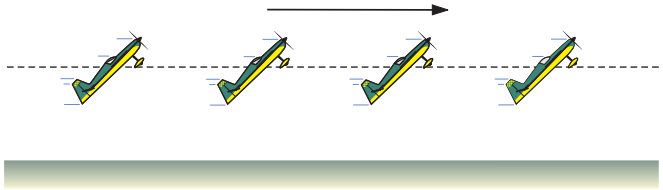
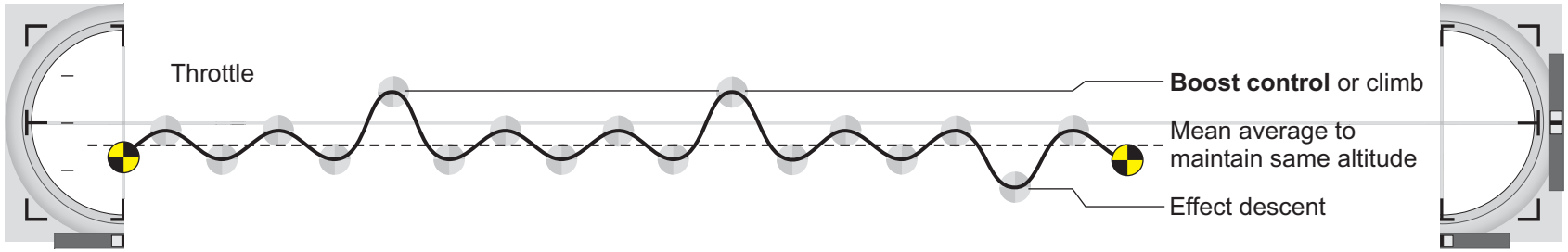
3D Harrier: Throttle Technique

The high alpha “harrier” pass is the corner stone of 3D flying. A harrier pass consists of flying an airplane at a very high angle of attack and a very low airspeed. In this position, it can be said that the plane is flying on the prop instead of on the wing.



Control during a harrier is primarily maintained by propwash over the tail surfaces. Thus, as a 3D pilot, you must start thinking of throttle as equating to “control”. However, if you tried to maximize control by maintaining a higher throttle position, the airplane might climb or accelerate. On the other hand, if you waited until the controls were no longer effective to start adding power, you may not recover control in time to save the maneuver. Therefore, a 3D pilot smoothly pumps the throttle when flying on the prop in order to maintain propwash over the tail surfaces without holding the higher throttle positions long enough to cause the airplane to accelerate.

The objective is to pump the throttle throughout the harrier to maintain the same height, while adjusting the elevator to maintain a very high angle of attack. At the instant the controls become ineffective or the plane starts to descend, give the throttle a little extra boost. You will find that you are able to respond to moments when more control is needed much faster when continually pumping the throttle, than if the throttle had been stationary.



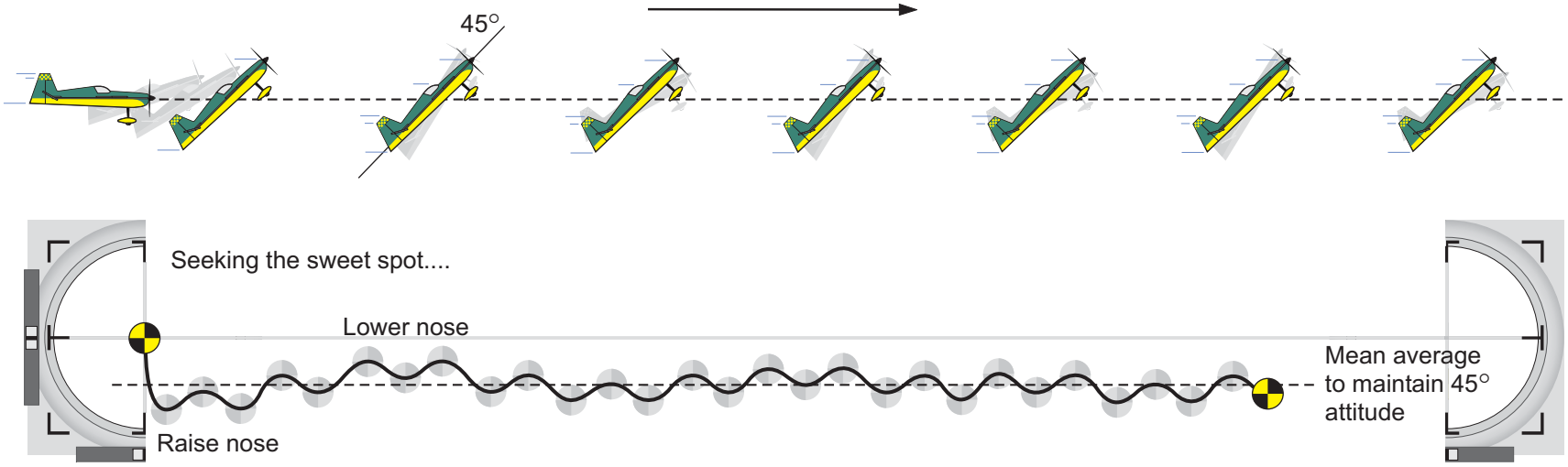
To maintain the same height during a harrier, the amplitude or range of the throttle movements is usually between 1/4 and 1/2 throttle with an airplane capable of hovering at half throttle. Note: if you lose complete control at these very low airspeeds, often the only way to regain control and recover is to quickly go to full power.

