



The National Transportation Safety Board

Office of Aviation Safety
Central Region
Memorandum for the Record
Estimated Landing Distance
Calculations
CEN21LA071
Lufkin, Texas
December 2, 2020

Summary

To determine the estimated landing distance the Cessna 551 Airplane Flight Manual performance tables were used (included in this memo). **The length of runway 16 was 4,311 ft. Video showed that the airplane touched down about 1,000 ft down the runway, leaving about 3,311 ft to stop. The estimated landing distance for the airplane at the time of the accident was 4,127 ft.**

Details and Charts

The KLFK airport elevation is 296'. (Sea Level and 1,000' charts were used)
The pilot reported the landing weight as 10,500 pounds.
The reported temperature at the time of the accident was 9°C.
The reported wind was 100° at 6 kts. (This produced a crosswind component of 5.2 kts and a headwind of 3 kts).
There was light rain and mist reported at the time of the accident.

Landing distance performance was estimated by using the 1000 Feet chart, 10°C, and Zero Wind. The estimated landing distance was 2,080'.

When chart results were interpolated for field elevation of 296', temperature of 9°C, and 3 kts headwind, the estimated landing distance was 2,013.24'. For simplicity, that was rounded to 2,013'.

Chart Results and Interpolations

Sea Level, 05°C, Zero Wind = 2030	Sea Level, 05°C, 10 kts Wind = 1900
Sea Level, 09°C, Zero Wind = 2038	Sea Level, 09°C, 10 kts Wind = 1916
Sea Level, 09°C, 3 kts = 2001.4	
Sea Level, 10°C, Zero Wind = 2040	Sea Level, 10°C, 10 kts Wind = 1920
1000 Feet, 05°C, Zero Wind = 2070	1000 Feet, 05°C, 10 kts Wind = 1940
1000 Feet, 09°C, Zero Wind = 2078	1000 Feet, 09°C, 10 kts Wind = 1956
1000 Feet, 09°C, 3 kts = 2041.4	
1000 Feet, 10°C, Zero Wind = 2080	1000 Feet, 10°C, 10 kts Wind = 1960

Because the runway was wet, the AFM "Data for Wet, Slush, Snow-and Ice-Covered Runways" was used to complete the landing performance estimate. A Warning in the AFM noted: "These correction factors for adverse runway conditions are approximate and are to be considered minimums, as actual runway conditions may require factors greater than those listed."

For a "Wet" runway condition, which is defined as having a depth of precipitation of less than 0.01-inch water, the landing performance chart noted to increase landing field length by 1.45.

For a "Water" runway condition, which is defined as having a depth of precipitation of less than 0.4-inch water, the landing performance chart noted to increase landing field length by 2.05.

Video of the landing indicated that there was a significant amount of water on the runway, thus the correction factor of 2.05 was used.

The interpolated landing distance of 2,013' x 2.05 = 4,126.65'. For simplicity, that was rounded to an estimated landing distance of 4,127 ft.

MODEL 551

SECTION IV - PERFORMANCE APPROACH AND LANDING

LANDING DISTANCE - FEET ACTUAL DISTANCE SEA LEVEL

CONDITIONS: Landing Gear - DOWN Anti-Ice Systems - ON or OFF
 Wing Flaps - LAND Thrust - IDLE
 Speed Brakes - EXTEND AFTER TOUCHDOWN Airspeed - V_{REF} at 50 FEET

Some conditions may be brake energy limited. Refer to Figures 4-27 and 4-28 for allowable landing weights.

