CL-350

CL-350 SUPPLEMENTAL MANUAL

PERFORMANCE PROBLEM 11

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CHALLENGER 350

BD-100-1A10

PERFORMANCE EXERCISE

Flight Planning & Performance

San Diego (KSAN) → Chicago / Rockford (KRFD)

LOFT · CL-350 Ground School · Part 142 · Revision: Original · 17 March 2026

Before You Begin — Exercise Notes

- Performance values (takeoff/landing field length, V-speeds, N1, max weight for a required climb gradient) come from the CL-350 CAFM (Computerized AFM) — questions needing them are marked "CAFM." Limitation speeds (e.g. VFE) are from the AFM.
- Airport data (KSAN / KRFD) is from AirNav; confirm against current charts.

Flight Planning and Performance Exercise

San Diego (KSAN) to Chicago / Rockford (KRFD)

Your Chief Pilot hands you the following for this afternoon's CL-350 charter to Rockford — 6 passengers and their bags. Plan the flight, complete the weight & balance, and answer the performance questions. Will it work?

I. Planning Data

WEIGHT AND BALANCE INFORMATION

- **True Empty Weight (TEW):** 23,981 lb @ 607.06 in (aircraft weighing report / WBM)
- **Operating items (crew, baggage, provisions):** default weights & arms shown in the Weight & Balance table
- **Passengers (arms from W&B slide 24):** Seat 1: 210 · Seat 2: 185 · Seat 3: 200 · Seat 4: 190 · Seat 5: 195 · Seat 6: 175 lb
- **Baggage (aft compartment, arm 650.00):** 320 lb
- **Fuel plan:** Ramp 11,000 lb · Taxi/APU 250 lb · Enroute (trip) burn 7,300 lb (fuel CG from OEM Table 3A)

WEATHER (KSAN)

- **METAR:** KSAN 091853Z 27010KT 10SM FEW015 SCT250 24/17 A2996

ROUTE

- **Departure:** PADRES FOUR Departure, then as filed Cruise: FL430 Alternate: Chicago O'Hare (KORD)

CLEARANCE

N350LT CLEARED TO THE ROCKFORD AIRPORT VIA THE PADRES FOUR DEPARTURE, THEN AS FILED. CLIMB VIA SID EXCEPT MAINTAIN FL230. EXPECT FL430 ONE-ZERO MINUTES AFTER DEPARTURE. SQUAWK 5150.

ARRIVAL WEATHER (KRFD)

