

The Roo Project Live Ground Instruction

PAR Checkride Prep: Aircraft Performance and W&B



Session ID	ACC-PC
Type	Live
Location	Remote
Estimated Timing	1–3h
Timing Breakdown	1–3h Theory / Discussion

Lesson Overview

This lesson is designed to prepare you for the Private Pilot Airplane Oral Exam, focusing on Aircraft Performance and Weight & Balance. Depending on time constraints, this lesson may be split into multiple sessions.

Learning Objectives

By the end of this lesson, the student will be able to:

- Define aircraft weight categories (basic empty weight, gross weight, useful load, and max gross weight) and explain the significance of each.
- Perform weight and balance calculations using arm, moment, datum, and CG, and determine whether the CG falls within the approved envelope.
- Explain pressure altitude and density altitude, and calculate density altitude from given conditions.
- Describe how altitude, temperature, and humidity affect air density and aircraft performance.
- Use performance charts to determine takeoff and landing distances under varying density altitude, wind, runway surface, and weight conditions.

Session Preparation

The student should familiarize themselves with the following prior to the session:

TRP Private Pilot Ground School

N/A

PHAK

Chapter 10: Weight and Balance
Chapter 11: Aircraft Performance

AFH

Chapter 2: Ground Operations – Weight & Balance planning for flight

POH / AFM (Aircraft-Specific)

Section 5: Performance Charts (Takeoff, Landing, Cruise)
Section 6: Weight & Balance (loading charts, CG envelope)

Session Tasks

Theory Tasks	ACS Ref
Weight & Balance Fundamentals - Basic empty weight - Gross weight - Useful load - Max gross weight	PA.I.F.K1 PA.I.F.K2c
CG Calculations - Arm / Moment - Datum - CG – Forward / Aft limits - CG Envelope	PA.I.F.K2c PA.I.F.K2d
Altitude & Air Density - Pressure altitude - Density altitude - Air density – Altitude - Air density – Temperature - Air density – Humidity	PA.I.F.K4 PA.I.F.K4a
Takeoff & Landing Performance - T/O + LDG performance – Density altitude - T/O + LDG performance – Wind - T/O + LDG performance – Runway surface & slope - T/O + LDG performance – Weight	PA.I.F.K4 PA.I.F.K4b PA.I.F.K4c
Scenario-Based Applications How performance & W&B apply in scenarios given by the instructor	

Completion Standards

- **Understand and define all weight categories: basic empty weight, gross weight, useful load, and max gross weight.**
 - Able to locate each value in the POH and explain what is included/excluded.
- **Demonstrate the ability to calculate weight and balance using the arm/moment method.**
 - Correctly identify the datum and all station arms from the POH.
 - Calculate total weight and total moment, then derive CG location.
 - Plot and interpret the CG envelope to determine if loading is within limits.
- **Explain the difference between pressure altitude and density altitude.**
 - Calculate density altitude using a flight computer or POH chart given OAT and field elevation.
- **Describe how altitude, temperature, and humidity individually affect air density and performance.**
- **Use POH performance charts to determine takeoff and landing distances.**
 - Adjust for density altitude, wind component, runway surface/slope, and aircraft weight.
 - Understand the direction and magnitude of each variable's effect on performance.

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- **Apply weight & balance and performance knowledge to real-world flight scenarios provided by the instructor.**