3940	114 115 125 4000	114 115 125 4070	114 115 125 4175	113 115 124 4300	113 115 124 4365		
	-1	114 115 125 3915	114 115 124 3980	114 115 124 4050	113 115 124 4160	113 115 124 4290	113 115 123 4355		
	0	114 115 124 3900	114 115 124 3960	114 115 124 4030	113 115 123 4145	113 115 123 4280	113 115 123 4345		
	1	114 115 123 3885	113 115 123 3950	113 115 123 4020	113 115 123 4135	113 115 122 4275	113 115 122 4345		
	2	113 115 122 3875	113 115 122 3940	113 115 122 4010	113 115 122 4125	113 115 121 4275	112 115 121 4345		
30000 V _{F_{TO}} = 140	-2	114 115 124 4035	114 115 124 4105	114 115 124 4175	113 115 124 4285	113 115 123 4425	113 115 123 4495		
	-1	114 115 124 4020	114 115 124 4085	113 115 123 4160	113 115 123 4275	113 115 123 4420	113 115 122 4490		
	0	113 115 123 4010	113 115 123 4070	113 115 123 4145	113 115 122 4265	113 115 122 4415	112 115 122 4485		
	1	113 115 122 3995	113 115 122 4060	113 115 122 4135	113 115 122 4260	112 115 121 4415	112 115 121 4490		
	2	113 115 121 3990	113 115 121 4055	113 115 121 4130	113 115 121 4260	112 115 120 4420	112 115 120 4500		
32000 V _{F_{TO}} = 145	-2	113 115 123 4135	113 115 123 4205	113 115 123 4280	113 115 123 4400	113 115 122 4550	113 115 122 4625		
	-1	113 115 123 4125	113 115 123 4190	113 115 123 4265	113 115 122 4390	113 115 122 4545	112 115 121 4620		
	0	113 115 122 4115	113 115 122 4180	113 115 122 4255	113 115 122 4385	112 115 121 4545	112 115 121 4625		
	1	113 115 121 4110	113 115 121 4175	113 115 121 4255	113 115 121 4385	112 115 120 4555	112 115 120 4640		
	2	113 115 120 4105	113 115 120 4175	113 115 120 4250	112 115 120 4390	112 115 119 4570	112 115 119 4655		
33000 V _{F_{TO}} = 147	-2	113 115 123 4185	113 115 123 4255	113 115 123 4330	113 115 123 4455	113 115 122 4615	112 115 122 4685		
	-1	113 115 122 4175	113 115 122 4245	113 115 122 4320	113 115 122 4445	112 115 121 4610	112 115 121 4690		
	0	113 115 121 4165	113 115 121 4235	113 115 121 4315	113 115 121 4445	112 115 120 4615	112 115 120 4695		
	1	113 115 121 4165	113 115 121 4230	113 115 121 4310	112 115 120 4450	112 115 120 4625	112 115 120 4715		
	2	113 115 120 4165	113 115 120 4235	112 115 120 4315	112 115 120 4455	112 116 120 4645	112 116 120 4735		

TODATA_350SFO_IMP_F20_WETG_ZERO_4K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-45 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED OFF****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
34000 V _{FTO} = 149	-2	113 116 124 4235	113 116 124 4305	113 116 124 4385	113 116 123 4510	113 116 123 4675	112 115 122 4750	
	-1	113 116 123 4225	113 116 123 4295	113 116 123 4375	113 116 123 4505	112 116 122 4675	112 116 122 4755	
	0	113 116 123 4220	113 116 123 4290	113 116 122 4370	112 116 122 4505	112 116 122 4680	112 116 122 4765	
	1	113 116 122 4220	113 116 122 4290	113 116 122 4370	112 116 122 4510	112 117 122 4700	112 117 122 4785	
	2	112 117 122 4225	112 117 122 4295	112 117 122 4375	112 117 122 4525	112 118 122 4740	113 118 122 4890	
35000 V _{FTO} = 151	-2	113 117 125 4285	113 117 125 4355	113 117 125 4435	113 117 125 4565	112 117 124 4735	112 117 124 4815	
	-1	113 117 124 4280	113 118 124 4345	113 118 124 4425	113 118 124 4565	112 118 124 4740	112 118 124 4825	
	0	113 118 124 4275	113 118 124 4345	113 118 124 4425	112 118 124 4565	112 118 124 4750	112 119 124 4840	
	1	113 118 124 4275	112 118 124 4345	112 118 124 4430	112 119 124 4575	113 119 124 4820	113 119 124 4965	
	2	113 119 124 4305	113 119 124 4380	113 119 124 4475	113 119 124 4690	115 120 124 5035	115 120 124 5190	
36000 V _{FTO} = 153	-2	113 119 126 4335	113 119 126 4405	113 119 126 4485	113 119 126 4620	112 119 126 4795	112 119 126 4880	
	-1	113 119 126 4330	113 119 126 4400	113 119 126 4480	112 119 126 4620	112 120 126 4805	112 120 126 4890	
	0	113 120 126 4330	113 120 126 4400	113 120 126 4480	112 120 126 4630	113 121 126 4885	113 121 126 5035	
	1	113 120 126 4380	113 120 126 4455	113 121 126 4550	114 121 126 4760	115 121 126 5105	115 121 126 5265	
	2	115 121 126 4555	115 121 126 4630	115 121 126 4730	116 122 126 4965	117 122 126 5340	118 122 126 5515	
38000 V _{FTO} = 157	-2	113 122 129 4430	113 122 129 4505	113 122 129 4590	112 123 129 4735	113 123 129 4990	114 123 129 5135	
	-1	113 123 129 4495	113 123 129 4570	114 123 129 4665	114 123 129 4880	115 124 129 5215	116 124 129 5365	
	0	116 124 129 4680	116 124 129 4760	116 124 129 4860	116 124 129 5090	117 125 129 5450	118 125 129 5620	
	1	118 125 129 4875	118 125 129 4955	118 125 129 5065	118 125 129 5315	120 125 129 5705	120 126 129 5890	
	2	120 125 129 5085	120 125 129 5170	120 125 129 5285	120 126 129 5560	122 126 129 6025	123 126 129 6235	

TODATA_350SFO_IMP_F20_WETG_ZERO_4K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-45 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	35	
28000 V _{FTO} = 136	-2	114 115 126 3465	114 115 126 3515	114 115 126 3570	114 115 126 3620	114 115 126 3675	114 115 125 3735	114 115 125 3835	
	-1	114 115 125 3445	114 115 125 3500	114 115 125 3550	114 115 125 3605	114 115 125 3655	114 115 125 3715	114 115 124 3820	
	0	114 115 124 3430	114 115 124 3485	114 115 124 3535	114 115 124 3590	114 115 124 3640	114 115 124 3705	113 115 124 3810	
	1	114 115 124 3420	114 115 124 3475	114 115 124 3525	114 115 124 3580	114 115 123 3630	114 115 123 3690	113 115 123 3800	
	2	114 115 123 3410	114 115 123 3465	114 115 123 3515	113 115 123 3570	113 115 123 3620	113 115 123 3685	113 115 122 3800	
30000 V _{FTO} = 140	-2	114 115 125 3545	114 115 125 3605	114 115 125 3655	114 115 125 3715	114 115 125 3770	114 115 125 3830	113 115 124 3935	
	-1	114 115 124 3535	114 115 124 3590	114 115 124 3645	114 115 124 3695	114 115 124 3750	114 115 124 3815	113 115 124 3930	
	0	114 115 123 3520	114 115 123 3575	114 115 123 3630	114 115 123 3685	113 115 123 3740	113 115 123 3800	113 115 123 3920	
	1	113 115 123 3515	113 115 122 3570	113 115 122 3625	113 115 122 3675	113 115 122 3730	113 115 122 3795	113 115 122 3920	
	2	113 115 122 3510	113 115 122 3565	113 115 122 3620	113 115 122 3670	113 115 121 3725	113 115 121 3790	113 115 121 3920	
32000 V _{FTO} = 145	-2	114 115 124 3630	114 115 124 3690	114 115 124 3745	114 115 124 3805	114 115 124 3860	113 115 124 3925	113 115 123 4040	
	-1	114 115 123 3620	113 115 123 3680	113 115 123 3735	113 115 123 3790	113 115 123 3845	113 115 123 3915	113 115 123 4035	
	0	113 115 122 3610	113 115 122 3670	113 115 122 3725	113 115 122 3785	113 115 122 3840	113 115 122 3905	113 115 122 4030	
	1	113 115 121 3610	113 115 121 3665	113 115 121 3720	113 115 121 3780	113 115 121 3835	113 115 121 3900	113 115 121 4035	
	2	113 115 121 3605	113 115 121 3665	113 115 120 3720	113 115 120 3780	113 115 120 3835	113 115 120 3900	112 115 120 4040	
33000 V _{FTO} = 147	-2	114 115 124 3675	114 115 124 3735	113 115 123 3790	113 115 123 3850	113 115 123 3905	113 115 123 3970	113 115 123 4090	
	-1	113 115 123 3665	113 115 123 3725	113 115 123 3780	113 115 123 3835	113 115 122 3895	113 115 122 3960	113 115 122 4085	
	0	113 115 122 3660	113 115 122 3715	113 115 122 3775	113 115 122 3830	113 115 122 3890	113 115 122 3955	113 115 121 4085	
	1	113 115 121 3655	113 115 121 3715	113 115 121 3770	113 115 121 3830	113 115 121 3885	113 115 121 3955	112 115 120 4090	
	2	113 115 120 3660	113 115 120 3715	113 115 120 3775	113 115 120 3830	113 115 120 3890	113 115 120 3955	112 115 120 4100	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-46 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****V₁ (KIAS) V_R (KIAS)****ENGINE BLEED ON****V₂ (KIAS) TOFL (FT)**