- **ATIS "B":** KRFD 092253Z 07012KT 10SM BKN035 OVC060 21/14 A2989 — ILS RWY 7 IN USE

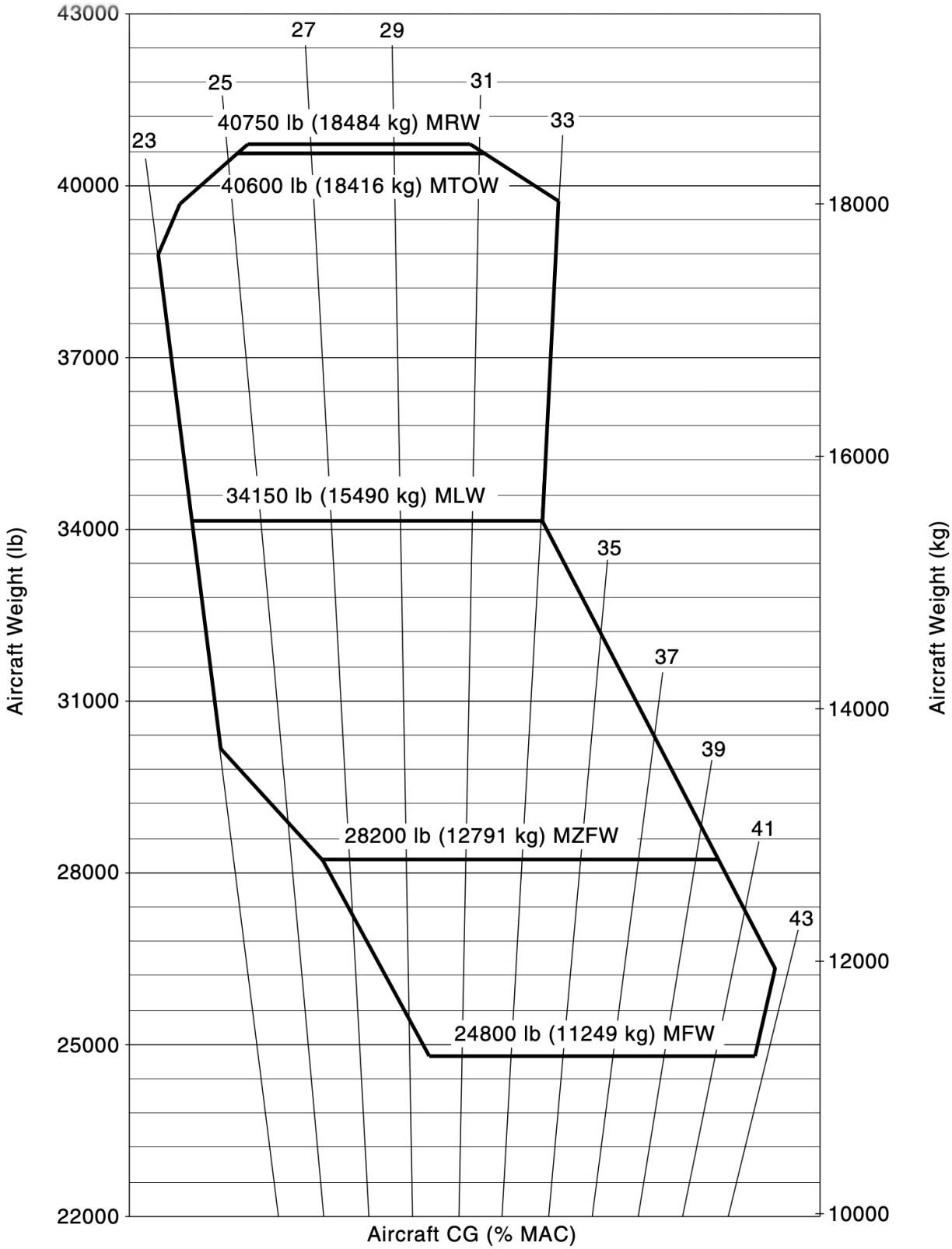
II. Performance Exercise

A. Weight & Balance

Item	Op	Weight (lb)	Arm (in)	Moment/1000	%MAC	Limit
True Empty Weight (TEW)	=	23,981	607.06	14,557.91	44.90	
Pilot	+	199	305.20			
Copilot	+	199	305.20			
Crew Carry-On Baggage	+	40	385.00			
Crew Baggage	+	60	650.00			
Flight Manuals	+	30	320.00			
Galley Supplies	+	109	366.30			
Aft Potable Water	+	20	636.00			
Lav Chemicals	+	20	610.00			
Lav Supplies	+	5	610.00			
Aft Equipment Bay Ladder	+	9	737.10			
OPERATING WEIGHT EMPTY (OWE)	=	_____	_____	_____	_____	
Passenger — Seat 1	+	210	422.70			
Passenger — Seat 2	+	185	422.70			
Passenger — Seat 3	+	200	469.30			
Passenger — Seat 4	+	190	471.30			
Passenger — Seat 5	+	195	518.70			
Passenger — Seat 6	+	175	520.70			
Baggage — aft compartment	+	320	650.00			
ZERO FUEL WEIGHT (gear down)	=	_____	_____	_____	_____	**MZFW 28,200**
Add gear-retraction moment (−4.60 / 1000)	+	—	—	−4.60		
ZERO FUEL WEIGHT (gear up)	=	_____	_____	_____	_____	
Ramp fuel (Table 3A)	+	11,000	565.0			
RAMP WEIGHT (= ZFW + ramp fuel)	=	_____	_____	_____	_____	**MRW 40,750**
Remaining fuel prior takeoff (Table 3A)	+	10,750	564.4			
TAKEOFF WEIGHT (= ZFW + fuel)	=	_____	_____	_____	_____	**MTOW 40,600**
Fuel for FCBP1 — 11,660 lb (Table 3A)	+	11,660	566.1			
FCBP1 (gear down) = ZFW + fuel	=	_____	_____	_____	_____	
Add gear-retraction moment (−4.60 / 1000)	+	—	—	−4.60		
FCBP1 (gear up)	=	_____	_____	_____	_____	**23.0–33.0%**
