



Figure 6-5. S-Turns.

An S-turn across a road is a practice maneuver in which the airplane's ground track describes semicircles of equal radii on each side of a selected straight line on the ground. [Figure 6-5] The straight line may be a road, fence, railroad, or section line that lies perpendicular to the wind, and should be of sufficient length for making a series of turns. A constant altitude should be maintained throughout the maneuver.

S-turns across a road present one of the most elementary problems in the practical application of the turn and in the correction for wind drift in turns. While the application of this maneuver is considerably less advanced in some respects than the rectangular course, it is taught after the student has been introduced to that maneuver in order that the student may have a knowledge of the correction for wind drift in straight flight along a reference line before the student attempt to correct for drift by playing a turn.

The objectives of S-turns across a road are to develop the ability to compensate for drift during turns, orient the flightpath with ground references, follow an assigned ground track, arrive at specified points on assigned headings, and divide the pilot's attention. The maneuver consists of crossing the road at a 90° angle and immediately beginning a series of 180° turns of uniform radius in opposite directions, re-crossing the road at a 90° angle just as each 180° turn is completed.

To accomplish a constant radius ground track requires a changing roll rate and angle of bank to establish the wind correction angle. Both will increase or decrease as groundspeed increases or decreases.

The bank must be steepest when beginning the turn on the downwind side of the road and must be shallowed gradually as the turn progresses from a downwind heading to an upwind heading. On the upwind side, the turn should be started with a relatively shallow bank and then gradually steepened as the airplane turns from an upwind heading to a downwind heading.

In this maneuver, the airplane should be rolled from one bank directly into the opposite just as the reference line on the ground is crossed.

Before starting the maneuver, a straight ground reference line or road that lies 90° to the direction of the wind should be selected, then the area checked to ensure that no obstructions or other aircraft are in the immediate vicinity. The road should be approached from the upwind side, at the selected altitude on a downwind heading. When directly over the road, the first turn should be started immediately. With the airplane headed downwind, the groundspeed is greatest and the rate of departure from the road will be rapid; so the roll into the steep bank must be fairly rapid to attain the proper wind correction angle. This prevents the airplane from flying too far from the road and from establishing a ground track of excessive radius.

During the latter portion of the first 90° of turn when the airplane's heading is changing from a downwind heading to a crosswind heading, the groundspeed becomes less and the rate of departure from the road decreases. The wind correction angle will be at the maximum when the

airplane is headed directly crosswind.

After turning 90° , the airplane's heading becomes more and more an upwind heading, the groundspeed will decrease, and the rate of closure with the road will become slower. If a constant steep bank were maintained, the airplane would turn too quickly for the slower rate of closure, and would be headed perpendicular to the road prematurely. Because of the decreasing groundspeed and rate of closure while approaching the upwind heading, it will be necessary to gradually shallow the bank during the remaining 90° of the semicircle, so that the wind correction angle is removed completely and the wings become level as the 180° turn is completed at the moment the road is reached.

At the instant the road is being crossed again, a turn in the opposite direction should be started. Since the airplane is still flying into the headwind, the groundspeed is relatively slow. Therefore, the turn will have to be started with a shallow bank so as to avoid an excessive rate of turn that would establish the maximum wind correction angle too soon. The degree of bank should be that which is necessary to attain the proper wind correction angle so the ground track describes an arc the same size as the one established on the downwind side.

Since the airplane is turning from an upwind to a downwind heading, the groundspeed will increase and after turning 90° , the rate of closure with the road will increase rapidly. Consequently, the angle of bank and rate of turn must be progressively increased so that the airplane will have turned 180° at the time it reaches the road. Again, the rollout must be timed so the airplane is in straight-and-level flight directly over and perpendicular to the road.

Throughout the maneuver a constant altitude should be maintained, and the bank should be changing constantly to effect a true semicircular ground track.

Often there is a tendency to increase the bank too rapidly during the initial part of the turn on the upwind side, which will prevent the completion of the 180° turn before re-crossing the road. This is apparent when the turn is not completed in time for the airplane to cross the road at a perpendicular

angle. To avoid this error, the pilot must visualize the desired half circle ground track, and increase the bank during the early part of this turn. During the latter part of the turn, when approaching the road, the pilot must judge the closure rate properly and increase the bank accordingly, so as to cross the road perpendicular to it just as the rollout is completed.

Common Errors

Common errors in the performance of S-turns across a road are:

- ◆ Failure to adequately clear the area.
- ◆ Poor coordination.
- ◆ Gaining or losing altitude.
- ◆ Inability to visualize the half circle ground track.
- ◆ Poor timing in beginning and recovering from turns.
- ◆ Faulty correction for drift.
- ◆ Inadequate visual lookout for other aircraft.