Rectangular Course

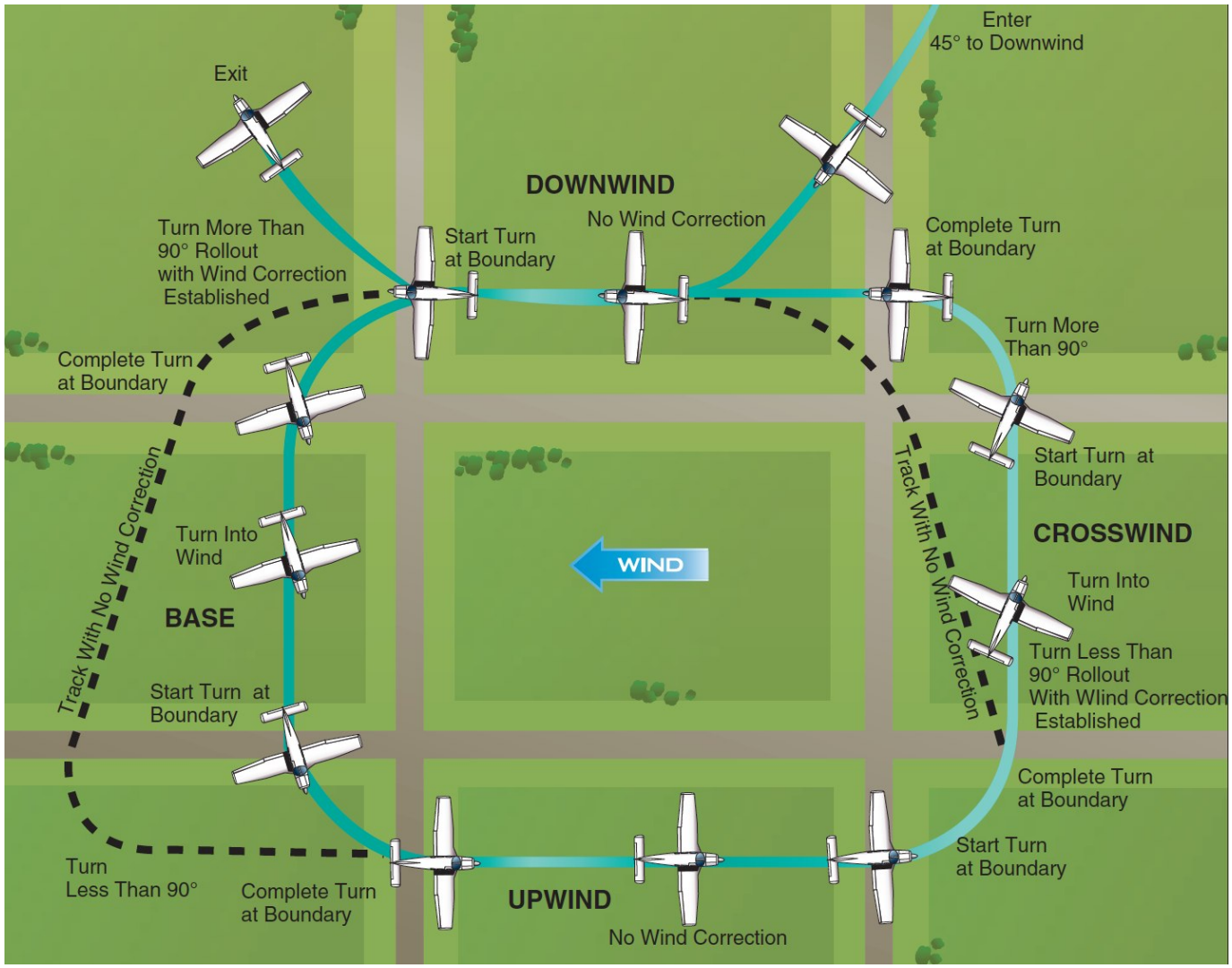

Figure 6-4. Rectangular course.

Normally, the first ground reference maneuver the pilot is introduced to is the rectangular course. [Figure 6-4] The rectangular course is a training maneuver in which the ground track of the airplane is equidistant from all sides of a selected rectangular area on the ground. The maneuver simulates the conditions encountered in an airport traffic pattern. While performing the maneuver, the altitude and airspeed should be held constant. 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. Like those of other ground track maneuvers, one of the objectives is to develop division of attention between the flightpath and ground references, while controlling the airplane and watching for other aircraft in the vicinity. Another objective is to develop recognition of drift toward or away from a line parallel to the intended ground track. This will be helpful in recognizing drift toward or from an airport runway during the various legs of the airport traffic pattern.