Fuel for FCBP2 — 9,310 lb (Table 3A)	+	9,310	562.0			
FCBP2 (gear down) = ZFW + fuel	=	_____	_____	_____	_____	
Add gear-retraction moment (−4.60 / 1000)	+	—	—	−4.60		
FCBP2 (gear up)	=	_____	_____	_____	_____	**23.0–33.0%**
Remaining fuel at landing (Table 3A)	+	3,450	550.3			
LANDING WEIGHT (= ZFW + fuel)	=	_____	_____	_____	_____	**MLW 34,150**

Is the aircraft within all weight limits? ☐ Yes ☐ No

Is the CG within the envelope at every point (plot the fuel curve)? ☐ Yes ☐ No


43000
40000
37000
34000
31000
28000
25000
22000
Aircraft Weight (lb)
18000
16000
14000
12000
10000
Aircraft Weight (kg)
Aircraft CG (% MAC)
23
25
27
29
31
33
35
37
39
41
43
40750 lb (18484 kg) MRW
40600 lb (18416 kg) MTOW
34150 lb (15490 kg) MLW
28200 lb (12791 kg) MZFW
24800 lb (11249 kg) MFW

B. Climb Gradient Conversion Chart

Gradient (%) = tan(angle) × 100 *Rate (ft/NM) = gradient(%) × 60.76*

Deg	%	Ft/NM	Deg	%	Ft/NM
1.0	1.7	106	5.0	8.7	532
1.2	2.1	127	5.2	9.1	553
1.4	2.4	148	5.4	9.5	574
1.6	2.8	170	5.6	9.8	596
1.8	3.1	191	5.8	10.2	617
2.0	3.5	212	6.0	10.5	639
2.2	3.8	233	6.2	10.9	660
2.4	4.2	255	6.4	11.2	682
2.6	4.5	276	6.6	11.6	703
2.8	4.9	297	6.8	11.9	725
3.0	5.2	318	7.0	12.3	746
3.2	5.6	340	7.2	12.6	768
3.4	5.9	361	7.4	13.0	789
3.6	6.3	382	7.6	13.3	811
3.8	6.6	404	7.8	13.7	832
4.0	7.0	425	8.0	14.1	854
4.2	7.3	446	8.2	14.4	876
4.4	7.7	468	8.4	14.8	897
4.6	8.0	489	8.6	15.1	919
4.8	8.4	510	8.8	15.5	941

C. Performance Exercise Questions

NOTE: Assume Flaps 10 for all takeoffs unless otherwise specified.

