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COMMERCIAL PILOT · AIRPLANE

Commercial Pilot Study Guide

Airplane Single-Engine Land: the material behind the ACS, explained so you can use it in the airplane

Organized by FAA-S-ACS-7B, Commercial Pilot Airplane. Single-engine land Tasks, with an in-depth look at the subject matter: privileges and Part 119, inspections, performance, the commercial maneuvers, stalls, high-altitude operations, and emergencies. Seaplane and multiengine Tasks are not included.

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This free sample is from the Commercial Pilot Study Guide: the chandelles Task, with its in-depth chapter. Free to share in this form. Independent study material, not an FAA publication, and not a substitute for your POH/AFM or flight instruction. Always verify against current FAA sources.

CA.V.C Chandelles (ASEL, ASES)

References: FAA-H-8083-2, FAA-H-8083-3, FAA-H-8083-25; POH/AFM

Objective: *To determine the applicant exhibits satisfactory knowledge, risk management, and skills associated with chandelles.*

Note: See Appendix 3: Aircraft, Equipment, and Operational Requirements & Limitations for information related to this Task.

WHAT THE EXAMINER IS LOOKING FOR

A chandelle: a maximum-performance 180-degree climbing turn that ends just above the stall, with a smooth, coordinated flow and no stall.

WHAT YOU NEED TO KNOW

- **Phases:** entry, the first 90 degrees of turn with a constant 30-degree bank and a **rising pitch**, and the second 90 degrees with a **constant pitch** and a **decreasing bank**.
- **Aerodynamics:** the **loss of speed** as the airplane climbs, **overbanking**, **P-factor**, and **accelerated stall** risk.
- **Tolerances:** bank about **30 degrees**, rollout at the **180 degree point ±10 degrees**, **just above stall speed** at completion, no stall, and a **minimum loss of altitude** in the recovery.

HOW TO DO IT WELL

- Plan the **pitch increase** to reach the **stall warning** at the **end** of the turn, not before.

WHAT YOU MAY RUN INTO

- A chandelle to the left and to the right, entered **at a steady entry speed**.

COMMON MISTAKES

- Too much pitch early (a stall before the 180).
- Not holding the bank, then rolling out early.

HOW TO PREPARE

- Make a **cheat sheet** with the **entry speed**, **power**, and **checkpoints** for your airplane.

> **Your airplane:** The **entry speed** is the one in **your POH**, or **no more than Va**.

Chandelles: What to Know, Why, and Where to Find It

What the ACS is asking, and why

The chandelle is a maximum-performance climbing turn. The ACS includes it because it requires you to manage a changing energy state: you trade speed for altitude while turning, and you must keep the airplane coordinated as the speed falls. The maneuver teaches the feel of the airplane near the stall with a high power setting, and the importance of planning.

The aerodynamics

- **Energy:** you start with speed, and power and kinetic energy are converted to altitude and heading change. The amount of altitude you gain depends on the entry speed and the power. A higher entry speed gives more altitude, but must not exceed Va.
- The bank: 30 degrees for the first 90 degrees of turn (constant), then it decreases uniformly to wings level at 180 degrees. The pitch increases at a steady rate in the first half, and then is held constant in the second half (and the speed falls to just above the stall).
- Why the bank decreases: at low speeds, a steeper bank raises the stall speed (load factor). Rolling out gives a margin.
- Rudder and the left-turning tendencies: as the speed drops with a high power, P-factor, torque, and slipstream increase the need for right rudder. A left chandelle needs more right rudder, and a right chandelle needs less at the start (then more).
- Adverse yaw and aileron effectiveness: at low speeds the ailerons are less effective, and roll out requires more control deflection and coordination.

ACS standards

- Entry speed: the POH's speed or no more than Va.
- Bank: approximately 30 degrees. Heading at the end: 180 degrees ±10 degrees from the entry.
- Airspeed at the completion: just above the stall speed, without a stall or a buffet, and a smooth recovery to straight-and-level flight.
- A constant pitch rate and a constant bank rate are the marks of a good chandelle.