WEIGHT = 10500 LBS VREF = 99 KIAS VAPP = 106 KIAS						WEIGHT = 9500 LBS VREF = 97 KIAS VAPP = 101 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS			TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS		
			10 KTS	20 KTS	30 KTS				10 KTS	20 KTS	30 KTS
-25	2350	1930	1800	1680	1570	-25	2340	1910	1790	1670	1560
-20	2360	1940	1820	1700	1590	-20	2350	1930	1800	1680	1570
-15	2380	1960	1830	1720	1600	-15	2370	1940	1820	1700	1590
-10	2400	1980	1850	1730	1620	-10	2390	1960	1830	1720	1600
-5	2410	1990	1870	1750	1640	-5	2400	1980	1850	1730	1620
0	2430	2010	1880	1770	1650	0	2420	1990	1870	1750	1630
5	2450	2030	1900	1780	1670	5	2430	2010	1880	1760	1650
10	2460	2040	1920	1800	1690	10	2450	2030	1900	1780	1660
15	2480	2060	1940	1820	1700	15	2470	2040	1920	1800	1680
20	2500	2080	1950	1830	1720	20	2480	2060	1930	1810	1700
25	2520	2100	1970	1850	1730	25	2500	2070	1950	1830	1710
30	2530	2110	1990	1860	1750	30	2520	2090	1960	1840	1730
35	2550	2130	2000	1880	1770	35	2530	2110	1980	1860	1740
40	2570	2150	2020	1900	1780	40	2550	2120	2000	1870	1760
45	2590	2160	2040	1910	1800	45	2560	2140	2010	1890	1770
50	2600	2170	2050	1930	1810	50	2570	2150	2020	1900	1780
54	2590	2170	2050	1930	1810	54	2570	2150	2020	1900	1780

SECTION IV - PERFORMANCE APPROACH AND LANDING

MODEL 551

LANDING DISTANCE - FEET ACTUAL DISTANCE 1000 FEET

CONDITIONS: Landing Gear - DOWN Anti-Ice Systems - ON or OFF
 Wing Flaps - LAND Thrust - IDLE
 Speed Brakes - EXTEND AFTER TOUCHDOWN Airspeed - V_{REF} at 50 FEET

Some conditions may be brake energy limited. Refer to Figures 4-27 and 4-28 for allowable landing weights.

WEIGHT = 10500 LBS VREF = 99 KIAS VAPP = 106 KIAS						WEIGHT = 9500 LBS VREF = 97 KIAS VAPP = 101 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS			TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS		
			10 KTS	20 KTS	30 KTS				10 KTS	20 KTS	30 KTS
-25	2380	1960	1830	1720	1600	-25	2370	1950	1820	1700	1590
-20	2400	1980	1850	1730	1620	-20	2390	1960	1840	1720	1600
-15	2420	1990	1870	1750	1640	-15	2400	1980	1850	1730	1620
-10	2430	2010	1890	1770	1650	-10	2420	2000	1870	1750	1640
-5	2450	2030	1900	1780	1670	-5	2440	2010	1890	1770	1650
0	2470	2050	1920	1800	1690	0	2450	2030	1900	1780	1670
5	2490	2070	1940	1820	1700	5	2470	2050	1920	1800	1680
10	2500	2080	1960	1840	1720	10	2490	2060	1940	1820	1700
15	2520	2100	1970	1850	1740	15	2510	2080	1950	1830	1720
20	2540	2120	1990	1870	1760	20	2520	2100	1970	1850	1730
25	2560	2140	2010	1890	1770	25	2540	2110	1990	1870	1750
30	2580	2150	2030	1910	1790	30	2560	2130	2000	1880	1770
35	2590	2170	2040	1920	1810	35	2570	2150	2020	1900	1780
40	2610	2190	2060	1940	1820	40	2590	2170	2040	1910	1800
45	2630	2210	2080	1960	1840	45	2610	2180	2050	1930	1810
50	2640	2220	2090	1970	1850	50	2620	2190	2060	1940	1820
52	2640	2220	2100	1970	1860	52	2620	2200	2070	1950	1830

PERFORMANCE (REFER TO NOTE 1)

RUNWAY CONDITION	DEPTH OF PRECIPITATION (REFER TO NOTE 6)	TAKEOFF (REFER TO NOTE 2)		LANDING
		CHANGE FLIGHT MANUAL V_1^* BY:	INCREASE NORMAL TAKEOFF FIELD LENGTH BY:	INCREASE LANDING FIELD LENGTH BY: (REFER TO NOTE 3)
WET	LESS THAN 0.01 INCH WATER	-6 KIAS	1.30	1.45
WATER	LESS THAN 0.4 INCH WATER	+9 KIAS	2.60	2.05
SLUSH	LESS THAN 0.4 INCH	+6 KIAS	2.50 (REFER TO NOTE 4)	1.90
LOOSE DRY SNOW	1.0 INCH	-9 KIAS	2.40 (REFER TO NOTE 5)	2.35
	2.0 INCHES	-3 KIAS	2.30 (REFER TO NOTE 6)	2.00
ICE (DRY)		UNKNOWN	UNKNOWN	2.60

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