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)									
WT (LB)	RWY	TEMPERATURE (°C)							
V_{FTO} (KIAS)	GRD (%)	5 & BELOW	10	15	20	25	30	35	
34000 V_{FTO} = 149	-2	113 115 124 3715	113 115 124 3775	113 115 124 3835	113 115 124 3890	113 115 124 3950	113 115 124 4020	113 115 123 4145	
	-1	113 115 123 3710	113 115 123 3765	113 115 123 3825	113 115 123 3885	113 116 123 3945	113 116 123 4010	113 115 123 4140	
	0	113 116 122 3705	113 116 122 3765	113 116 122 3820	113 116 122 3880	113 116 122 3935	113 116 122 4005	113 116 122 4140	
	1	113 116 122 3705	113 116 122 3765	113 116 122 3820	113 116 122 3880	113 116 122 3940	113 116 122 4010	112 116 122 4150	
	2	113 117 122 3710	113 117 122 3770	113 117 122 3825	113 117 122 3885	113 117 122 3945	113 117 122 4015	112 117 122 4165	
35000 V_{FTO} = 151	-2	113 117 125 3760	113 117 125 3820	113 117 125 3880	113 117 125 3935	113 117 125 3995	113 117 125 4065	113 117 125 4195	
	-1	113 117 124 3755	113 117 124 3810	113 117 124 3870	113 117 124 3930	113 117 124 3990	113 117 124 4060	113 117 124 4195	
	0	113 117 124 3750	113 117 124 3810	113 117 124 3870	113 117 124 3930	113 117 124 3985	113 117 124 4060	112 118 124 4200	
	1	113 118 124 3755	113 118 124 3815	113 118 124 3870	113 118 124 3930	113 118 124 3990	113 118 124 4060	112 118 124 4210	
	2	113 119 124 3790	113 119 124 3855	113 119 124 3910	113 119 124 3970	113 119 124 4030	113 119 124 4110	114 119 124 4345	
36000 V_{FTO} = 153	-2	113 118 126 3800	113 119 126 3865	113 119 126 3920	113 119 126 3980	113 119 126 4040	113 119 126 4110	113 119 126 4245	
	-1	113 119 126 3795	113 119 126 3860	113 119 126 3915	113 119 126 3975	113 119 126 4040	113 119 126 4110	113 119 125 4250	
	0	113 119 125 3795	113 119 125 3860	113 119 125 3920	113 119 125 3975	113 119 125 4035	113 120 125 4110	112 120 125 4255	
	1	113 120 125 3850	113 120 125 3920	113 120 125 3975	113 120 125 4040	113 120 125 4100	113 120 125 4180	114 121 125 4410	
	2	116 121 125 4005	116 121 125 4075	116 121 125 4135	116 121 125 4200	115 121 125 4265	115 121 125 4345	116 121 125 4605	
38000 V_{FTO} = 157	-2	113 122 129 3885	113 122 129 3950	113 122 129 4010	113 122 129 4070	113 122 129 4130	113 122 129 4205	113 122 129 4350	
	-1	114 123 129 3950	114 123 129 4015	114 123 129 4075	114 123 129 4140	114 123 129 4205	114 123 129 4285	115 123 129 4515	
	0	116 123 129 4110	116 123 129 4180	116 124 129 4245	116 124 129 4310	116 124 129 4380	116 124 129 4465	117 124 129 4710	
	1	118 124 129 4280	118 124 129 4355	118 124 129 4420	118 124 129 4490	118 124 129 4560	118 124 129 4650	119 125 129 4925	
	2	120 125 129 4470	120 125 129 4550	120 125 129 4615	120 125 129 4690	120 125 129 4760	120 125 129 4855	121 126 129 5165	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-46 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	34	
28000 V _{FTO} = 136	-2	114 115 126 3515	114 115 126 3570	114 115 126 3625	114 115 126 3680	114 115 125 3735	114 115 125 3810	114 115 125 3895	
	-1	114 115 125 3500	114 115 125 3555	114 115 125 3605	114 115 125 3660	114 115 125 3715	114 115 125 3795	113 115 124 3885	
	0	114 115 124 3485	114 115 124 3540	114 115 124 3590	114 115 124 3645	114 115 124 3700	114 115 124 3785	113 115 124 3875	
	1	114 115 124 3470	114 115 124 3525	114 115 124 3580	114 115 123 3635	114 115 123 3685	113 115 123 3770	113 115 123 3870	
	2	114 115 123 3460	114 115 123 3515	113 115 123 3570	113 115 123 3625	113 115 123 3680	113 115 122 3765	113 115 122 3865	
30000 V _{FTO} = 140	-2	114 115 125 3605	114 115 125 3660	114 115 125 3715	114 115 125 3775	114 115 125 3825	114 115 124 3910	113 115 124 4005	
	-1	114 115 124 3590	114 115 124 3645	114 115 124 3700	114 115 124 3755	114 115 124 3815	113 115 124 3900	113 115 123 3995	
	0	114 115 123 3575	114 115 123 3635	114 115 123 3690	113 115 123 3745	113 115 123 3800	113 115 123 3890	113 115 123 3990	
	1	113 115 123 3570	113 115 122 3625	113 115 122 3680	113 115 122 3735	113 115 122 3790	113 115 122 3885	113 115 122 3985	
	2	113 115 122 3565	113 115 122 3620	113 115 122 3675	113 115 121 3730	113 115 121 3785	113 115 121 3880	113 115 121 3990	
32000 V _{FTO} = 145	-2	114 115 124 3690	114 115 124 3750	114 115 124 3805	114 115 124 3860	114 115 124 3920	113 115 124 4010	113 115 123 4110	
	-1	113 115 123 3680	113 115 123 3735	113 115 123 3795	113 115 123 3850	113 115 123 3910	113 115 123 4000	113 115 122 4105	
	0	113 115 122 3670	113 115 122 3730	113 115 122 3785	113 115 122 3840	113 115 122 3900	113 115 122 3995	113 115 122 4100	
	1	113 115 121 3665	113 115 121 3725	113 115 121 3780	113 115 121 3840	113 115 121 3895	113 115 121 3995	113 115 121 4105	
	2	113 115 121 3665	113 115 120 3725	113 115 120 3780	113 115 120 3840	113 115 120 3895	113 115 120 3995	112 115 120 4115	
33000 V _{FTO} = 147	-2	114 115 124 3735	113 115 123 3795	113 115 123 3850	113 115 123 3910	113 115 123 3970	113 115 123 4060	113 115 123 4165	
	-1	113 115 123 3720	113 115 123 3780	113 115 123 3840	113 115 122 3900	113 115 122 3960	113 115 122 4055	113 115 122 4160	
	0	113 115 122 3715	113 115 122 3775	113 115 122 3835	113 115 122 3890	113 115 122 3950	113 115 121 4050	113 115 121 4160	
	1	113 115 121 3715	113 115 121 3775	113 115 121 3830	113 115 121 3890	113 115 121 3950	113 115 121 4050	112 115 120 4165	
	2	113 115 120 3715	113 115 120 3775	113 115 120 3835	113 115 120 3895	113 115 120 3950	112 115 120 4055	112 115 120 4180	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-47 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)**

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)									
WT (LB)	RWY	TEMPERATURE (°C)							
V_{FTO} (KIAS)	GRD (%)	5 & BELOW	10	15	20	25	30	34	
34000 V_{FTO} = 149	-2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	
		124 3775	124 3835	124 3895	124 3955	124 4015	124 4110	123 4215	
	-1	113 115	113 115	113 115	113 116	113 116	113 116	113 116	
		123 3765	123 3830	123 3885	123 3945	123 4005	123 4105	122 4215	
	0	113 116	113 116	113 116	113 116	113 116	113 116	112 116	
		122 3765	122 3825	122 3885	122 3940	122 4000	122 4100	122 4215	
35000 V_{FTO} = 151	-2	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		125 3820	125 3880	125 3940	125 4000	125 4060	125 4160	124 4270	
	-1	113 117	113 117	113 117	113 117	113 117	113 117	113 117	
		124 3810	124 3875	124 3935	124 3995	124 4055	124 4155	124 4270	
	0	113 117	113 117	113 117	113 117	113 117	113 117	112 118	
		124 3810	124 3870	124 3930	124 3990	124 4050	124 4155	124 4275	
36000 V_{FTO} = 153	-2	113 118	113 118	113 118	113 118	113 118	112 118	112 119	
		124 3810	124 3875	124 3935	124 3995	124 4055	124 4160	124 4290	
	-1	113 119	113 119	113 119	113 119	113 119	113 119	114 119	
		124 3850	124 3915	124 3970	124 4035	124 4095	124 4230	124 4455	
	0	113 119	113 119	113 119	113 119	113 119	113 119	113 119	
		126 3865	126 3925	126 3985	126 4045	126 4105	126 4205	126 4325	
38000 V_{FTO} = 157	-2	113 119	113 119	113 119	113 119	113 119	113 119	112 119	
		126 3855	126 3920	126 3980	126 4040	126 4100	126 4205	125 4325	
	-1	113 119	113 119	113 119	113 119	113 120	113 120	112 120	
		125 3860	125 3920	125 3980	125 4040	125 4105	125 4210	125 4335	
	0	113 120	113 120	113 120	113 120	113 120	113 120	114 121	
		125 3910	125 3975	125 4035	125 4100	125 4165	125 4295	125 4520	
38000 V_{FTO} = 157	-2	116 121	116 121	115 121	115 121	115 121	116 121	116 122	
		125 4070	125 4135	125 4200	125 4265	125 4330	125 4475	125 4720	
	-1	113 122	113 122	113 122	113 122	113 122	113 122	112 122	
		129 3950	129 4010	129 4070	129 4135	129 4200	129 4305	129 4430	
	0	114 123	114 123	114 123	114 123	114 123	114 123	115 123	
		129 4010	129 4080	129 4140	129 4205	129 4270	129 4405	129 4625	
38000 V_{FTO} = 157	-2	116 124	116 124	116 124	116 124	116 124	116 124	117 124	
		129 4175	129 4245	129 4310	129 4380	129 4450	129 4590	129 4825	
	-1	118 124	118 124	118 124	118 124	118 124	118 124	119 125	
		129 4350	129 4425	129 4490	129 4560	129 4635	129 4790	129 5050	
	0	120 125	120 125	120 125	120 125	120 125	120 125	121 126	
		129 4540	129 4615	129 4685	129 4760	129 4835	129 5005	129 5305	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-47 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115	114 115	114 115
		126 3570	126 3625	126 3680	126 3735	125 3790	125 3895	125 3965	
	-1	114 115	114 115	114 115	114 115	114 115	114 115	113 115	113 115
		125 3555	125 3605	125 3660	125 3720	125 3775	124 3880	124 3950	
	0	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3540	124 3595	124 3650	124 3705	124 3755	124 3865	123 3940	
	1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3525	124 3580	123 3635	123 3690	123 3745	123 3860	123 3935	
	2	114 115	114 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3515	123 3570	123 3625	123 3680	123 3735	122 3850	122 3935	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		125 3660	125 3720	125 3775	125 3830	124 3890	124 4000	124 4070	
	-1	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3645	124 3700	124 3760	124 3815	124 3875	123 3985	123 4065	
	0	114 115	114 115	114 115	113 115	113 115	113 115	113 115	113 115
		123 3630	123 3690	123 3745	123 3800	123 3860	123 3980	122 4060	
	1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3625	122 3680	122 3735	122 3795	122 3850	122 3975	122 4060	
	2	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3620	122 3675	121 3730	121 3785	121 3845	121 3975	121 4060	
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	114 115	113 115	113 115	113 115
		124 3750	124 3810	124 3865	124 3925	124 3985	123 4100	123 4180	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3735	123 3795	123 3855	123 3910	123 3970	123 4090	122 4175	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3725	122 3785	122 3845	122 3900	122 3960	122 4090	121 4175	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3720	121 3780	121 3840	121 3900	121 3960	121 4090	121 4180	
	2	113 115	113 115	113 115	113 115	113 115	112 115	112 115	112 115
		121 3720	120 3780	120 3840	120 3895	120 3955	120 4095	120 4190	
33000 V _{FTO} = 147	-2	114 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		124 3790	123 3850	123 3910	123 3970	123 4030	123 4155	123 4235	
	-1	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		123 3780	123 3840	122 3900	122 3960	122 4020	122 4145	122 4235	
	0	113 115	113 115	113 115	113 115	113 115	113 115	113 115	113 115
		122 3775	122 3835	122 3890	122 3955	122 4015	121 4145	121 4235	
	1	113 115	113 115	113 115	113 115	113 115	113 115	112 115	112 115
		121 3770	121 3830	121 3890	121 3950	121 4010	120 4150	120 4245	
	2	113 115	113 115	113 115	113 115	113 115	112 115	112 115	112 115
		120 3775	120 3835	120 3895	120 3950	120 4015	120 4160	120 4255	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-48 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	33	
34000 V _{FTO} = 149	-2	113 115 124 3835	113 115 124 3895	113 115 124 3955	113 115 124 4015	113 115 124 4080	113 115 123 4205	113 115 123 4290	
	-1	113 115 123 3825	113 115 123 3890	113 116 123 3950	113 116 123 4010	113 116 123 4070	113 116 123 4200	113 116 122 4290	
	0	113 116 122 3825	113 116 122 3885	113 116 122 3940	113 116 122 4005	113 116 122 4065	113 116 122 4200	112 116 122 4295	
	1	113 116 122 3820	113 116 122 3885	113 116 122 3945	113 116 122 4005	113 116 122 4065	112 116 122 4205	112 117 122 4305	
	2	113 117 122 3825	113 117 122 3890	113 117 122 3945	113 117 122 4010	113 117 122 4070	112 117 122 4220	112 117 122 4325	
35000 V _{FTO} = 151	-2	113 117 125 3880	113 117 125 3940	113 117 125 4000	113 117 125 4065	113 117 125 4125	113 117 125 4255	113 117 124 4345	
	-1	113 117 124 3870	113 117 124 3935	113 117 124 3995	113 117 124 4055	113 117 124 4120	113 117 124 4255	112 117 124 4350	
	0	113 117 124 3870	113 117 124 3930	113 117 124 3990	113 117 124 4055	113 118 124 4115	112 118 124 4260	112 118 124 4355	
	1	113 118 124 3870	113 118 124 3935	113 118 124 3995	113 118 124 4060	113 118 124 4120	112 118 124 4265	112 119 124 4375	
	2	113 119 124 3905	113 119 124 3970	113 119 124 4030	113 119 124 4095	113 119 124 4160	113 119 124 4375	114 120 124 4565	
36000 V _{FTO} = 153	-2	113 119 126 3925	113 119 126 3985	113 119 126 4045	113 119 126 4110	113 119 126 4175	113 119 126 4305	113 119 126 4400	
	-1	113 119 126 3920	113 119 126 3980	113 119 126 4045	113 119 126 4105	113 119 126 4165	113 119 125 4305	112 119 125 4405	
	0	113 119 125 3920	113 119 125 3980	113 119 125 4040	113 119 125 4105	113 120 125 4170	112 120 125 4315	112 120 125 4435	
	1	113 120 125 3970	113 120 125 4035	113 120 125 4095	113 120 125 4160	113 120 125 4225	114 121 125 4445	115 121 125 4630	
	2	115 121 125 4130	115 121 125 4195	115 121 125 4260	115 121 125 4330	115 121 125 4395	116 121 125 4635	117 122 125 4840	
38000 V _{FTO} = 157	-2	113 122 129 4010	113 122 129 4075	113 122 129 4135	113 122 129 4205	113 122 129 4270	113 122 129 4410	113 123 129 4535	
	-1	114 123 129 4070	114 123 129 4140	114 123 129 4200	114 123 129 4270	114 123 129 4340	114 123 129 4550	115 123 129 4735	
	0	116 123 129 4235	116 124 129 4305	116 124 129 4375	116 124 129 4445	116 124 129 4515	116 124 129 4745	117 124 129 4945	
	1	118 124 129 4415	118 124 129 4485	118 124 129 4555	118 124 129 4630	118 124 129 4705	119 125 129 4960	119 125 129 5175	
	2	120 125 129 4605	120 125 129 4680	120 125 129 4755	120 125 129 4830	120 125 129 4910	121 125 129 5190	122 126 129 5445	

