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Solutions

# Steep Turns

## Pre-lesson Workbook

*CASA Recreational Pilot License (Aeroplane) — CASA Sample Syllabus*
*Lesson 18, Pre-lesson Workbook*

Complete this before your lesson — on your own, at your own pace. For each topic: watch a video or read an article, then answer the questions in the space provided. Print this out, or write your answers in a notebook. It should take about 30–45 minutes in total, and we'll check it together at the start of your pre-flight brief.

This lesson has more "why" than usual, so working through it beforehand means we can spend the live theory on flying the manoeuvres rather than crunching numbers.

# 1. Load factor and the higher stall speed

This is the single most important idea behind steep turns. When you bank and hold height, the wing has to work harder — it carries more than the aeroplane's weight. We call the ratio of lift to weight the **load factor** ('g'), and it drives the one number that matters most today: the speed at which the wing stalls.

**Watch:**

- How Load Factor Affects Stall Speed — Aerodynamics Explained — FlightInsight. Walks the whole chain: why a level turn loads the wing, and why that raises the stall speed.

**Read:**

- Why Does Stall Speed Increase With Bank Angle? — Boldmethod. Short and clear on the "square root of load factor" relationship, with a worked Cessna example.

**Answer:**

1. In your own words, what is **load factor**? _____
2. In **straight and level** flight, what is the value of the load factor? ____
3. In a **level turn**, does the load factor depend on the aircraft's weight, its speed, or the bank angle? _____
4. Fill in the load factor for each bank angle (a level turn):

| Bank angle | Load factor ('g') |
|---|---|
| 0° | _____ |
| 45° | _____ |
| 60° | _____ |

5. The wing always stalls at the same **angle of attack**. Explain, in your own words, *why* loading the wing in a turn makes it stall at a **higher speed**:
   _____
6. Stall speed rises with the **square root of the load factor**. If your aeroplane stalls at **50 kt** wings-level, roughly what speed will it stall at in a **60° level turn** (2 g)?
   _____
7. Food for thought: you roll into a hard 60° turn at 75 kt, feeling nowhere near the stall. Then you pull a little harder to tighten the turn. What could happen, and why? _____

# 2. Knowing your aircraft's limits

Steep turns and 'g' don't just affect the wing — they load the whole airframe, and they touch a few systems too. Every aeroplane has certified limits for how much 'g' it can take; your job is to know *your* aeroplane's numbers before you fly them. This one needs your aircraft's **Pilot's Operating Handbook (POH) / flight manual** as well as the reading.

**Watch:**

- Phil Unicomb's explanation of Rolling G - the hidden risk

**Answer:**

1. Open your training aircraft's POH / flight manual and find its **limit load factors** (the maximum positive 'g', sometimes with a separate lower figure while *rolling*). Write them here, with the section/page: _____
2. The **rolling** 'g' limit is *lower* than the straight ("symmetrical") one. If your POH doesn't provide one explicitly, use the 2/3 rule mentioned in Phil's video above to work out an approximate rolling g limit for your aircraft:
   _____
3. Find and write down your aircraft's **flap limiting speed** ($V_{FE}$) and its **manoeuvring speed** ($V_A$): _____
4. Name one aircraft **system** (think fuel, or the pitot-static instruments) that a prolonged, steep, or unbalanced manoeuvre could affect, and how:
   _____

## 3. A preview: flying a steep turn

In the live brief we'll talk through actually flying the steep turn — the sight picture, the extra power and back pressure, and what to do if the nose drops. Watch this now so the picture isn't brand new when we cover it together.

**Watch:**

- Steep Turns with Flight Academy - this video focuses on the essentials of steep turns and helps show what you can expect.

**Answer:**

1. What **sight picture** (nose and horizon) is the pilot aiming to hold through the turn? _____
2. If the nose starts to drop in the steep turn, what can you do to correct it? _____

## Bring this to your lesson

- Bring your completed answers (printed, or your notebook) to the pre-flight brief
- Bring your aircraft's **POH / flight manual** numbers from Topic 2 — we'll use them
- We'll check through your answers together and clear up anything that didn't make sense
- From there, the live theory brief builds on this: we'll *apply* the load-factor idea to flying the steep turn, then move on to the steep descending turn, maximum-rate and minimum-radius turns, recognising and recovering from a spiral dive, and sideslipping

> *The whole lesson rests on one number: at 60° of bank the wing carries twice the weight and stalls about 41% faster. Get comfortable with why that's true now, and everything we fly will make sense.*