

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR24FA190

WEIGHT AND BALANCE AND PERFORMANCE SUMMARY

12/04/25

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A. ACCIDENT

Location: Elk River, Idaho
Date: June 12, 2024
Time: 10:06 Pacific daylight time
Airplane: N34903, Cessna 177B

B. WEIGHT AND BALANCE AND PERFORMANCE SUMMARY

An estimated weight and balance of the airplane prior to flight, and climb performance summary was calculated using the following:

- Most recent aircraft weight and balance, dated June 17, 2022
- Reported weights of the occupants
- Front seat occupant positions
- Rear seat occupant position
- Estimated weight for 2 flight bags (20 lbs)
- Full fuel
- Accident airplane POH weight and balance calculation graph
- Accident airplane POH climb performance data and engine operation guidance

C. WEIGHT AND BALANCE

Seats – Occupants 1 front left, 1 front right 1 rear bench seat		
Fuel – Full (50 gallons)		
Item	Weight	Moment
Airplane	1563.68	164386.62
Front Left, Front Right	337.0	31350.00
Rear + Flight Bags	170.0	22600.00
Fuel	300.0	34000.00
Totals	2370.68	252336.00

Figure 1. Calculated take off weight and center of gravity moment.

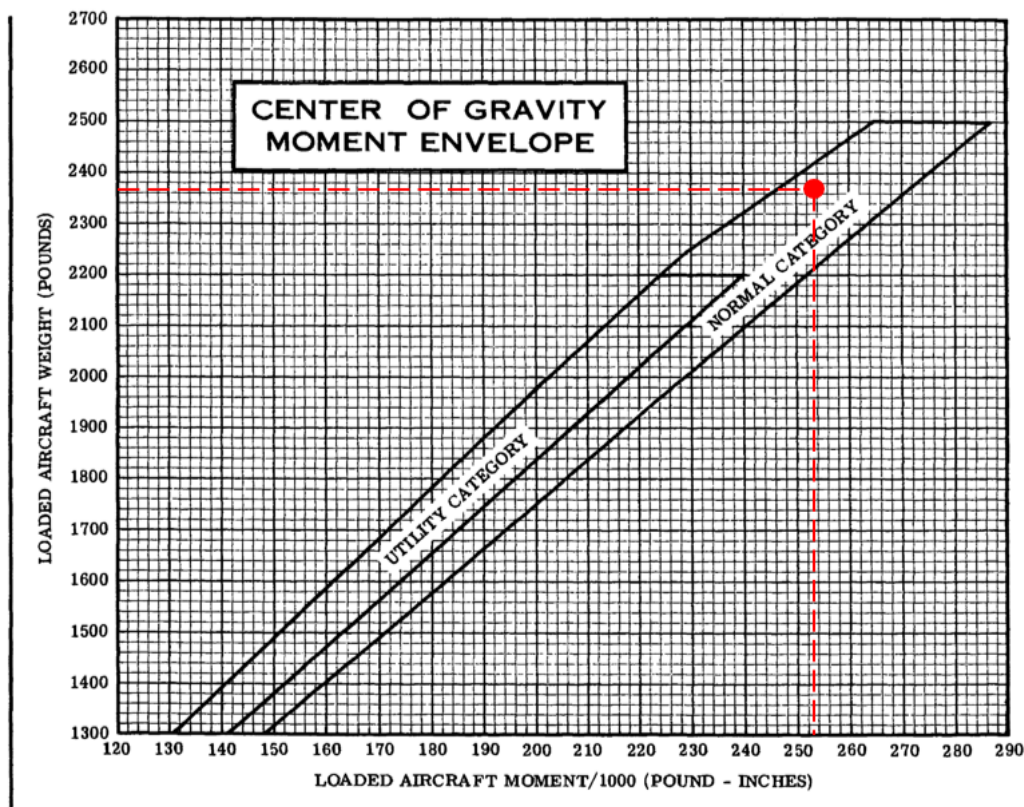


Figure 2. Center of gravity location using POH calculation graph.

The loading scenario was inside the normal category center of gravity limit.