TODATA_350SFO_IMP_F20_WETG_ECS_1K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-48 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
28000 V _{FTO} = 136	-2	114 115 126 3685	114 115 126 3740	114 115 125 3800	114 115 125 3860	114 115 125 3950	113 115 125 4075	113 115 124 4100	
	-1	114 115 125 3665	114 115 125 3725	114 115 125 3780	114 115 125 3840	114 115 125 3930	113 115 124 4060	113 115 124 4090	
	0	114 115 124 3650	114 115 124 3705	114 115 124 3765	114 115 124 3820	113 115 124 3920	113 115 123 4050	113 115 123 4080	
	1	114 115 124 3635	114 115 123 3695	114 115 123 3750	114 115 123 3810	113 115 123 3910	113 115 122 4045	113 115 122 4075	
	2	114 115 123 3630	113 115 123 3685	113 115 123 3740	113 115 123 3795	113 115 122 3900	113 115 122 4045	113 115 121 4075	
30000 V _{FTO} = 140	-2	114 115 125 3775	114 115 125 3835	114 115 125 3895	114 115 124 3955	113 115 124 4055	113 115 124 4185	113 115 124 4215	
	-1	114 115 124 3760	114 115 124 3820	114 115 124 3880	114 115 124 3935	113 115 124 4040	113 115 123 4175	113 115 123 4205	
	0	114 115 123 3750	113 115 123 3805	113 115 123 3865	113 115 123 3925	113 115 123 4030	113 115 122 4175	113 115 122 4205	
	1	113 115 122 3740	113 115 122 3795	113 115 122 3855	113 115 122 3915	113 115 122 4025	113 115 121 4175	113 115 121 4205	
	2	113 115 122 3735	113 115 122 3790	113 115 121 3850	113 115 121 3910	113 115 121 4025	112 115 121 4180	112 115 120 4215	
32000 V _{FTO} = 145	-2	114 115 124 3870	114 115 124 3930	114 115 124 3990	113 115 124 4055	113 115 123 4160	113 115 123 4300	113 115 123 4335	
	-1	113 115 123 3855	113 115 123 3915	113 115 123 3975	113 115 123 4040	113 115 123 4150	113 115 122 4295	113 115 122 4330	
	0	113 115 122 3845	113 115 122 3905	113 115 122 3965	113 115 122 4030	113 115 122 4145	113 115 121 4295	112 115 121 4330	
	1	113 115 121 3840	113 115 121 3900	113 115 121 3960	113 115 121 4025	113 115 121 4140	112 115 120 4305	112 115 120 4340	
	2	113 115 120 3840	113 115 120 3900	113 115 120 3960	113 115 120 4025	112 115 120 4145	112 115 120 4315	112 115 119 4350	
33000 V _{FTO} = 147	-2	113 115 123 3915	113 115 123 3975	113 115 123 4040	113 115 123 4100	113 115 123 4210	113 115 122 4360	113 115 122 4390	
	-1	113 115 123 3905	113 115 122 3965	113 115 122 4025	113 115 122 4090	113 115 122 4200	113 115 122 4355	113 115 121 4390	
	0	113 115 122 3895	113 115 122 3955	113 115 122 4020	113 115 121 4080	113 115 121 4200	112 115 121 4360	112 115 121 4395	
	1	113 115 121 3890	113 115 121 3955	113 115 121 4015	113 115 121 4080	113 115 121 4200	112 115 120 4370	112 115 120 4405	
	2	113 115 120 3895	113 115 120 3955	113 115 120 4015	113 115 120 4080	112 115 120 4210	112 115 120 4385	112 116 120 4425	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-49 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	30	31	
34000 V _{FTO} = 149	-2	113 115 124 3960	113 115 124 4020	113 115 124 4085	113 115 124 4145	113 115 124 4260	113 115 123 4415	113 115 123 4450	
	-1	113 116 123 3950	113 116 123 4010	113 116 123 4075	113 116 123 4140	113 116 123 4255	112 116 122 4415	112 116 122 4450	
	0	113 116 123 3945	113 116 123 4005	113 116 123 4070	113 116 123 4135	113 116 122 4255	112 116 122 4420	112 116 122 4460	
	1	113 116 122 3945	113 116 122 4005	113 116 122 4070	113 116 122 4130	112 116 122 4260	112 117 122 4435	112 117 122 4475	
	2	113 117 122 3945	113 117 122 4010	113 117 122 4075	113 117 122 4140	112 117 122 4270	112 118 122 4455	112 118 122 4520	
35000 V _{FTO} = 151	-2	113 117 125 4005	113 117 125 4070	113 117 125 4130	113 117 125 4195	113 117 125 4310	113 117 124 4475	113 117 124 4510	
	-1	113 117 125 4000	113 117 125 4060	113 117 124 4125	113 117 124 4190	113 117 124 4310	112 117 124 4475	112 117 124 4510	
	0	113 117 124 3995	113 118 124 4055	113 118 124 4120	113 118 124 4185	113 118 124 4310	112 118 124 4485	112 118 124 4525	
	1	113 118 124 3995	113 118 124 4060	113 118 124 4120	113 118 124 4185	112 118 124 4320	112 119 124 4530	113 119 124 4595	
	2	113 119 124 4015	113 119 124 4080	113 119 124 4150	113 119 124 4215	113 119 124 4400	114 120 124 4730	115 120 124 4800	
36000 V _{FTO} = 153	-2	113 119 126 4050	113 119 126 4115	113 119 126 4180	113 119 126 4245	113 119 126 4365	112 119 126 4530	112 119 125 4565	
	-1	113 119 126 4045	113 119 126 4105	113 119 126 4175	113 119 126 4240	113 119 126 4365	112 119 125 4535	112 120 125 4575	
	0	113 119 125 4045	113 119 125 4105	113 120 125 4175	113 120 125 4240	112 120 125 4365	113 120 125 4595	113 120 125 4660	
	1	113 120 125 4085	113 120 125 4150	113 120 125 4215	113 120 125 4290	113 120 125 4470	115 121 125 4795	115 121 125 4865	
	2	115 121 125 4245	115 121 125 4315	115 121 125 4385	115 121 125 4460	116 121 125 4660	117 122 125 5015	117 122 125 5090	
38000 V _{FTO} = 157	-2	113 122 129 4140	113 122 129 4205	113 122 129 4270	113 122 129 4340	113 122 129 4470	113 123 129 4695	113 123 129 4755	
	-1	114 123 129 4190	113 123 129 4260	113 123 129 4330	113 123 129 4400	114 123 129 4580	115 124 129 4900	115 124 129 4970	
	0	116 124 129 4360	116 124 129 4430	116 124 129 4505	116 124 129 4580	116 124 129 4775	117 124 129 5125	118 124 129 5195	
	1	118 124 129 4540	118 124 129 4615	118 124 129 4690	118 124 129 4770	118 125 129 4985	120 125 129 5365	120 125 129 5440	
	2	120 125 129 4740	120 125 129 4815	120 125 129 4895	120 125 129 4980	120 125 129 5210	122 126 129 5655	122 126 129 5745	

TODATA_350SFO_IMP_F20_WETG_ECS_2K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-49 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	113 115	113 115	
		125 3810	125 3870	125 3930	125 4015	125 4130	124 4240	
	-1	114 115	114 115	114 115	114 115	113 115	113 115	
		125 3790	125 3845	125 3905	124 3995	124 4115	123 4230	
	0	114 115	114 115	114 115	113 115	113 115	113 115	
		124 3770	124 3830	124 3890	124 3985	123 4105	123 4225	
	1	114 115	114 115	114 115	113 115	113 115	113 115	
		123 3760	123 3820	123 3875	123 3970	122 4095	122 4220	
	2	113 115	113 115	113 115	113 115	113 115	112 115	
		123 3745	123 3805	122 3865	122 3965	122 4095	121 4225	
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	113 115	113 115	
		125 3905	124 3965	124 4025	124 4120	124 4240	123 4370	
	-1	114 115	114 115	114 115	113 115	113 115	113 115	
		124 3885	124 3945	124 4010	124 4105	123 4230	122 4360	
	0	113 115	113 115	113 115	113 115	113 115	113 115	
		123 3875	123 3935	123 3995	123 4095	122 4225	122 4360	
	1	113 115	113 115	113 115	113 115	113 115	112 115	
		122 3865	122 3925	122 3985	122 4090	121 4225	121 4360	
	2	113 115	113 115	113 115	113 115	112 115	112 115	
		121 3855	121 3920	121 3980	121 4085	121 4225	120 4370	
32000 V _{FTO} = 145	-2	114 115	113 115	113 115	113 115	113 115	113 115	
		124 4000	124 4065	123 4125	123 4225	123 4355	122 4490	
	-1	113 115	113 115	113 115	113 115	113 115	112 115	
		123 3985	123 4050	123 4115	123 4215	122 4350	121 4490	
	0	113 115	113 115	113 115	113 115	113 115	112 115	
		122 3975	122 4040	122 4100	122 4205	121 4345	121 4495	
	1	113 115	113 115	113 115	113 115	112 115	112 115	
		121 3970	121 4030	121 4095	121 4205	120 4350	120 4505	
	2	113 115	113 115	113 115	113 115	112 115	112 115	
		120 3970	120 4030	120 4095	120 4205	120 4360	119 4520	
33000 V _{FTO} = 147	-2	113 115	113 115	113 115	113 115	113 115	113 115	
		123 4045	123 4110	123 4175	123 4280	122 4415	122 4555	
	-1	113 115	113 115	113 115	113 115	113 115	112 115	
		122 4035	122 4100	122 4165	122 4270	122 4410	121 4555	
	0	113 115	113 115	113 115	113 115	112 115	112 115	
		122 4025	122 4090	121 4155	121 4265	121 4410	120 4560	
	1	113 115	113 115	113 115	113 115	112 115	112 115	
		121 4025	121 4085	121 4155	121 4265	120 4415	120 4575	
	2	113 115	113 115	113 115	112 115	112 115	112 116	
		120 4025	120 4090	120 4155	120 4270	120 4430	120 4600	

TODATA_350SFO_IMP_F20_WETG_ECS_3K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-50 (Sheet 1 of 2)



WET GROOVED RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 3000 FT

ENGINE BLEED ON

V₁ (KIAS) V_R (KIAS)V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	29	
34000 V _{FTO} = 149	-2	113 115 124 4095	113 116 124 4160	113 116 124 4225	113 116 124 4330	113 116 123 4470	112 115 122 4615	
	-1	113 116 123 4085	113 116 123 4150	113 116 123 4215	113 116 123 4325	113 116 122 4465	112 116 122 4620	
	0	113 116 123 4080	113 116 123 4145	113 116 123 4210	113 116 122 4320	112 116 122 4470	112 116 122 4630	
	1	113 116 122 4075	113 116 122 4140	113 116 122 4210	112 116 122 4325	112 117 122 4480	112 117 122 4650	
	2	113 117 122 4080	113 117 122 4145	112 117 122 4210	112 117 122 4330	112 118 122 4500	113 118 122 4760	
35000 V _{FTO} = 151	-2	113 117 125 4140	113 117 125 4205	113 117 125 4275	113 117 125 4380	113 117 124 4525	112 117 124 4675	
	-1	113 117 125 4130	113 117 124 4200	113 117 124 4265	113 117 124 4380	112 117 124 4525	112 118 124 4685	
	0	113 118 124 4130	113 118 124 4195	113 118 124 4265	113 118 124 4380	112 118 124 4535	112 119 124 4700	
	1	113 118 124 4130	113 118 124 4195	113 118 124 4265	112 118 124 4385	112 119 124 4555	113 119 124 4830	
	2	113 119 124 4155	113 119 124 4225	113 119 124 4295	113 119 124 4450	114 120 124 4750	115 120 124 5050	
36000 V _{FTO} = 153	-2	113 119 126 4190	113 119 126 4255	113 119 126 4325	113 119 126 4435	113 119 126 4585	112 119 125 4735	
	-1	113 119 126 4180	113 119 126 4250	113 119 126 4320	113 119 126 4430	112 119 125 4585	112 120 125 4750	
	0	113 120 125 4180	113 120 125 4245	113 120 125 4315	112 120 125 4435	112 120 125 4625	114 121 125 4895	
	1	113 120 125 4225	113 120 125 4295	113 120 125 4365	113 121 125 4520	115 121 125 4820	116 121 125 5120	
	2	115 121 125 4390	115 121 125 4465	115 121 125 4540	115 121 125 4710	117 122 125 5040	118 122 125 5370	
38000 V _{FTO} = 157	-2	113 122 129 4280	113 122 129 4350	113 122 129 4420	113 122 129 4535	113 123 129 4725	114 123 129 4995	
	-1	113 123 129 4335	113 123 129 4405	113 123 129 4480	114 123 129 4635	115 124 129 4935	116 124 129 5220	
	0	116 124 129 4510	116 124 129 4585	116 124 129 4665	116 124 129 4835	117 124 129 5150	118 125 129 5465	
	1	118 124 129 4700	118 124 129 4775	118 125 129 4860	118 125 129 5040	119 125 129 5390	120 126 129 5730	
	2	120 125 129 4900	120 125 129 4985	120 125 129 5070	120 125 129 5265	122 126 129 5665	123 126 129 6065	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-50 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON**