For this maneuver, a square or rectangular field, or an area bounded on four sides by section lines or roads (the sides of which are approximately a mile in length), should be selected well away from other air traffic. The airplane should be flown parallel to and at a uniform distance about one-fourth to one-half mile away from the field boundaries, not above the boundaries. For best results, the flightpath should be positioned outside the field boundaries just far enough that they may be easily observed from either pilot seat by looking out the side of the airplane. If an attempt is made to fly directly above the edges of the field, the pilot will have no usable reference points to start and complete the turns. The closer the track of the airplane is to the field boundaries, the steeper the bank necessary at the turning points. Also, the pilot should be able to see the edges of the selected field while seated in a normal position and looking out the side of the airplane during either a left-hand or right-hand course. The distance of the ground track from the edges of the field should be the same regardless of whether the course is flown to the left or right. All turns should be started when the airplane is abeam the corner of the field boundaries, and the bank normally should not exceed 45°. These should be the determining factors in establishing the distance from the boundaries for performing the maneuver.

Although the rectangular course may be entered from any direction, this discussion assumes entry on a downwind.

On the downwind leg, the wind is a tailwind and results in an increased groundspeed. Consequently, the turn onto the next leg is entered with a fairly fast rate of roll-in with relatively steep bank. As the turn progresses, the bank angle is reduced gradually because the tailwind component is diminishing, resulting in a decreasing groundspeed.

During and after the turn onto this leg (the equivalent of the base leg in a traffic pattern), the wind will tend to drift the airplane away from the field boundary. To compensate for the drift, the amount of turn will be more than 90°.

The rollout from this turn must be such that as the wings become level, the airplane is turned slightly toward the field and into the wind to correct for drift. The airplane should again be the same distance from the field boundary and at the same altitude, as on other legs. The base leg should be continued until the upwind leg boundary is being approached. Once more the pilot should anticipate drift and turning radius. Since drift correction was held on the base leg, it is necessary to turn less than 90° to align the airplane parallel to the upwind leg boundary. This turn should be started with a medium bank angle with a gradual reduction to a shallow bank as the turn progresses. The rollout should be timed to assure paralleling the boundary of the field as the wings become level.

While the airplane is on the upwind leg, the next field boundary should be observed as it is being approached, to plan the turn onto the crosswind leg. Since the wind is a headwind on this leg, it is reducing the airplane's groundspeed and during the turn onto the crosswind leg will try to drift the airplane toward the field. For this reason, the roll-in to the turn must be slow and the bank relatively shallow to counteract this effect. As the turn progresses, the headwind component decreases, allowing the groundspeed to increase. Consequently, the bank angle and rate of turn are increased gradually to assure that upon completion of the turn the crosswind ground track will continue the same distance from the edge of the field. Completion of the turn with the wings level should be accomplished at a point aligned with the upwind corner of the field. Simultaneously, as the wings are rolled

level, the proper drift correction is established with the airplane turned into the wind. This requires that the turn be less than a 90° change in heading. If the turn has been made properly, the field boundary will again appear to be one-fourth to one-half mile away. While on the crosswind leg, the wind correction angle should be adjusted as necessary to maintain a uniform distance from the field boundary.

As the next field boundary is being approached, the pilot should plan the turn onto the downwind leg. Since a wind correction angle is being held into the wind and away from the field while on the crosswind leg, this next turn will require a turn of more than 90°. Since the crosswind will become a tailwind, causing the groundspeed to increase during this turn, the bank initially should be medium and progressively increased as the turn proceeds. To complete the turn, the rollout must be timed so that the wings become level at a point aligned with the crosswind corner of the field just as the longitudinal axis of the airplane again becomes parallel to the field boundary. The distance from the field boundary should be the same as from the other sides of the field.

Usually, drift should not be encountered on the upwind or the downwind leg, but it may be difficult to find a situation where the wind is blowing exactly parallel to the field boundaries. This would make it necessary to use a slight wind correction angle on all the legs. It is important to anticipate the turns to correct for groundspeed, drift, and turning radius. When the wind is behind the airplane, the turn must be faster and steeper; when it is ahead of the airplane, the turn must be slower and shallower. These same techniques apply while flying in airport traffic patterns.

Common Errors

Common errors in the performance of rectangular courses are:

- 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 in beginning and recovering from turns.
- Inadequate visual lookout for other aircraft.