D. CLIMB PERFORMANCE

The pilot operating handbook for the accident airplane contained climb performance data and engine operation guidelines for varied conditions that included instructions to lean the fuel mixture above 3,000 ft to maintain smooth engine operation, and to expect a decrease in rate of climb by 30 ft/minute for each 10° F above standard temperature for a particular altitude.

Rate of climb performance was calculated using weight and balance information, the manufacturers supplied performance chart, and calculated density altitude based on available weather information. The calculated rate of climb performance also assumes that the pilot followed the manufacturer's operational guidance notated on the provided performance chart including:

- wing flaps up
- a leaned mixture above 3,000'
- decreased rate of climb by 30 ft/minute for each 10° F above standard temperature

TAKE-OFF DATA

TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY WITH FLAPS 15°

GROSS WEIGHT POUNDS	IAS AT 50' MPH	HEAD WIND KNOTS	AT SEA LEVEL & 59°F		AT 2500 FT. & 50°F		AT 5000 FT. & 41°F		AT 7500 FT. & 32°F	
			GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS
2500	69	0	750	1400	900	1675	1090	2050	1335	2640
		10	525	1060	635	1280	780	1585	970	2070
		20	335	760	415	935	520	1175	660	1565
2200	64	0	555	1085	665	1265	800	1500	975	1835
		10	380	810	460	950	560	1140	695	1410
		20	230	565	290	675	360	820	455	1035
1900	60	0	400	840	475	955	570	1105	690	1310
		10	260	615	315	710	385	825	475	985
		20	150	420	190	490	235	580	300	700

NOTES: 1. Increase distance 10% for each 20°F above standard temperature for particular altitude.
2. For operation on a dry, grass runway, increase distances (both "ground run" and "total to clear 50 ft. obstacle") by 7% of the "total to clear 50 ft. obstacle" figure.

MAXIMUM RATE-OF-CLIMB DATA

GROSS WEIGHT POUNDS	AT SEA LEVEL & 59°F			AT 5000 FT & 41°F			AT 10,000 FT & 23°F			AT 15,000 FT & 5°F		
	IAS MPH	RATE OF CLIMB FT/MIN	GAL. OF FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED
2500	92	840	1.5	88	585	3.4	83	330	5.6	79	80	10.4
2200	89	1020	1.5	84	735	3.0	80	450	4.8	76	165	7.7
1900	86	1205	1.5	81	890	2.8	77	575	4.2	73	260	6.3

NOTES: 1. Flaps up, full throttle, 2700 rpm, and mixture leaned for smooth operation above 3000 ft.
2. Fuel used includes warm up and take-off allowance.
3. For hot weather, decrease rate of climb 30 ft./min. for each 10°F above standard day temperature for particular altitude.

Figure 6-3.

Figure 3. POH climb performance data.

Density Altitude Calculator

Altimeter Setting to Pressure Altitude

Altimeter Setting [☒ in/hg | ☐ hpa] :

Field Elevation [☒ ft | ☐ mt] :

Pressure Altitude (ft)

What is the formula?

Pressure Altitude to Density Altitude

Pressure Altitude [☒ ft | ☐ mt] :

True Altitude (ft)

Standard (ISA) Temperature [☐ °C | ☒ °F] :

Air Temperature (OAT) [☐ °C | ☒ °F] :

Density Altitude (ft)

What is the formula?

Figure 4. Calculated density altitude at ID85.

Density Altitude Calculator

Altimeter Setting to Pressure Altitude

Altimeter Setting [☒ in/hg | ☐ hpa] :

Field Elevation [☒ ft | ☐ mt] :

Pressure Altitude (ft)
What is the formula?

Pressure Altitude to Density Altitude

Pressure Altitude [☒ ft | ☐ mt] :

True Altitude (ft)

Standard (ISA) Temperature [☐ °C | ☒ °F] :

Air Temperature (OAT) [☐ °C | ☒ °F] :

Density Altitude (ft)
What is the formula?

Figure 5. Calculated density altitude at accident site.

Rate of climb calculation at ID85: 725 ft/min.

Rate of climb calculation at accident site elevation: 648 ft/min.

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