V₁ (KIAS)	V_R (KIAS)
V₂ (KIAS)	TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)						
		5 & BELOW	10	15	20	25	27	
28000 V _{FTO} = 136	-2	114 115 125 3940	114 115 125 4000	114 115 125 4085	114 115 124 4195	113 115 124 4330	113 115 124 4395	
		114 115 125 3920	114 115 124 3980	114 115 124 4070	113 115 124 4180	113 115 123 4315	113 115 123 4380	
	-1	114 115 124 3900	114 115 124 3965	113 115 124 4050	113 115 123 4165	113 115 122 4310	113 115 122 4375	
		114 115 123 3885	113 115 123 3950	113 115 123 4040	113 115 122 4160	113 115 122 4305	112 115 121 4375	
	0	113 115 122 3880	113 115 122 3940	113 115 122 4030	113 115 122 4150	112 115 121 4310	112 115 121 4385	
		113 115 122 3865	113 115 122 3925	113 115 122 4015	113 115 122 4135	112 115 121 4295	112 115 121 4365	
	1	113 115 122 3865	113 115 122 3925	113 115 122 4015	113 115 122 4135	112 115 121 4295	112 115 121 4365	
		113 115 122 3850	113 115 122 3910	113 115 122 3995	113 115 122 4120	112 115 121 4285	112 115 121 4355	
	2	113 115 122 3835	113 115 122 3895	113 115 122 3980	113 115 122 4105	112 115 121 4305	112 115 121 4375	
		113 115 122 3820	113 115 122 3880	113 115 122 3965	113 115 122 4090	112 115 121 4290	112 115 121 4360	
30000 V _{FTO} = 140	-2	114 115 124 4040	114 115 124 4105	114 115 124 4195	113 115 124 4310	113 115 123 4455	113 115 123 4525	
		114 115 124 4020	113 115 124 4085	113 115 123 4180	113 115 123 4300	113 115 122 4450	113 115 122 4520	
	-1	113 115 123 4010	113 115 123 4070	113 115 123 4165	113 115 122 4290	113 115 121 4445	112 115 121 4520	
		113 115 122 4000	113 115 122 4065	113 115 122 4160	113 115 121 4285	112 115 121 4450	112 115 120 4525	
	0	113 115 121 3995	113 115 121 4055	113 115 121 4155	113 115 121 4285	112 115 120 4455	112 115 120 4540	
		113 115 121 3980	113 115 121 4040	113 115 121 4140	113 115 121 4270	112 115 120 4445	112 115 120 4530	
	1	113 115 121 3965	113 115 121 4025	113 115 121 4125	113 115 121 4255	112 115 120 4435	112 115 120 4515	
		113 115 121 3950	113 115 121 4010	113 115 121 4110	113 115 121 4240	112 115 120 4425	112 115 119 4505	
	2	113 115 121 3935	113 115 121 3995	113 115 121 4095	113 115 121 4225	112 115 120 4415	112 115 119 4495	
		113 115 121 3920	113 115 121 3980	113 115 121 4080	113 115 121 4210	112 115 120 4405	112 115 119 4485	
32000 V _{FTO} = 145	-2	113 115 123 4140	113 115 123 4205	113 115 123 4300	113 115 123 4425	113 115 122 4585	113 115 122 4655	
		113 115 123 4125	113 115 123 4190	113 115 123 4290	113 115 122 4415	112 115 121 4580	112 115 121 4655	
	-1	113 115 122 4115	113 115 122 4180	113 115 122 4280	113 115 121 4415	112 115 121 4585	112 115 120 4665	
		113 115 121 4110	113 115 121 4175	113 115 121 4280	112 115 120 4415	112 115 120 4595	112 115 119 4680	
	0	113 115 120 4110	113 115 120 4175	113 115 120 4280	112 115 120 4425	112 115 119 4610	112 115 119 4700	
		113 115 120 4100	113 115 120 4165	113 115 120 4270	112 115 120 4415	112 115 119 4605	112 115 119 4695	
	1	113 115 120 4095	113 115 120 4160	113 115 120 4265	112 115 120 4405	112 115 119 4595	112 115 119 4685	
		113 115 120 4080	113 115 120 4145	113 115 120 4250	112 115 120 4395	112 115 119 4585	112 115 119 4675	
	2	113 115 120 4065	113 115 120 4130	113 115 120 4230	112 115 120 4385	112 115 119 4575	112 115 119 4665	
		113 115 120 4050	113 115 120 4115	113 115 120 4215	112 115 120 4375	112 115 119 4565	112 115 119 4655	
33000 V _{FTO} = 147	-2	113 115 123 4190	113 115 123 4255	113 115 123 4355	113 115 122 4480	113 115 122 4645	112 115 121 4720	
		113 115 122 4175	113 115 122 4245	113 115 122 4345	113 115 121 4475	112 115 121 4645	112 115 121 4725	
	-1	113 115 121 4170	113 115 121 4235	113 115 121 4340	113 115 121 4475	112 115 120 4655	112 115 120 4735	
		113 115 121 4165	113 115 121 4230	113 115 120 4335	112 115 120 4480	112 115 120 4665	112 115 120 4755	
	0	113 115 120 4165	113 115 120 4235	113 115 120 4345	112 115 120 4490	112 116 120 4690	112 116 120 4780	
		113 115 120 4150	113 115 120 4215	113 115 120 4315	112 115 120 4475	112 115 120 4680	112 115 120 4765	
	1	113 115 120 4135	113 115 120 4200	113 115 120 4305	112 115 120 4455	112 115 120 4660	112 115 120 4745	
		113 115 120 4120	113 115 120 4185	113 115 120 4290	112 115 120 4445	112 115 120 4650	112 115 120 4735	
	2	113 115 120 4105	113 115 120 4170	113 115 120 4275	112 115 120 4435	112 115 120 4640	112 115 120 4735	
		113 115 120 4090	113 115 120 4155	113 115 120 4260	112 115 120 4425	112 115 120 4630	112 115 120 4725	

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-51 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)							
		5 & BELOW	10	15	20	25	27		
34000 V _{FTO} = 149	-2	113 116 124 4235	113 116 124 4305	113 116 124 4405	113 116 123 4535	112 115 122 4710	112 115 122 4785		
	-1	113 116 123 4230	113 116 123 4295	113 116 123 4400	113 116 122 4535	112 116 122 4710	112 116 122 4795		
	0	113 116 122 4220	113 116 122 4290	113 116 122 4395	112 116 122 4535	112 117 122 4720	112 117 122 4810		
	1	113 116 122 4220	113 116 122 4290	112 116 122 4400	112 117 122 4545	112 117 122 4740	112 118 122 4830		
	2	112 117 122 4225	112 117 122 4295	112 117 122 4405	112 118 122 4560	113 118 122 4860	113 118 122 5015		
35000 V _{FTO} = 151	-2	113 117 125 4285	113 117 125 4355	113 117 125 4460	113 117 124 4595	112 117 124 4770	112 117 124 4850		
	-1	113 117 124 4280	113 118 124 4350	113 118 124 4455	112 117 124 4595	112 118 124 4780	112 118 124 4860		
	0	113 118 124 4275	113 118 124 4345	113 118 124 4455	112 118 124 4600	112 119 124 4790	112 119 124 4880		
	1	113 118 124 4280	112 118 124 4350	112 118 124 4460	112 119 124 4610	113 119 124 4935	114 120 124 5090		
	2	113 119 124 4315	113 119 124 4390	113 119 124 4525	114 120 124 4800	115 120 124 5160	116 120 124 5330		
36000 V _{FTO} = 153	-2	113 119 126 4335	113 119 126 4410	113 119 126 4515	113 119 126 4650	112 119 126 4835	112 120 126 4915		
	-1	113 119 126 4330	113 119 126 4400	113 119 126 4510	112 120 126 4655	112 120 126 4845	112 120 126 4930		
	0	113 120 126 4330	113 120 126 4400	112 120 126 4510	112 120 126 4675	114 121 126 5005	114 121 126 5155		
	1	113 120 126 4385	113 121 126 4460	113 121 126 4600	114 121 126 4870	116 122 126 5230	116 122 126 5395		
	2	115 121 126 4560	115 121 126 4640	115 121 126 4785	117 122 126 5085	118 122 126 5490	119 123 126 5680		
38000 V _{FTO} = 157	-2	113 122 129 4435	113 122 129 4510	113 122 129 4620	113 123 129 4780	114 123 129 5105	114 124 129 5250		
	-1	114 123 129 4500	114 123 129 4580	114 123 129 4715	115 124 129 4990	116 124 129 5335	117 124 129 5490		
	0	116 124 129 4685	116 124 129 4765	116 124 129 4915	117 124 129 5205	118 125 129 5580	119 125 129 5755		
	1	118 125 129 4880	118 125 129 4965	118 125 129 5120	119 125 129 5440	120 126 129 5855	121 126 129 6055		
	2	120 125 129 5095	120 125 129 5180	120 125 129 5355	121 126 129 5715	123 126 129 6195	124 127 129 6410		

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-51 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	115 115 126 3245	115 115 126 3300	114 115 126 3355	114 115 126 3410	114 115 126 3465	114 115 126 3515
	-1	114 115 126 3230	114 115 126 3285	114 115 125 3340	114 115 125 3390	114 115 125 3445	114 115 125 3500
	0	114 115 125 3215	114 115 125 3270	114 115 125 3325	114 115 125 3380	114 115 124 3430	114 115 124 3485
	1	114 115 124 3205	114 115 124 3260	114 115 124 3315	114 115 124 3365	114 115 124 3420	114 115 124 3475
	2	114 115 123 3195	114 115 123 3250	114 115 123 3305	114 115 123 3360	114 115 123 3410	114 115 123 3465
30000 V _{FTO} = 140	-2	114 115 125 3325	114 115 125 3380	114 115 125 3435	114 115 125 3495	114 115 125 3545	114 115 125 3605
	-1	114 115 125 3310	114 115 125 3370	114 115 124 3420	114 115 124 3480	114 115 124 3535	114 115 124 3590
	0	114 115 124 3300	114 115 124 3355	114 115 124 3410	114 115 123 3470	114 115 123 3520	114 115 123 3580
	1	114 115 123 3290	114 115 123 3350	114 115 123 3405	113 115 123 3460	113 115 123 3515	113 115 122 3570
	2	113 115 122 3285	113 115 122 3345	113 115 122 3400	113 115 122 3455	113 115 122 3510	113 115 122 3565
32000 V _{FTO} = 145	-2	114 115 124 3405	114 115 124 3460	114 115 124 3520	114 115 124 3575	114 115 124 3635	114 115 124 3690
	-1	114 115 124 3395	114 115 124 3450	114 115 123 3505	114 115 123 3565	114 115 123 3625	113 115 123 3680
	0	113 115 123 3385	113 115 123 3440	113 115 122 3500	113 115 122 3560	113 115 122 3615	113 115 122 3670
	1	113 115 122 3380	113 115 122 3435	113 115 122 3495	113 115 122 3550	113 115 121 3610	113 115 121 3670
	2	113 115 121 3380	113 115 121 3435	113 115 121 3495	113 115 121 3555	113 115 121 3610	113 115 120 3670
33000 V _{FTO} = 147	-2	114 115 124 3440	114 115 124 3500	114 115 124 3560	114 115 124 3615	114 115 124 3675	114 115 123 3735
	-1	114 115 123 3435	113 115 123 3490	113 115 123 3550	113 115 123 3610	113 115 123 3665	113 115 123 3725
	0	113 115 122 3425	113 115 122 3485	113 115 122 3545	113 115 122 3600	113 115 122 3660	113 115 122 3720
	1	113 115 121 3425	113 115 121 3480	113 115 121 3540	113 115 121 3600	113 115 121 3660	113 115 121 3720
	2	113 115 120 3425	113 115 120 3485	113 115 120 3545	113 115 120 3600	113 115 120 3660	113 115 120 3720