Planning and risk

- Clear the area; choose a reference (a road or a section line) at 180 degrees.
- Altitude: enough to recover safely (the ACS minimum: 1,500 ft AGL).
- The danger: an uncoordinated entry at a low speed can cause a spin if a stall occurs. Recover at the first sign.
- The engine: full power for a short time, within the POH limits.

Where to find it

- **Airplane Flying Handbook:** the chapter on performance maneuvers (chandelles).
- **Pilot's Handbook of Aeronautical Knowledge:** the chapter on aerodynamics of flight (energy, load factor, stalls).
- Your airplane's POH: Va, the power and the stall speeds.
- **Commercial ACS, Area V Task C.**

Chandelles in Depth

What a chandelle is

A **chandelle** is a **maximum-performance climbing turn through 180 degrees**. The **entry** is at a **fixed speed**, the **bank** is **constant (30 degrees)** for the **first 90 degrees**, the **pitch** goes up **at a constant rate**, then in the **second 90 degrees** the **pitch is constant** and the **bank decreases** at a **constant rate**. The airplane should be **just above the stall** at the 180-degree point, **wings level**, heading **±10 degrees** of the reciprocal.

The sequence

Point	Bank	Pitch	Power	Airspeed
Entry (0°)	Roll to **30 degrees**	**Level**, then smoothly **start the pitch up**	**Entry power** (often **full** or the POH value)	**Entry speed** (POH or Va)
First 90°	**Constant 30°**	**Pitch up at a constant rate**	**Full power** is added as the speed falls	**Decreasing**
90° point	**30°**, then start **rolling out**	**Maximum pitch**	**Full power**	About halfway to the stall
Second 90°	Roll out at a **constant rate** to **wings level at 180°**	**Hold the pitch constant**	**Full power**	**Decreasing to just above the stall**
180° point	**Wings level**	**Slowly lower** to level	**Cruise**	**Just above the stall**, then recover

Aerodynamics to understand

- **Power and pitch** together give the **climb**, and the **speed falls** because the **climb** uses the excess energy.
- **Torque and P-factor** at **high power** and **low speed** need **right rudder** (more rudder in a left chandelle).
- **Overbanking tendency** needs **opposite aileron** early in the turn. As the speed drops, the **ailerons** become **less effective**, so **use more rudder** for the **roll out**.
- **Coordinated flight** at the **slowest** speed is the challenge. A **skid** or **slip** at the **end** can cause a **stall and a spin entry**.
- **Load factor** is about **1.15 G** in the 30-degree bank, so the **accelerated stall** is only a **small** risk in the first half.

Common errors

Error	Cause	Correction
A stall before 180°	Too much pitch too early.	**Use a constant pitch rate**. Pick a **reference** at **90°**, and then hold the pitch.
Airspeed too high at 180°	Too little pitch.	**Raise the nose** more in the first 90 degrees.
Roll-out too early or late	Not tracking the heading.	**Pick a reference point** on the horizon, **90 degrees** from the start.
Loss of altitude after	A late recovery.	**Lower the nose** just enough, **add power**, and **trim**.

Error	Cause	Correction
Uncoordinated flight	Not using the rudder.	**Watch the ball**, and **use rudder** with the aileron.

Planning your chandelle

Choose a **road or a line** on the ground for the **reference**, **clear** the area, and **pick the entry speed** and **power** from your POH or your instructor. Many pilots use **an initial pitch up** of about **5 to 10 degrees** and increase to **20 or 25 degrees** at the 90-degree point (airplane-dependent). **Rehearse it** at the same altitude each time, and **record the pitch attitude** at the **90-degree** point that gives you **just above stall** at 180.

That was a sample.

The full guide explains every Task the same way.

The full Commercial Pilot Study Guide (150 pages) includes:

- Every Commercial Pilot Airplane single-engine land ACS Task, in ACS order
- An in-depth chapter for each Task, like the one in this sample
- Maneuver tolerances, common errors, and how to practice each one
- A numbers-to-know quick reference and a checkride scenario bank

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