**Rectangular Course**

**WARNING:**  
All procedures here are GENERALIZED for learning.  
Fly the maneuver in accordance with the Pilot Operating Handbook (POH) or  
current Standard Operating Procedures (SOPs)

**What it is……**

* The rectangular course maneuver simulates the airport [traffic pattern](http://www.cfinotebook.net/notebook/operations/terminal/traffic-pattern.html), demonstrating the effect of wind on an aircraft [Figure 1]

**Why we do it…….**

**The maneuver assists the student pilot in perfecting:**

* + Practical application of the turn
  + The division of attention between the flightpath, ground objects, and the handling of the airplane
  + The timing of the start of a turn so that the turn will be fully established at a definite point over the ground
  + The timing of the recovery from a turn so that a definite ground track will be maintained
  + The establishing of a ground track and the determination of the appropriate "crab" angle

**How to do it………..**

**C-172S Procedure:**

1. Note wind direction and strength, if able
   * Important for finding the downwind and anticipating ground speed
   * Can be determined by trees, water, flags, etc...
2. Perform [clearing turns](http://www.cfinotebook.net/notebook/maneuvers/clearing-turns.html)
3. Pick a reference rectangle in an area where an emergency landing can be made if necessary
   * Fields or perpendicular roads are best
   * Distances should be about 1 mile in length and maintained at the same distance throughout the maneuver
   * The rectangle should be flown outside of the visual references, not on top to enable good visibility of the track
4. Establish and maintain 100 [KIAS](http://www.cfinotebook.net/notebook/maneuvers/ground/rectangular-course.html) (approx. 2200 RPM) and 1,000' AGL throughout the maneuver maintaining 1/4th to 1/2 mile of lateral distance from the rectangular edges
5. Enter the maneuver on a 45° mid-field downwind
   * Ground speed will increase as you enter the pattern
6. Turn base at boundary:
   * **AOB:** Steep AOB, not to exceed 45°, transitioning to medium bank as the turn progresses
   * **GS:** Decrease, due to lost tailwind
   * **Degrees:** Turn greater than 90°, to compensate for wind, so as you roll out you have established a crab
7. Turn upwind at boundary:
   * **AOB:** Medium AOB, transitioning shallow as the turn progresses
   * **GS:** Decrease, you are now flying directly into the wind
   * **Degrees:** Turn less than 90°, due to the crab already set prior to your turn
8. Turn crosswind at boundary:
   * **AOB:** Shallow AOB, transitioning to medium as the turn progresses
   * **GS:** Increase, due to the loss of the complete headwind component
   * **Degrees:** Turn less than 90° to allow for wind correction
9. Turn downwind at boundary:
   * **AOB:** Medium AOB transitioning to a much steeper AOB than earlier, not to exceed 45°
   * **GS:** Increase, due to the increasing tailwind
   * **Degrees:** Turn more than 90°
10. Depart the maneuver on a 45° mid-field downwind
11. Complete cruise checklist

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| [Rectangular Course](http://www.cfinotebook.net/graphics/maneuvers/RectangularCourse.jpg) |
| Figure 1: Airplane Flying Handbook, Rectangular Course |

**Notes:**

* It is unusual to find a situation where the wind is blowing exactly parallel to the field boundaries so slight wind corrections on all legs may be required
* It is important to anticipate the turns to correct for groundspeed, drift, angle of bank (AOB), and turning radius
* When the wind is behind the airplane, the turn requires a larger AOB due to the [turn radius/rate](http://www.cfinotebook.net/notebook/performance/turns.html) and vice versa
  + Because of this, you will need to anticipate your turn at different points around the box pattern
  + The higher the ground speed, the earlier you must anticipate the turn
* Altitude and airspeed should be held constant
* Requires utilization of ground track with wind forming a "crab" angle to maintain an equidistant track from all sides of the rectangle
  + Approximately 1/4 to 1/2 mile away
  + For a Cessna, this will be when the edge of the rectangle bisects the wing strut
  + The closer you fly, the steeper the turns will have to be, the farther, the shallower

**Common Errors:**

* Failure to adequately clear the area
* Failure to establish proper altitude prior to entry (Typically entering the maneuver while descending)
* Failure to establish appropriate wind correction angle, resulting in drift
* Gaining or losing altitude
* Poor coordination (Typically skidding in turns from a downwind heading and slipping in turns from an upwind heading)
* Abrupt control usage
* Inability to adequately divide attention between airplane control and maintaining ground track
* Improper timing to beginning and recovering from turns
* Inadequate visual lookout for other aircraft

**Standards:**

* [Practical Test Standards](http://www.faa.gov/training_testing/testing/airmen/test_standards/pilot/)

[**Reference:**](http://www.cfinotebook.net/notebook/references.html)

* [Airplane Flying Handbook (6-4) Rectangular Course](http://www.faa.gov/library/manuals/aircraft/airplane_handbook/)
* [AOPA - Understanding the most basic ground reference maneuver](http://flighttraining.aopa.org/students/presolo/skills/rectangular.html)
* [CFI Notebook.net - Traffic Pattern](http://www.cfinotebook.net/notebook/operations/terminal/traffic-pattern.html)
* [FAA - Practical Test Standards](http://www.faa.gov/training_testing/testing/airmen/test_standards/pilot/)