TODATA_350SFO_IMP_F20_WETG_ALL_SL_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-52 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE SEA LEVEL****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS)****V_R (KIAS)****V₂ (KIAS)****TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3480	114 115 124 3540	114 115 124 3600	113 115 124 3660	113 115 124 3720	113 115 124 3780
	-1	113 115 123 3470	113 115 123 3530	113 115 123 3590	113 115 123 3650	113 115 123 3710	113 115 123 3770
	0	113 115 123 3470	113 115 122 3530	113 115 122 3590	113 115 122 3645	113 116 122 3705	113 116 122 3765
	1	113 116 122 3470	113 116 122 3525	113 116 122 3585	113 116 122 3645	113 116 122 3705	113 116 122 3770
	2	113 116 122 3470	113 116 122 3530	113 117 122 3590	113 117 122 3650	113 117 122 3710	113 117 122 3770
35000 V _{FTO} = 151	-2	113 117 125 3520	113 117 125 3580	113 117 125 3640	113 117 125 3700	113 117 125 3760	113 117 125 3820
	-1	113 117 124 3510	113 117 124 3575	113 117 124 3635	113 117 124 3695	113 117 124 3755	113 117 124 3815
	0	113 117 124 3510	113 117 124 3570	113 117 124 3635	113 117 124 3690	113 117 124 3755	113 117 124 3815
	1	113 118 124 3515	113 118 124 3575	113 118 124 3635	113 118 124 3695	113 118 124 3755	113 118 124 3820
	2	113 119 124 3535	113 119 124 3605	113 119 124 3670	113 119 124 3730	113 119 124 3795	113 119 124 3865
36000 V _{FTO} = 153	-2	113 118 126 3560	113 118 126 3620	113 118 126 3680	113 118 126 3740	113 118 126 3805	113 119 126 3865
	-1	113 118 126 3555	113 119 126 3615	113 119 126 3675	113 119 126 3740	113 119 126 3800	113 119 126 3860
	0	113 119 125 3555	113 119 125 3615	113 119 125 3675	113 119 125 3735	113 119 125 3800	113 119 125 3860
	1	113 120 125 3595	113 120 125 3660	113 120 125 3730	113 120 125 3795	114 120 125 3860	114 120 125 3925
	2	116 121 125 3740	116 121 125 3810	116 121 125 3880	116 121 125 3945	116 121 125 4015	116 121 125 4085
38000 V _{FTO} = 157	-2	113 122 129 3635	113 122 129 3695	113 122 129 3760	113 122 129 3825	113 122 129 3885	113 122 129 3950
	-1	114 122 129 3680	114 122 129 3750	114 122 129 3820	114 123 129 3885	114 123 129 3955	114 123 129 4025
	0	116 123 129 3835	116 123 129 3905	116 123 129 3980	116 123 129 4045	116 123 129 4120	116 124 129 4190
	1	118 124 129 3990	118 124 129 4070	118 124 129 4140	118 124 129 4215	118 124 129 4290	118 124 129 4365
	2	120 125 129 4170	121 125 129 4250	121 125 129 4325	121 125 129 4405	121 125 129 4485	121 125 129 4560

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-52 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	115 115 126 3295	114 115 126 3355	114 115 126 3410	114 115 126 3465	114 115 126 3515	114 115 126 3570
	-1	114 115 126 3280	114 115 125 3335	114 115 125 3390	114 115 125 3445	114 115 125 3500	114 115 125 3555
	0	114 115 125 3265	114 115 125 3320	114 115 125 3375	114 115 124 3430	114 115 124 3485	114 115 124 3540
	1	114 115 124 3255	114 115 124 3310	114 115 124 3365	114 115 124 3420	114 115 124 3475	114 115 124 3530
	2	114 115 123 3245	114 115 123 3300	114 115 123 3355	114 115 123 3410	114 115 123 3465	114 115 123 3520
30000 V _{FTO} = 140	-2	114 115 125 3375	114 115 125 3435	114 115 125 3490	114 115 125 3545	114 115 125 3605	114 115 125 3660
	-1	114 115 125 3365	114 115 124 3420	114 115 124 3475	114 115 124 3535	114 115 124 3590	114 115 124 3650
	0	114 115 124 3350	114 115 124 3410	114 115 124 3465	114 115 123 3520	114 115 123 3580	114 115 123 3635
	1	114 115 123 3345	114 115 123 3400	113 115 123 3455	113 115 123 3515	113 115 122 3570	113 115 122 3630
	2	113 115 122 3340	113 115 122 3395	113 115 122 3455	113 115 122 3510	113 115 122 3565	113 115 122 3620
32000 V _{FTO} = 145	-2	114 115 124 3455	114 115 124 3515	114 115 124 3575	114 115 124 3630	114 115 124 3690	114 115 124 3750
	-1	114 115 124 3445	114 115 123 3505	114 115 123 3565	114 115 123 3620	113 115 123 3680	113 115 123 3740
	0	113 115 123 3440	113 115 123 3495	113 115 122 3555	113 115 122 3615	113 115 122 3670	113 115 122 3730
	1	113 115 122 3430	113 115 122 3490	113 115 122 3550	113 115 121 3610	113 115 121 3670	113 115 121 3725
	2	113 115 121 3430	113 115 121 3490	113 115 121 3550	113 115 121 3610	113 115 121 3665	113 115 120 3725
33000 V _{FTO} = 147	-2	114 115 124 3495	114 115 124 3555	114 115 124 3615	114 115 124 3675	114 115 124 3735	113 115 123 3795
	-1	114 115 123 3485	113 115 123 3545	113 115 123 3605	113 115 123 3665	113 115 123 3725	113 115 123 3785
	0	113 115 122 3480	113 115 122 3540	113 115 122 3600	113 115 122 3660	113 115 122 3720	113 115 122 3780
	1	113 115 121 3475	113 115 121 3535	113 115 121 3595	113 115 121 3655	113 115 121 3720	113 115 121 3775
	2	113 115 120 3480	113 115 120 3540	113 115 120 3600	113 115 120 3660	113 115 120 3720	113 115 120 3780

TODATA_350SFO_IMP_F20_WETG_ALL_500_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-53 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 500 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	114 115 124 3535	114 115 124 3595	113 115 124 3655	113 115 124 3715	113 115 124 3780	113 115 124 3840
		113 115 123 3525	113 115 123 3590	113 115 123 3650	113 115 123 3710	113 115 123 3770	113 115 123 3830
	0	113 115 123 3525	113 115 122 3585	113 115 122 3645	113 116 122 3705	113 116 122 3765	113 116 122 3825
		113 116 122 3520	113 116 122 3585	113 116 122 3645	113 116 122 3705	113 116 122 3765	113 116 122 3825
	1	113 116 122 3520	113 117 122 3590	113 117 122 3650	113 117 122 3710	113 117 122 3770	113 117 122 3830
		113 116 122 3520	113 117 122 3590	113 117 122 3650	113 117 122 3710	113 117 122 3770	113 117 122 3830
	2	113 116 122 3525	113 117 122 3590	113 117 122 3650	113 117 122 3710	113 117 122 3770	113 117 122 3830
		113 116 122 3525	113 117 122 3590	113 117 122 3650	113 117 122 3710	113 117 122 3770	113 117 122 3830
	-2	113 117 125 3575	113 117 125 3635	113 117 125 3700	113 117 125 3760	113 117 125 3820	113 117 125 3885
		113 117 124 3570	113 117 124 3630	113 117 124 3690	113 117 124 3755	113 117 124 3815	113 117 124 3875
35000 V _{FTO} = 151	-1	113 117 124 3570	113 117 124 3630	113 117 124 3690	113 117 124 3755	113 117 124 3815	113 117 124 3875
		113 117 124 3570	113 117 124 3630	113 117 124 3690	113 117 124 3755	113 117 124 3815	113 117 124 3875
	0	113 117 124 3565	113 117 124 3630	113 117 124 3690	113 117 124 3750	113 117 124 3815	113 117 124 3875
		113 118 124 3570	113 118 124 3630	113 118 124 3690	113 118 124 3755	113 118 124 3815	113 118 124 3875
	1	113 118 124 3570	113 118 124 3630	113 118 124 3690	113 118 124 3755	113 118 124 3815	113 118 124 3875
		113 119 124 3595	113 119 124 3660	113 119 124 3725	113 119 124 3790	113 119 124 3855	113 119 124 3920
	2	113 119 124 3595	113 119 124 3660	113 119 124 3725	113 119 124 3790	113 119 124 3855	113 119 124 3920
		113 119 124 3595	113 119 124 3660	113 119 124 3725	113 119 124 3790	113 119 124 3855	113 119 124 3920
	-2	113 118 126 3615	113 118 126 3675	113 118 126 3740	113 118 126 3800	113 119 126 3865	113 119 126 3925
		113 119 126 3610	113 119 126 3675	113 119 126 3735	113 119 126 3800	113 119 126 3860	113 119 126 3920
36000 V _{FTO} = 153	-1	113 119 126 3610	113 119 126 3675	113 119 126 3735	113 119 126 3800	113 119 126 3860	113 119 126 3920
		113 119 126 3610	113 119 126 3675	113 119 126 3735	113 119 126 3800	113 119 126 3860	113 119 126 3920
	0	113 119 125 3610	113 119 125 3675	113 119 125 3735	113 119 125 3795	113 119 125 3860	113 119 125 3925
		113 120 125 3650	113 120 125 3720	113 120 125 3785	113 120 125 3855	113 120 125 3920	113 120 125 3985
	1	113 120 125 3650	113 120 125 3720	113 120 125 3785	113 120 125 3855	113 120 125 3920	113 120 125 3985
		116 121 125 3800	116 121 125 3870	116 121 125 3940	116 121 125 4010	116 121 125 4075	116 121 125 4145
	2	116 121 125 3800	116 121 125 3870	116 121 125 3940	116 121 125 4010	116 121 125 4075	116 121 125 4145
		116 121 125 3800	116 121 125 3870	116 121 125 3940	116 121 125 4010	116 121 125 4075	116 121 125 4145
	-2	113 122 129 3695	113 122 129 3755	113 122 129 3820	113 122 129 3885	113 122 129 3950	113 122 129 4015
		114 122 129 3740	114 122 129 3815	114 123 129 3880	114 123 129 3950	114 123 129 4020	114 123 129 4085
38000 V _{FTO} = 157	-1	114 122 129 3740	114 122 129 3815	114 123 129 3880	114 123 129 3950	114 123 129 4020	114 123 129 4085
		116 123 129 3895	116 123 129 3970	116 123 129 4040	116 123 129 4110	116 123 129 4185	116 124 129 4255
	0	116 123 129 3895	116 123 129 3970	116 123 129 4040	116 123 129 4110	116 123 129 4185	116 124 129 4255
		118 124 129 4055	118 124 129 4135	118 124 129 4210	118 124 129 4285	118 124 129 4360	118 124 129 4430
	1	118 124 129 4055	118 124 129 4135	118 124 129 4210	118 124 129 4285	118 124 129 4360	118 124 129 4430
		120 125 129 4235	120 125 129 4315	120 125 129 4395	120 125 129 4475	120 125 129 4550	120 125 129 4630
	2	120 125 129 4235	120 125 129 4315	120 125 129 4395	120 125 129 4475	120 125 129 4550	120 125 129 4630
		120 125 129 4235	120 125 129 4315	120 125 129 4395	120 125 129 4475	120 125 129 4550	120 125 129 4630
	-2	113 122 129 3695	113 122 129 3755	113 122 129 3820	113 122 129 3885	113 122 129 3950	113 122 129 4015
		114 122 129 3740	114 122 129 3815	114 123 129 3880	114 123 129 3950	114 123 129 4020	114 123 129 4085