KPTR: Pump the throttle to maintain control authority without accelerating.
Vary the amplitude or range that you pump the throttle to control altitude.

3D Harrier Pass: Elevator Technique

The simplest way to enter a harrier is to slow down near stall speed. Then smoothly pull the nose up to establish a very high angle of attack while simultaneously adding power to maintain the same height.

Every airplane has a certain fuselage angle or “sweet spot” during the harrier that results in the least amount of wing rocking. That angle is usually close to 45 degrees, and it usually takes about half elevator to achieve that angle. You will then find that it takes constant elevator adjustments to maintain that angle due to the fact that airplanes are not designed to fly this way. Note: If you are late with any of your elevator adjustments, it will take a much larger input to recover, thus increasing the potential for over-controlling. Therefore, 3D pilots smoothly pump the elevator throughout the harrier to keep their fingers nimble and ready to instantly respond to the needs of the moment. Inputting a series of smaller adjustments, rather than waiting to respond with larger adjustments, also reduces the potential for over-controlling.

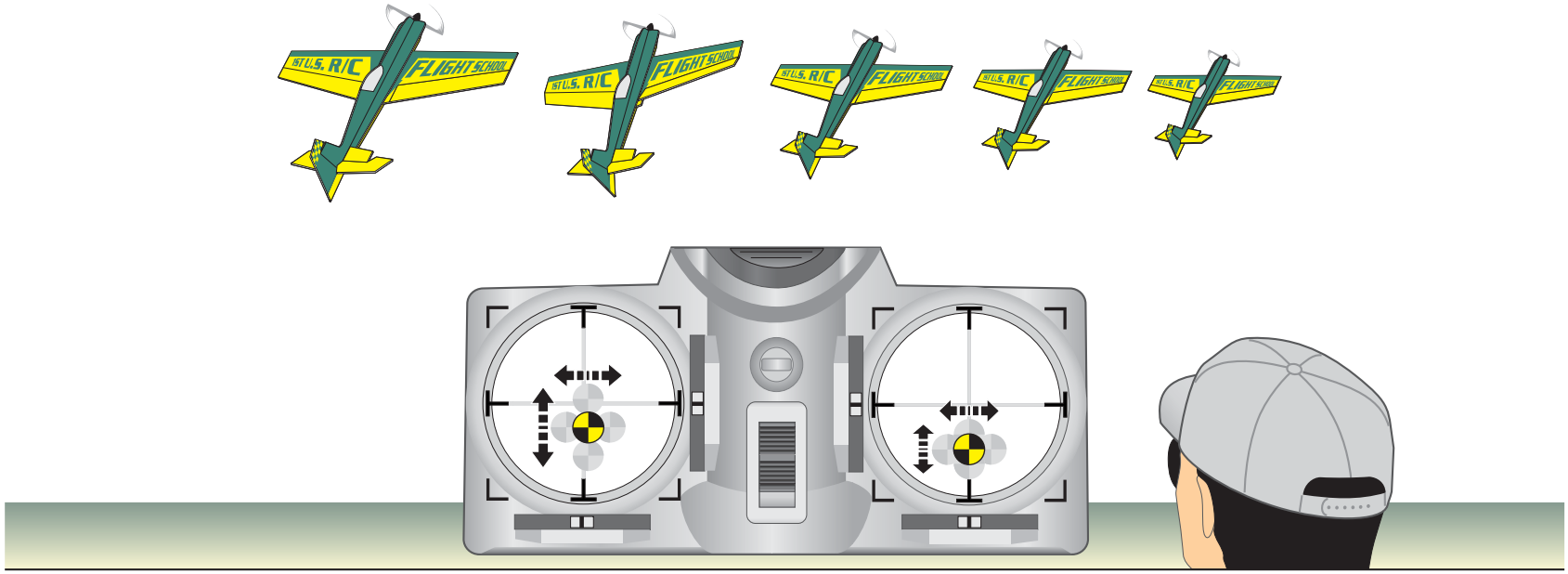


KPTR: Seek to maintain an approx. 45 degree fuselage angle during the harrier by smoothly pumping the elevator.

3D Harrier Pass: Rudder and Aileron Applications

Rudder is used throughout the harrier to correct left and right deviations and to steer the airplane. Coordinated aileron and rudder inputs are used to keep the wings level and prevent adverse yaw. Airplanes are typically very unstable during high alpha flight, making it very easy to over-control. Therefore, you must keep your rudder and aileron inputs very small and brief to avoid causing the wings to rock uncontrollably.

Conventional flying experience teaches us to relax the elevator and lower the nose when the wings start to rock during a stall. However, one must resist the urge to relax the elevator when the wings start rocking during a harrier. Maintaining a high angle of attack can actually work to lessen wing rocking by keeping both wings deeply stalled and therefore having as little aerodynamic influence on the maneuver as possible. Put another way, when the wings start rocking, sometimes pulling more elevator will lead to less wing rocking. You can also reduce wing rocking slightly by programming both ailerons to deflect up 10-15° with up elevator.



KPTR: Use rudder to keep the fuselage pointed in the same direction, and coordinate tiny aileron-rudder inputs to keep the wings level during a harrier.