1. At KSAN, RWY 27 lists declared distances TORA 9,401 / TODA 9,401 / ASDA 9,401 / LDA 7,591 ft. Which value is the runway length available for LANDING? **CHART SUPP**

- **A.** TORA 9,401
- **B.** TODA 9,401
- **C.** ASDA 9,401
- **D.** LDA 7,591

2. How many flap positions does the Challenger 350 have? **FCOM/ASTM 05**

- **A.** Three (0, 20, 30)
- **B.** Four (0, 10, 20, 30)
- **C.** Five
- **D.** Two (UP, DN)

3. Which flap settings are approved for takeoff? **FCOM NORMAL**

- **A.** 10 only
- **B.** 20 only
- **C.** 10 or 20
- **D.** Flaps 0

4. Maximum flap-extended speed (V_{FE}) for Flaps 30 is: **AFM LIM**

- **A.** 175 KIAS
- **B.** 200 KIAS
- **C.** 210 KIAS
- **D.** 250 KIAS

5. V_1 is best defined as: **AFM**

- **A.** The speed at which the aircraft lifts off
- **B.** The maximum speed at which the crew must take the first action to reject the takeoff (takeoff decision speed)
- **C.** The target speed to fly after liftoff with an engine failure
- **D.** 1.3 × stall speed

6. V_2 (takeoff safety speed) is: **AFM**

- **A.** The minimum speed to maintain after an engine failure to at least 35 ft, meeting the required 2nd-segment climb gradient
- **B.** The rotation speed
- **C.** A never-exceed speed
- **D.** The flap-retraction speed

7. A departure requires a climb of 404 ft/NM. Using the Climb Gradient Conversion Chart, this is about: **CLIMB CHART**

- **A.** 3.8%
- **B.** 5.2%
- **C.** 6.6%
- **D.** 8.0%

8. Departing KSAN RWY 27 (275° M) with wind 250° at 20 kt, the approximate components are: AFM WIND

- **A.** 20 kt HW / 0 kt XW
- **B.** 18 kt HW / 8 kt left XW
- **C.** 10 kt HW / 17 kt right XW
- **D.** 8 kt HW / 18 kt left XW

9. Takeoff Field Length (TOFL) for the transport-category CL-350 is: CAFM

- **A.** The all-engine takeoff distance
- **B.** The accelerate-stop distance only
- **C.** The greatest of accelerate-go, accelerate-stop, or 1.15 × all-engine takeoff distance
- **D.** The ground roll only

10. A "balanced field" exists when: CAFM

- **A.** Runway slope is zero
- **B.** The accelerate-go distance equals the accelerate-stop distance
- **C.** Headwind equals crosswind
- **D.** TOW equals LDW

11. From the Planning Data, compute the ZERO FUEL WEIGHT. Within MZFW (28,200 lb)? ZFW = _____ lb

☐ Within ☐ Over W&B

12. Compute the TAKEOFF WEIGHT (ZFW + remaining fuel prior takeoff). Within MTOW (40,600 lb)?

TOW = _____ lb ☐ Within ☐ Over W&B

13. Compute the LANDING WEIGHT (ZFW + remaining fuel at landing). Within MLW (34,150 lb)?

LW = _____ lb ☐ Within ☐ Over W&B

14. Using %MAC = [(Xarm − 556.675)/112.22]×100, the takeoff CG ≈ _____ %MAC.

Within the envelope (TOW band ≈ 23.5–33%)? ☐ Yes ☐ No W&B ENVELOPE

15. Selecting engine (cowl) anti-ice ON for the departure will: CAFM

- **A.** Have no effect on takeoff performance
- **B.** Reduce available thrust, increasing required field length and reducing the maximum permissible takeoff weight
- **C.** Increase available thrust
- **D.** Only affect the landing

16. Using the CAFM (KSAN elev 17 ft, RWY 27, the day's OAT/QNH, Flaps 10) and your TOW, find the takeoff field length required and confirm it fits the 9,401 ft available. TOFL required = _____ ft CAFM

17. Record your takeoff V-speeds for the computed TOW and conditions: V_1 _____ V_R _____ V_2 _____ V_{FTO} _____ CAFM

18. V_{REF} for a normal Flaps 30 landing is based on: AFM

- **A.** 1.3 × V_{S0}
- **B.** Approximately 1.23 × the reference stall speed (V_{SR}) in the landing configuration
- **C.** V_2 + 10
- **D.** The single-engine climb speed