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NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-53 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3350	114 115 126 3405	114 115 126 3460	114 115 126 3515	114 115 126 3570	114 115 126 3630
		114 115 126 3330	114 115 125 3385	114 115 125 3445	114 115 125 3500	114 115 125 3555	114 115 125 3610
	0	114 115 125 3320	114 115 125 3375	114 115 125 3430	114 115 124 3485	114 115 124 3540	114 115 124 3595
	1	114 115 124 3305	114 115 124 3360	114 115 124 3415	114 115 124 3470	114 115 124 3530	114 115 124 3580
	2	114 115 123 3295	114 115 123 3355	114 115 123 3410	114 115 123 3460	114 115 123 3520	113 115 123 3575
30000 V _{FTO} = 140	-2	114 115 125 3430	114 115 125 3490	114 115 125 3545	114 115 125 3605	114 115 125 3660	114 115 125 3720
		114 115 124 3415	114 115 124 3475	114 115 124 3530	114 115 124 3590	114 115 124 3645	114 115 124 3705
	0	114 115 124 3405	114 115 124 3465	114 115 123 3520	114 115 123 3575	114 115 123 3635	114 115 123 3690
	1	114 115 123 3395	114 115 123 3455	113 115 123 3510	113 115 123 3570	113 115 122 3625	113 115 122 3680
	2	113 115 122 3390	113 115 122 3450	113 115 122 3505	113 115 122 3560	113 115 122 3620	113 115 122 3675
32000 V _{FTO} = 145	-2	114 115 124 3510	114 115 124 3570	114 115 124 3630	114 115 124 3690	114 115 124 3750	114 115 124 3810
		114 115 123 3500	114 115 123 3560	114 115 123 3620	113 115 123 3680	113 115 123 3735	113 115 123 3795
	0	113 115 123 3490	113 115 122 3550	113 115 122 3610	113 115 122 3670	113 115 122 3730	113 115 122 3790
	1	113 115 122 3485	113 115 122 3545	113 115 122 3605	113 115 121 3665	113 115 121 3725	113 115 121 3785
	2	113 115 121 3485	113 115 121 3545	113 115 121 3605	113 115 121 3665	113 115 120 3725	113 115 120 3785
33000 V _{FTO} = 147	-2	114 115 124 3555	114 115 124 3610	114 115 124 3670	114 115 124 3735	114 115 123 3795	113 115 123 3850
		113 115 123 3540	113 115 123 3600	113 115 123 3665	113 115 123 3720	113 115 123 3785	113 115 123 3845
	0	113 115 122 3535	113 115 122 3595	113 115 122 3655	113 115 122 3715	113 115 122 3775	113 115 122 3835
	1	113 115 121 3530	113 115 121 3595	113 115 121 3655	113 115 121 3715	113 115 121 3775	113 115 121 3835
	2	113 115 120 3535	113 115 120 3595	113 115 120 3655	113 115 120 3715	113 115 120 3775	113 115 120 3835

TODATA_350SFO_IMP_F20_WETG_ALL_1K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-54 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 1000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)**

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)								
WT (LB)	RWY	TEMPERATURE (°C)						
V _{FTO} (KIAS)	GRD (%)	-15 & BELOW	-10	-5	0	5	10	
34000 V _{FTO} = 149	-2	114 115 124 3590	114 115 124 3655	113 115 124 3715	113 115 124 3775	113 115 124 3840	113 115 124 3895	
	-1	113 115 123 3585	113 115 123 3645	113 115 123 3705	113 115 123 3765	113 115 123 3830	113 115 123 3890	
	0	113 115 123 3580	113 115 123 3640	113 116 122 3700	113 116 122 3765	113 116 122 3825	113 116 122 3885	
	1	113 116 122 3580	113 116 122 3640	113 116 122 3700	113 116 122 3765	113 116 122 3825	113 116 122 3885	
	2	113 116 122 3580	113 117 122 3645	113 117 122 3705	113 117 122 3765	113 117 122 3830	113 117 122 3890	
35000 V _{FTO} = 151	-2	113 117 125 3630	113 117 125 3695	113 117 125 3755	113 117 125 3820	113 117 125 3880	113 117 125 3940	
	-1	113 117 125 3625	113 117 124 3690	113 117 124 3750	113 117 124 3810	113 117 124 3875	113 117 124 3935	
	0	113 117 124 3625	113 117 124 3685	113 117 124 3745	113 117 124 3810	113 117 124 3875	113 117 124 3935	
	1	113 118 124 3625	113 118 124 3685	113 118 124 3750	113 118 124 3810	113 118 124 3875	113 118 124 3935	
	2	113 119 124 3650	113 119 124 3715	113 119 124 3780	113 119 124 3845	113 119 124 3915	113 119 124 3975	
36000 V _{FTO} = 153	-2	113 118 126 3670	113 118 126 3735	113 118 126 3800	113 119 126 3860	113 119 126 3925	113 119 126 3985	
	-1	113 119 126 3665	113 119 126 3730	113 119 126 3795	113 119 126 3855	113 119 126 3920	113 119 126 3985	
	0	113 119 125 3665	113 119 125 3730	113 119 125 3795	113 119 125 3855	113 119 125 3920	113 119 125 3980	
	1	113 120 125 3705	113 120 125 3775	113 120 125 3840	113 120 125 3910	113 120 125 3975	113 120 125 4040	
	2	115 121 125 3855	115 121 125 3925	116 121 125 3995	116 121 125 4065	116 121 125 4135	116 121 125 4205	
38000 V _{FTO} = 157	-2	113 122 129 3750	113 122 129 3815	113 122 129 3880	113 122 129 3950	113 122 129 4010	113 122 129 4075	
	-1	114 122 129 3800	114 122 129 3870	114 123 129 3940	114 123 129 4010	114 123 129 4080	114 123 129 4145	
	0	116 123 129 3955	116 123 129 4030	116 123 129 4100	116 123 129 4175	116 124 129 4245	116 124 129 4315	
	1	118 124 129 4120	118 124 129 4195	118 124 129 4270	118 124 129 4345	118 124 129 4420	118 124 129 4495	
	2	120 125 129 4300	120 125 129 4380	120 125 129 4460	120 125 129 4535	120 125 129 4615	120 125 129 4695	

TODATA_350SFO_JMP_F20_WETG_ALL_1K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-54 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 2000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3455	114 115 126 3515	114 115 126 3570	114 115 126 3630	114 115 126 3690	114 115 125 3750
	-1	114 115 125 3440	114 115 125 3495	114 115 125 3555	114 115 125 3610	114 115 125 3670	114 115 125 3735
	0	114 115 125 3425	114 115 125 3480	114 115 124 3535	114 115 124 3595	114 115 124 3655	114 115 124 3720
	1	114 115 124 3410	114 115 124 3470	114 115 124 3525	114 115 124 3580	114 115 124 3640	114 115 123 3705
	2	114 115 123 3400	114 115 123 3455	114 115 123 3515	114 115 123 3570	113 115 123 3630	113 115 122 3700
30000 V _{FTO} = 140	-2	114 115 125 3540	114 115 125 3600	114 115 125 3660	114 115 125 3720	114 115 125 3780	114 115 124 3850
	-1	114 115 124 3525	114 115 124 3585	114 115 124 3645	114 115 124 3705	114 115 124 3765	114 115 124 3835
	0	114 115 124 3510	114 115 123 3570	114 115 123 3630	114 115 123 3690	114 115 123 3750	113 115 123 3820
	1	114 115 123 3505	113 115 123 3565	113 115 123 3620	113 115 122 3680	113 115 122 3740	113 115 122 3810
	2	113 115 122 3495	113 115 122 3555	113 115 122 3615	113 115 122 3675	113 115 122 3735	113 115 121 3805
32000 V _{FTO} = 145	-2	114 115 124 3625	114 115 124 3685	114 115 124 3750	114 115 124 3810	114 115 124 3870	113 115 124 3945
	-1	114 115 123 3615	114 115 123 3670	113 115 123 3735	113 115 123 3795	113 115 123 3860	113 115 123 3930
	0	113 115 123 3605	113 115 122 3665	113 115 122 3725	113 115 122 3790	113 115 122 3845	113 115 122 3920
	1	113 115 122 3600	113 115 122 3660	113 115 121 3720	113 115 121 3780	113 115 121 3845	113 115 121 3920
	2	113 115 121 3595	113 115 121 3660	113 115 121 3720	113 115 121 3780	113 115 120 3840	113 115 120 3920
33000 V _{FTO} = 147	-2	114 115 124 3665	114 115 124 3730	114 115 124 3790	113 115 123 3850	113 115 123 3915	113 115 123 3990
	-1	113 115 123 3655	113 115 123 3715	113 115 123 3780	113 115 123 3840	113 115 123 3905	113 115 122 3980
	0	113 115 122 3650	113 115 122 3710	113 115 122 3775	113 115 122 3835	113 115 122 3895	113 115 121 3975
	1	113 115 121 3645	113 115 121 3710	113 115 121 3770	113 115 121 3830	113 115 121 3895	113 115 121 3970
	2	113 115 120 3645	113 115 120 3710	113 115 120 3770	113 115 120 3835	113 115 120 3895	113 115 120 3975

TODATA_350SFO_IMP_F20_WETG_ALL_2K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-55 (Sheet 1 of 2)

WET GROOVED RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 2000 FT

ENGINE BLEED ON, ENGINE & WING A/I ON

V₁ (KIAS) V_R (KIAS)
V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)							
WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 3710	113 115 124 3770	113 115 124 3835	113 115 124 3895	113 115 124 3960	113 115 124 4035
	-1	113 115 123 3700	113 115 123 3760	113 115 123 3825	113 115 123 3890	113 116 123 3950	113 116 123 4030
	0	113 116 123 3695	113 116 123 3755	113 116 123 3820	113 116 123 3885	113 116 123 3945	113 116 122 4025
	1	113 116 122 3695	113 116 122 3755	113 116 122 3820	113 116 122 3885	113 116 122 3945	113 116 122 4025
	2	113 117 122 3695	113 117 122 3760	113 117 122 3825	113 117 122 3890	113 117 122 3950	113 117 122 4030
35000 V _{FTO} = 151	-2	113 117 125 3750	113 117 125 3815	113 117 125 3880	113 117 125 3940	113 117 125 4005	113 117 125 4085
	-1	113 117 125 3745	113 117 125 3805	113 117 125 3870	113 117 124 3935	113 117 124 4000	113 117 124 4075
	0	113 117 124 3740	113 117 124 3805	113 117 124 3870	113 117 124 3930	113 117 124 3995	113 117 124 4075
	1	113 118 124 3740	113 118 124 3805	113 118 124 3870	113 118 124 3935	113 118 124 4000	113 118 124 4080
	2	113 119 124 3760	113 119 124 3825	113 119 124 3895	113 119 124 3960	113 119 124 4025	113 119 124 4135
36000 V _{FTO} = 153	-2	113 118 127 3790	113 119 127 3855	113 119 126 3920	113 119 126 3985	113 119 126 4050	113 119 126 4130
	-1	113 119 126 3785	113 119 126 3850	113 119 126 3915	113 119 126 3980	113 119 126 4045	113 119 126 4125
	0	113 119 125 3785	113 119 125 3850	113 119 125 3915	113 119 125 3980	113 119 125 4045	113 120 125 4125
	1	113 120 125 3820	113 120 125 3890	113 120 125 3955	113 120 125 4025	113 120 125 4095	114 120 125 4205
	2	115 121 125 3970	115 121 125 4045	115 121 125 4115	115 121 125 4185	115 121 125 4255	116 121 125 4375
38000 V _{FTO} = 157	-2	113 122 129 3875	113 122 129 3940	113 122 129 4005	113 122 129 4075	113 122 129 4140	113 122 129 4225
	-1	114 122 129 3915	114 123 129 3990	114 123 129 4060	114 123 129 4130	114 123 129 4200	114 123 129 4310
	0	116 123 129 4075	116 123 129 4150	116 123 129 4225	116 124 129 4295	116 124 129 4370	116 124 129 4490
	1	118 124 129 4245	118 124 129 4320	118 124 129 4400	118 124 129 4475	118 124 129 4550	118 125 129 4680
	2	120 125 129 4430	120 125 129 4510	120 125 129 4590	120 125 129 4670	120 125 129 4750	120 125 129 4885

TODATA_350SFO_IMP_F20_WETG_ALL_2K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-55 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 3000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115	114 115	114 115	114 115	114 115	114 115
		126 3570	126 3630	126 3690	126 3750	125 3815	125 3920
	-1	114 115	114 115	114 115	114 115	114 115	114 115
		125 3555	125 3610	125 3670	125 3730	125 3795	124 3905
	0	114 115	114 115	114 115	114 115	114 115	113 115
		124 3535	124 3595	124 3655	124 3715	124 3780	123 3890
	1	114 115	114 115	114 115	114 115	114 115	113 115
		124 3525	124 3580	124 3640	123 3700	123 3765	122 3880
	2	114 115	114 115	113 115	113 115	113 115	113 115
		123 3515	123 3575	123 3635	123 3690	122 3755	122 3875
30000 V _{FTO} = 140	-2	114 115	114 115	114 115	114 115	114 115	113 115
		125 3660	125 3720	125 3780	125 3845	124 3910	124 4025
	-1	114 115	114 115	114 115	114 115	114 115	113 115
		124 3640	124 3705	124 3765	124 3830	124 3895	123 4010
	0	114 115	114 115	114 115	113 115	113 115	113 115
		123 3630	123 3690	123 3750	123 3815	123 3880	122 4000
	1	113 115	113 115	113 115	113 115	113 115	113 115
		123 3620	122 3680	122 3745	122 3805	122 3875	121 4000
	2	113 115	113 115	113 115	113 115	113 115	113 115
		122 3615	122 3675	122 3740	121 3800	121 3865	121 3995
32000 V _{FTO} = 145	-2	114 115	114 115	114 115	114 115	113 115	113 115
		124 3745	124 3810	124 3875	124 3935	124 4010	123 4130
	-1	113 115	113 115	113 115	113 115	113 115	113 115
		123 3735	123 3795	123 3860	123 3925	123 3995	122 4120
	0	113 115	113 115	113 115	113 115	113 115	113 115
		122 3725	122 3790	122 3850	122 3915	122 3985	121 4115
	1	113 115	113 115	113 115	113 115	113 115	113 115
		121 3720	121 3780	121 3845	121 3910	121 3980	120 4115
	2	113 115	113 115	113 115	113 115	113 115	112 115
		121 3720	121 3780	120 3845	120 3910	120 3980	120 4120
33000 V _{FTO} = 147	-2	114 115	113 115	113 115	113 115	113 115	113 115
		124 3790	123 3855	123 3920	123 3985	123 4055	122 4180
	-1	113 115	113 115	113 115	113 115	113 115	113 115
		123 3780	123 3845	123 3910	122 3970	122 4045	122 4170
	0	113 115	113 115	113 115	113 115	113 115	113 115
		122 3770	122 3835	122 3900	122 3965	121 4035	121 4170
	1	113 115	113 115	113 115	113 115	113 115	113 115
		121 3770	121 3835	121 3900	121 3965	121 4035	120 4175
	2	113 115	113 115	113 115	113 115	113 115	112 115
		120 3770	120 3835	120 3900	120 3965	120 4035	120 4180

TODATA_350SFO_IMP_F20_WETG_ALL_3K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-56 (Sheet 1 of 2)

WET GROOVED RUNWAY TAKEOFF DATA

FLAPS 20°

ALTITUDE 3000 FT

ENGINE BLEED ON, ENGINE & WING A/I ON

V₁ (KIAS) V_R (KIAS)
V₂ (KIAS) TOFL (FT)

UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 3835	113 115 124 3900	113 115 124 3965	113 115 124 4030	113 115 124 4105	113 115 123 4230
	-1	113 115 123 3825	113 115 123 3890	113 116 123 3955	113 116 123 4020	113 116 123 4095	113 116 122 4225
	0	113 116 123 3820	113 116 123 3885	113 116 123 3950	113 116 123 4015	113 116 122 4090	113 116 122 4225
	1	113 116 122 3820	113 116 122 3885	113 116 122 3950	113 116 122 4015	113 116 122 4090	112 117 122 4230
	2	113 117 122 3820	113 117 122 3890	113 117 122 3955	113 117 122 4020	112 117 122 4095	112 118 122 4245
35000 V _{FTO} = 151	-2	113 117 125 3875	113 117 125 3945	113 117 125 4010	113 117 125 4075	113 117 125 4150	113 117 124 4280
	-1	113 117 125 3870	113 117 125 3935	113 117 124 4005	113 117 124 4070	113 117 124 4145	113 117 124 4280
	0	113 117 124 3865	113 117 124 3930	113 117 124 4000	113 118 124 4065	113 118 124 4140	112 118 124 4285
	1	113 118 124 3870	113 118 124 3935	113 118 124 4000	113 118 124 4070	113 118 124 4145	112 119 124 4295
	2	113 119 124 3890	113 119 124 3960	113 119 124 4030	113 119 124 4095	113 119 124 4190	114 120 124 4470
36000 V _{FTO} = 153	-2	113 119 127 3920	113 119 126 3985	113 119 126 4055	113 119 126 4125	113 119 126 4200	113 119 126 4335
	-1	113 119 126 3915	113 119 126 3985	113 119 126 4050	113 119 126 4115	113 119 126 4190	113 119 125 4335
	0	113 119 125 3915	113 119 125 3980	113 119 125 4050	113 119 125 4115	113 120 125 4195	113 120 125 4360
	1	113 120 125 3955	113 120 125 4025	113 120 125 4095	113 120 125 4165	113 120 125 4260	115 121 125 4540
	2	115 121 125 4110	115 121 125 4185	115 121 125 4260	115 121 125 4330	115 121 125 4430	117 122 125 4735
38000 V _{FTO} = 157	-2	113 122 129 4005	113 122 129 4075	113 122 129 4145	113 122 129 4215	113 122 129 4290	113 123 129 4460
	-1	114 123 129 4055	114 123 129 4130	114 123 129 4200	114 123 129 4275	114 123 129 4365	115 124 129 4650
	0	116 123 129 4220	116 124 129 4295	116 124 129 4370	116 124 129 4445	116 124 129 4545	117 124 129 4850
	1	118 124 129 4395	118 124 129 4475	118 124 129 4555	118 124 129 4630	118 125 129 4735	120 125 129 5065
	2	120 125 129 4585	120 125 129 4670	120 125 129 4750	120 125 129 4835	120 125 129 4945	122 126 129 5325

TODATA_350SFO_IMP_F20_WETG_ALL_3K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-56 (Sheet 2 of 2)

WET GROOVED RUNWAY TAKEOFF DATA**FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
28000 V _{FTO} = 136	-2	114 115 126 3695	114 115 126 3755	114 115 125 3815	114 115 125 3880	114 115 125 3985	113 115 124 4105
		114 115 125 3675	114 115 125 3735	114 115 125 3800	114 115 125 3860	114 115 124 3970	113 115 123 4095
	0	114 115 124 3660	114 115 124 3720	114 115 124 3780	114 115 124 3845	113 115 123 3955	113 115 122 4085
	1	114 115 123 3645	114 115 123 3705	114 115 123 3770	114 115 123 3830	113 115 122 3945	113 115 122 4080
	2	113 115 123 3635	113 115 123 3695	113 115 122 3755	113 115 122 3820	113 115 122 3940	113 115 121 4080
30000 V _{FTO} = 140	-2	114 115 125 3785	114 115 125 3850	114 115 124 3915	114 115 124 3980	113 115 124 4095	113 115 123 4220
		114 115 124 3770	114 115 124 3835	114 115 124 3895	114 115 124 3960	113 115 123 4080	113 115 122 4210
	0	114 115 123 3755	113 115 123 3820	113 115 123 3885	113 115 123 3950	113 115 122 4070	113 115 121 4210
	1	113 115 122 3745	113 115 122 3810	113 115 122 3875	113 115 122 3940	113 115 121 4065	113 115 121 4210
	2	113 115 122 3740	113 115 121 3805	113 115 121 3865	113 115 121 3935	113 115 121 4065	112 115 120 4215
32000 V _{FTO} = 145	-2	114 115 124 3875	114 115 124 3945	113 115 124 4010	113 115 124 4080	113 115 123 4195	113 115 122 4335
		113 115 123 3865	113 115 123 3930	113 115 123 3995	113 115 123 4065	113 115 122 4190	113 115 121 4330
	0	113 115 122 3855	113 115 122 3920	113 115 122 3985	113 115 122 4055	113 115 121 4185	113 115 120 4335
	1	113 115 121 3850	113 115 121 3915	113 115 121 3980	113 115 121 4050	113 115 120 4185	112 115 120 4340
	2	113 115 120 3845	113 115 120 3915	113 115 120 3980	113 115 120 4050	112 115 120 4190	112 115 119 4355
33000 V _{FTO} = 147	-2	113 115 123 3920	113 115 123 3990	113 115 123 4055	113 115 123 4125	113 115 122 4250	113 115 122 4395
		113 115 123 3910	113 115 122 3975	113 115 122 4045	113 115 122 4115	113 115 122 4240	113 115 121 4390
	0	113 115 122 3905	113 115 122 3970	113 115 121 4040	113 115 121 4110	113 115 121 4240	112 115 120 4395
	1	113 115 121 3900	113 115 121 3970	113 115 121 4035	113 115 121 4105	113 115 120 4245	112 115 120 4405
	2	113 115 120 3900	113 115 120 3970	113 115 120 4035	113 115 120 4105	112 115 120 4250	112 116 120 4420

TODATA_350SFO_IMP_F20_WETG_ALL_4K_PART1_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-57 (Sheet 1 of 2)

**WET GROOVED RUNWAY TAKEOFF DATA****FLAPS 20°****ALTITUDE 4000 FT****ENGINE BLEED ON, ENGINE & WING A/I ON****V₁ (KIAS) V_R (KIAS)****V₂ (KIAS) TOFL (FT)****UNCORRECTED TAKEOFF SPEEDS (KIAS) AND FIELD LENGTH (FT)**

WT (LB) V _{FTO} (KIAS)	RWY GRD (%)	TEMPERATURE (°C)					
		-15 & BELOW	-10	-5	0	5	10
34000 V _{FTO} = 149	-2	113 115 124 3965	113 115 124 4035	113 115 124 4105	113 116 124 4175	113 115 123 4300	113 115 122 4450
	-1	113 116 123 3960	113 116 123 4025	113 116 123 4095	113 116 123 4165	113 116 122 4295	112 116 122 4450
	0	113 116 123 3950	113 116 122 4020	113 116 122 4090	113 116 122 4160	113 116 122 4295	112 117 122 4460
	1	113 116 122 3950	113 116 122 4020	113 116 122 4090	113 116 122 4160	112 117 122 4305	112 117 122 4470
	2	113 117 122 3955	113 117 122 4025	113 117 122 4095	112 117 122 4165	112 118 122 4315	113 118 122 4595
35000 V _{FTO} = 151	-2	113 117 125 4010	113 117 125 4080	113 117 125 4150	113 117 125 4220	113 117 124 4355	113 117 124 4510
	-1	113 117 124 4005	113 117 124 4075	113 117 124 4145	113 117 124 4215	113 117 124 4350	112 118 124 4510
	0	113 117 124 4000	113 118 124 4070	113 118 124 4140	113 118 124 4210	112 118 124 4355	112 119 124 4520
	1	113 118 124 4005	113 118 124 4075	113 118 124 4145	113 118 124 4215	112 119 124 4365	114 120 124 4670
	2	113 119 124 4035	113 119 124 4110	113 119 124 4180	113 119 124 4255	114 120 124 4535	116 120 124 4880
36000 V _{FTO} = 153	-2	113 119 126 4060	113 119 126 4130	113 119 126 4200	113 119 126 4270	113 119 126 4405	112 119 126 4565
	-1	113 119 126 4055	113 119 126 4120	113 119 126 4195	113 119 126 4265	113 119 126 4405	112 120 126 4570
	0	113 119 126 4050	113 120 126 4125	113 120 126 4195	113 120 126 4265	113 120 126 4420	114 121 126 4735
	1	113 120 126 4105	113 120 126 4180	113 120 126 4250	113 120 126 4325	115 121 126 4605	116 122 126 4945
	2	115 121 126 4270	115 121 126 4345	115 121 126 4420	115 121 126 4500	117 122 126 4800	118 122 126 5190
38000 V _{FTO} = 157	-2	113 122 129 4150	113 122 129 4220	113 122 129 4290	113 122 129 4365	113 123 129 4525	114 123 129 4835
	-1	114 123 129 4210	114 123 129 4285	114 123 129 4360	114 123 129 4440	115 124 129 4715	116 124 129 5045
	0	116 124 129 4380	116 124 129 4460	116 124 129 4540	116 124 129 4620	117 124 129 4915	119 125 129 5275
	1	118 124 129 4560	118 124 129 4645	118 125 129 4730	118 125 129 4815	119 125 129 5135	121 126 129 5535
	2	120 125 129 4760	120 125 129 4850	120 125 129 4935	120 125 129 5025	122 126 129 5395	123 127 129 5840

TODATA_350SFO_IMP_F20_WETG_ALL_4K_PART2_22FEB19

NOTE: CORRECT V₁ AND TOFL USING THE APPLICABLE CORRECTION TABLE.

Figure 07-11A-01-57 (Sheet 2 of 2)

WET GROOVED RUNWAY WIND CORRECTIONS

	WIND (KNOTS)	UNCORRECTED V_1 (KIAS)				
		110	115	116	120	125
CORRECTED V_1 (KIAS)	-10	110	115	119	123	128
	0	110	115	116	120	125
	10	110	115	115	119	124
	20	110	115	114	118	123
	30	110	115	113	117	122

	WIND (KNOTS)	UNCORRECTED V_1 (KIAS)				
		110	115	116	120	125
TOFL FACTOR	-10	1.34	1.34	1.34	1.34	1.34
	0	1.00	1.00	1.00	1.00	1.00
	10	0.95	0.95	0.95	0.95	0.95
	20	0.90	0.90	0.90	0.90	0.90
	30	0.85	0.85	0.85	0.85	0.85

TODATA_350SFO_F20_WETG_WIND_CORR_26FEB19

NOTES:

1. In the tables, tailwinds are shown as negative values and headwinds as positive values.
2. If the corrected V_1 exceeds V_R for the appropriate conditions, use $V_1 = V_R$.