19. After a Flaps 10 takeoff, the flaps are retracted to 0 at: FCOM NORMAL

- **A.** V_2
- **B.** V_2 + 15
- **C.** V_{REF}
- **D.** 250 KIAS

20. If a required SID climb gradient exceeds the CL-350's single-engine climb capability at your takeoff weight, you should:

- **A.** Depart anyway — the SID is only for all-engines
- **B.** Plan and brief an engine-out obstacle departure (EOSID) and/or reduce takeoff weight to meet the requirement
- **C.** Ask for radar vectors after liftoff
- **D.** Use Flaps 30 for takeoff

Performance Exercise — TOLD Cards

Fill in the takeoff and landing data cards for this flight.

// TAKEOFF DATA CL-350

ATIS:

Airport	
Elevation	
Runway Required	
Runway Length	
Actual Weight	
Flap Setting	

V_1	
V_R	
V_2	
V_{FTO}	
$N_{1\%}$	

CLEARANCE:

// LANDING DATA CL-350

ATIS:

Airport	
Elevation	
Runway Length	
Runway Required	
Actual Weight	

V_{REF}	
V_{GA}	
V_{FTO}	

LOFT.AERO

INSTRUCTOR ANSWER KEY — remove before issuing to students

Weight & Balance (worked — real arms; fuel CG from OEM Table 3A)

Stage	Weight (lb)	CG Arm (in)	%MAC	Check
TRUE EMPTY WEIGHT (TEW) — given	23,981	607.06	44.9	
OPERATING WEIGHT EMPTY (OWE)	24,672	600.59	39.1	
ZERO FUEL WEIGHT (ZFW)	26,147	595.42	34.5	≤ MZFW 28,200 ✓
RAMP WEIGHT (RW)	37,147	586.40	26.5	≤ MRW 40,750 ✓
TAKEOFF WEIGHT (TOW)	36,897	586.39	26.5	≤ MTOW 40,600 ✓
ZERO FUEL WEIGHT (gear up)	26,147	595.24	34.4	in-flight CG
FCBP1 (gear down)	37,807	586.38	26.5	
FCBP1 (gear up)	37,807	586.26	26.4	23.0–33.0% ✓
FCBP2 (gear down)	35,457	586.64	26.7	
FCBP2 (gear up)	35,457	586.51	26.6	23.0–33.0% ✓
LANDING WEIGHT (LW)	29,597	590.16	29.8	≤ MLW 34,150 ✓

Fuel CG used (Table 3A): ramp 11000 lb @ 565.0 in · T/O 10750 lb @ 564.4 in · landing 3450 lb @ 550.3 in. Also verify the fuel-curve boundary points (RW → FCBP → ZFW) all plot inside the envelope, per the W&B presentation. All weights and CG are within limits.

Questions

1. D — LDA 7,591 ft (RWY 27 has a 1,810 ft displaced threshold).
2. B — Four: 0, 10, 20, 30.
3. C — 10 or 20.
4. A — 175 KIAS (Flaps 10/20 = 210).
5. B — takeoff decision speed; the reject decision must be made by V_1.
6. A.
7. C — ≈ 6.6% (404 / 60.76).
8. B — 25° off: HW = 20·cos25 ≈ 18 kt; XW = 20·sin25 ≈ 8 kt from the left.
9. C.
10. B.
11. ZFW = 26,147 lb @ 34.5%MAC — within.
12. TOW = 36,897 lb @ 26.5%MAC — within.
13. LW = 29,597 lb @ 29.8%MAC — within.
14. ≈ 26.5 %MAC — within the ≈23.5–33%MAC takeoff band.
15. B.
16. From the CAFM — takeoff (value depends on conditions; confirm ≤ TODA 9,401 ft).
17. From the CAFM / FMS TOLD for the actual weight & conditions.
18. B.
19. B — V_2 + 15 (Flaps 10); V_2 + 25 (Flaps 20).
20. B.

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