**WET GROOVED RUNWAY CORRECTIONS
DISPATCH WITH ONE THRUST REVERSER INOPERATIVE**

	UNCORRECTED V_1 (KIAS)				
	110	115	116	120	125
CORRECTED V_1 (KIAS)	110	115	115	119	124
TOFL FACTOR	1.04	1.04	1.04	1.04	1.04

TODATA_350SFO_F20_WETG_TREV_CORR_22FEB19

NOTE: If the corrected V_1 exceeds V_R for the appropriate conditions, use $V_1 = V_R$.

Figure 07-11A-01-58



TAKEOFF PATH

The takeoff path must be adjusted for an SFO takeoff. The Challenger 350 CAFM is required to determine the SFO takeoff path. To determine the takeoff path associated to an SFO takeoff, use the following procedure:

1. Run the CAFM Full Takeoff Module for the SFO conditions at Flaps 20 and assuming a balanced V_1 input. Select the applicable runway surface condition, engine bleed, airport pressure altitude, takeoff weight, ambient temperature, runway gradient, rolling takeoff state and reported wind.
2. With the resulting V_1/V_R ratio, run the CAFM Takeoff Path / Fixed Level-Off Height module with the same SFO input conditions, at the desired Gross Level-Off Height and Gross Final Height.
3. Correct the CAFM calculated Net Flight Path data as follows:
 - (a) Apply a distance correction to the horizontal Net Distance trajectory points. The Net Distance corrections provided in Fig. 07-11A-01-59 are a function of airplane weight and of selected Gross Level-Off Height.
 - (b) Reduce the calculated Net Heights by 10 ft. This correction is not applicable to the Brake Release, Lift-Off and 35 ft points.
 - (c) Increase the Level Acceleration Segment Distance by 170 ft. The Final Segment Net Distances are increased by the sum of the correction provided in Fig. 07-11A-01-59 and of the correction on Level Acceleration Segment Distance.
4. Using the same input conditions, reduce the maximum Level-Off Height calculated by the Takeoff Path / Maximum Level-Off Height module by 300 ft. The Net Flight Path corrections on Net Distance, Net Height and Level Acceleration Segment Distance presented in 3(a), 3(b) and 3(c) respectively must be applied to the Net Flight Path calculated by the Maximum Level-Off Height module.

TAKEOFF PATH NET DISTANCE CORRECTION (FT)

WEIGHT (LB)	GROSS LEVEL-OFF HEIGHT (FT)				
	400	1000	3000	5000	ABOVE 5000
29000 AND BELOW	100	100	100	100	100
30000	100	100	150	230	380
31000	100	100	220	370	630
32000	100	110	300	530	950
33000	110	140	410	730	1150
34000	380	380	430	540	800
35000	460	460	460	460	460
36000	410	410	410	410	410
37000	380	380	380	380	380
38000	350	350	350	350	350

350SFO_IMP_F20_TOPATH_CORR_14MAR19

NOTES:

1. Increase the CAFM Net Distances by the correction provided as a function of airplane weight and gross level-off height.
2. The takeoff starting point (distance zero) remains unchanged.
3. Interpolation is allowed between airplane weight and level-off height values, or the largest correction may be used.

Figure 07-11A-01-59

**Example:**

Determine the takeoff weight limited by obstacle clearance for the following conditions:

Aircraft Weight	= 33,000 lb
Engine Bleed	= Engine Bleed On
Runway Surface	= Dry
Rolling Takeoff	= Yes
Runway gradient	= +1.0% (Positive Uphill)
Airport pressure altitude	= 2,000 ft
Reported wind	= -10 knots (Negative for tailwind)
Airport Temperature (OAT)=	25 °C
CDL Index	= Zero
MMEL	= No MMEL item applicable
Obstacle Height	= 846.7 ft above the runway surface (lift-off end)
Obstacle Distance	= 18,924 ft from the takeoff starting point

Step 1: Determine the applicable V_1/V_R ratio

Open the CAFM Full Takeoff Module. Enter the conditions specified above for a Flaps 20 takeoff (SFO limitation) and assume a balanced V_1 (V_1 Type selection box). Run the CAFM and determine the applicable V_1/V_R ratio in the Output Data View.

For the specified conditions, the applicable V_1/V_R ratio is 1.0.

Step 2: Determine the SFO takeoff path

Open the CAFM Takeoff Path – Fixed Level-Off Height module. Enter the same conditions as in Step 1 and the applicable V_1/V_R ratio (1.0 for the specified conditions). Select appropriate values for the Gross Level-Off Height (LOH) and Gross Final Height. In this example, a Gross LOH of 1,000 ft and a Gross Final Height of 2,000 ft will be used. Run the CAFM to get the uncorrected Net Distance and Net Height trajectory points.

The following points of the takeoff path are calculated by the CAFM:

	BRAKE RELEASE	LIFT-OFF POINT	35 FT POINT	GEAR UP POINT	END 2ND SEGMT	END ACCEL. SEGMT	END FINAL SEGMT
Net Distance (ft)	0	3,656	5,017	7,287	18,784	44,075	55,924
Net Height (ft)	0.0	0.0	35.0	149.3	891.7	891.7	1,796.9

The Maximum LOH is obtained from the CAFM Takeoff Path – Maximum Level–Off Height module. For the associated conditions, the uncorrected Maximum LOH is 7,662 ft.

The following corrections are applicable for an SFO takeoff:

- Fig. 07–11A–01–59 provides the takeoff path net distance correction. For a weight of 33,000 lb and a Gross LOH of 1,000 ft, the calculated net distances must be increased by 140 ft. The takeoff starting point (brake release point in CAFM) is unchanged.
- The calculated net heights must be reduced by 10 ft. This correction is not applicable to the Brake Release, Lift–Off and 35 ft points.
- The calculated Level Acceleration Segment distance must be increased by 170 ft. The calculated Final Segment net distances are increased by the sum of 140 ft (correction in (a) above) and of 170 ft, giving 310 ft.

After application of the corrections, the SFO takeoff path is as follows:

	BRAKE RELEASE	LIFT–OFF POINT	35 FT POINT	GEAR UP POINT	END 2ND SEGMT	END ACCEL. SEGMT	END FINAL SEGMT
Net Distance (ft)	0	3,796	5,157	7,427	18,924	44,385	56,234
Net Height (ft)	0.0	0.0	35.0	139.3	881.7	881.7	1,786.9

The calculated Maximum LOH is reduced by 300 ft, giving an SFO Maximum LOH of 7,362 ft. The SFO Maximum LOH is not limiting the selected Gross LOH of 1,000 ft.

Step 3: Verify the obstacle clearance

The SFO takeoff path obtained in Step 2 is used to verify the obstacle clearance. Per regulations, the net trajectory must clear all obstacles by a minimum of 35 ft. For the specified conditions, the net trajectory clears the obstacle by exactly 35 ft at the beginning of the LOH horizontal segment (end of second segment). At the obstacle distance of 18,924 ft, the net height is of 881.7 ft giving an obstacle clearance of $881.7 - 846.7 = 35$ ft. Therefore, the takeoff weight is limited by obstacle clearance considerations.

In some situations, the selected Gross LOH may result in a net LOH which does not clear all the obstacles by 35 ft. The input Gross LOH is then increased such that the net LOH clears all obstacles by 35 ft, while remaining below the SFO Maximum LOH. If the net trajectory cannot clear an obstacle by 35 ft during the first or second segments, then the takeoff weight must be reduced. Repeat Steps 1 to 3 until obstacle clearance is assured.



STABILIZER TRIM SETTING FOR TAKEOFF

For an SFO takeoff, determine the required stabilizer trim setting for takeoff using the Stabilizer Trim Setting chart provided by Fig. 07-11A-01-60, as a function of aircraft weight and CG position.

**STABILIZER TRIM FOR TAKEOFF
FLAPS=20°**

TOSTAB_F20_CH350SFO_27FEB2019

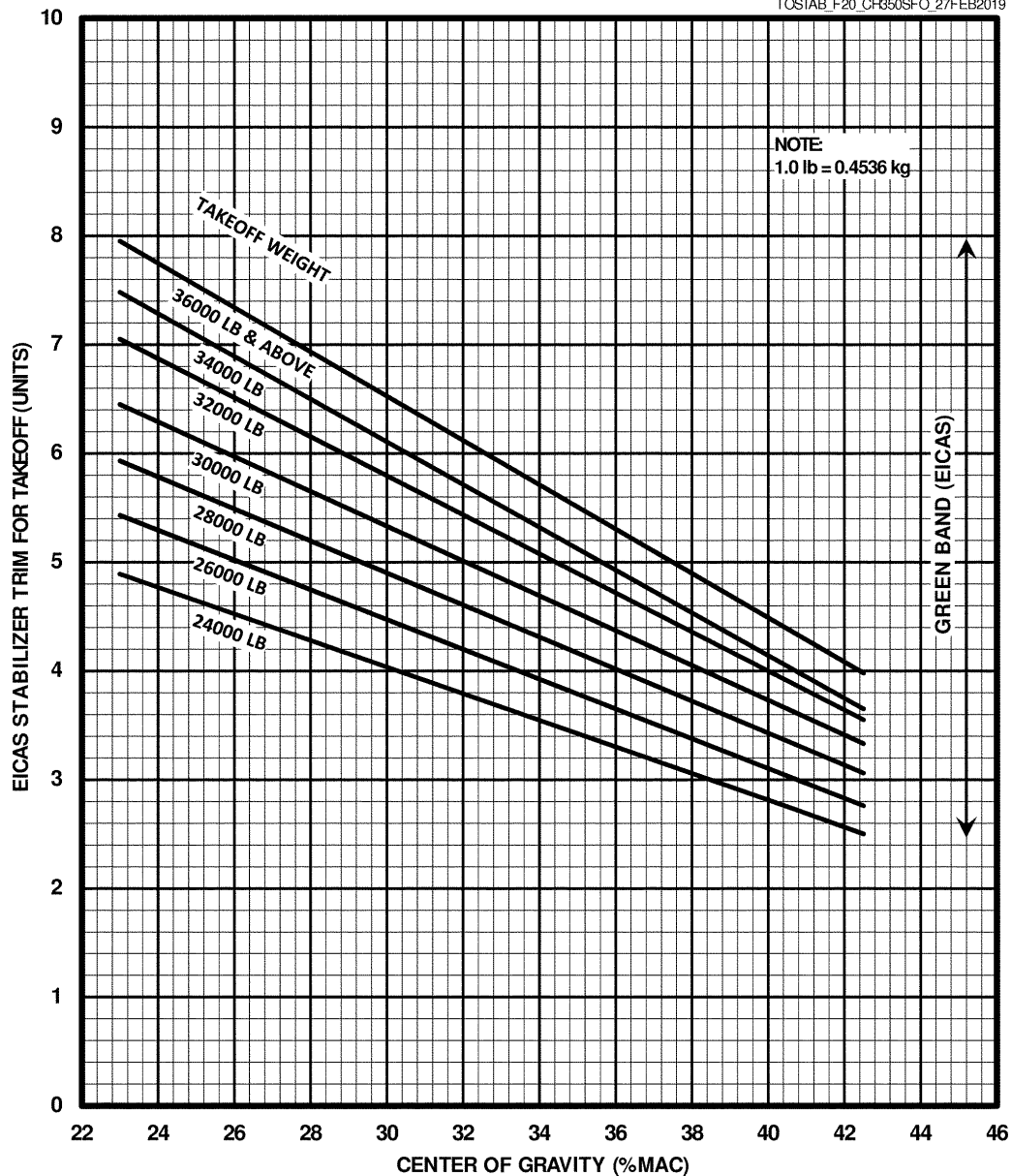


Figure 07-11A-01-60



TURN-AROUND TIME – REJECTED TAKEOFF BRAKE ENERGY – FLAPS 20°

For an SFO takeoff, the Rejected Takeoff Brake Energy calculated in Figure 06-50-2 must be increased by 0.2×10^6 ft.lb. The corresponding Cooling Time charts remain applicable for an SFO rejected takeoff.

SUPPLEMENTS

The supplementary data in chapter 7 are applicable except for the following:

- **SUPPLEMENT 2 – Supplemental Information for the MMEL**
 - **Flight Director Guidance or TOGA Switches Inoperative**

An SFO takeoff with one or both flight directors inoperative and/or with TOGA switches inoperative is permitted. The target pitch attitudes for a Flaps 20 takeoff presented in Figure 07-02-01-1 are applicable.
 - **Flight with Landing Gear Down**

An SFO takeoff with fixed landing gear down is prohibited.
 - **Nosewheel Steering Inoperative**

An SFO takeoff with nosewheel steering inoperative is permitted. The takeoff field length penalty of 1.0% is applicable to SFO takeoffs. When an SFO takeoff is performed with nosewheel steering inoperative, increase the SFO takeoff field length provided in this Supplement by 1.0%.
 - **Radio Altimeter Inoperative**

An SFO takeoff with the radio altimeter inoperative is permitted. The specified landing distance factor remains applicable to the corresponding landing performance.

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