

Masters (404)

Maneuver Descriptions

And

Suggested Downgrades

2015

**Purpose:** The purpose of this guide is to furnish an accurate description of each maneuver of the Masters (404) pattern sequence. Study of this guide by the competitor will help him learn exactly what is expected, while study by the judge will help them decide precisely how well the competitor meets these expectations. The competitor or judge should refer to the AMA Judge's Guide for general information regarding downgrades such as the "One Point per 15 degree Rule".

Also note that the following general statements apply.

- Turnaround maneuvers are never required to exit at the same altitude as the entry.
- Turnaround maneuvers are always required to be exited on a track that is a reciprocal heading (180 degrees) to the entry track.
- Center maneuvers will always exit at the same track as the entry track.
- All maneuvers must have a level entry and exit.
- Unless specifically stated, all maneuver geometry is to be judged by track.
- The only portions of maneuvers where track does not apply are the entries to the stall turn and the spin.
- Although the 15 degree rule applies universally, judges are expected to be more critical of horizontal and vertical tracks than those at off angles, such as 45 degree lines.
- Start of the takeoff, landing and box entry must be called out by the competitor or his caller to avoid downgrades. There is no downgrade for not calling takeoff and landing completions or box exits.

**Sequence:** Below is the sequence for Masters. U, D, and T represent Upwind, Downwind and Turnaround, respectively.

**Masters Sequence**

<b>Maneuver</b>	<b>Kf</b>
1. Takeoff Sequence (U)	1
2. Golf Ball, 2 of 4 point rolls up and down (U)	3
3. Humpty Bump, roll options, ½ (or ¼) rolls up and down, exit inverted (T)	3
4. Roll Combination, ½, Full, ½, all rolls opposite, exit inverted (D)	4
5. Half Cuban Eight, 2 of 2 point roll, (T)	2
6. Stall Turn, 1 ¼ roll up, ¾ roll down(U)	3
7. Knife Edge Humpty, ½ roll down, exit inverted (T)	4
8. Triangle loop, 2 of 4 point rolls up and down, full roll on top, exit inverted (D)	5
9. Half Square loop on corner with ½ rolls (T)	2
10. Double Immelman, full roll on bottom, 2 of 2 point on top (U)	4
11. Top Hat from top, ¾ roll down, ¼ roll up (T)	2
12. Hourglass (middle entry, top first) 1 ½ snap roll down, exit inverted (D)	5
13. Figure 6 with stall turn, ½ roll down (T)	4
14. Loop, full roll integrated over the top 90 degrees (U)	5
15. Reverse Sharks Tooth, 1 snap on 45 upline, ½ roll down (T)	3
16. Eight Point Roll (D)	4
17. Half Square Loop, 2 of 2 point roll up, reversing, exit inverted (T)	3
18. 2-1/2 Turn Inverted Spin (U)	3
19. Landing Sequence (U)	1
<b>TOTAL K-factor</b>	<b>61</b>

## Maneuver Descriptions:

- 1. Takeoff Sequence (U):** The takeoff maneuver will be scored in half point increments from 10 to 0. The model is smoothly accelerated to takeoff speed. When flying speed is reached it gently lifts off the ground and climbs at a gradual angle. The lift off should be within one meter of center for maximum points. (Measured as one meter each side of center as defined by the center pole) The aircraft must not deviate in track during takeoff but may change heading after liftoff to maintain a straight track with the takeoff roll. The maneuver is complete when the model is approximately 2 meters (6-1/2 feet) from the ground.

It is not necessary for the model to stand still on the ground with the engine running without being held before the takeoff begins. It is also not necessary for the model to reach 2 meters in the same distance as the takeoff role. The takeoff should not be downgraded for wing dips caused by air turbulence unless the wings are not immediately leveled.

Downgrades:

- Model jumps from the ground.
- Lift off is not within one meter each side of center.
- Retouches the ground after becoming airborne.
- Steep climb angle.
- Gallops in elevation during climb.
- Wings not level.
- Throttle not smoothly accelerated.
- Model passes behind the judge's line, scored 0 points.

- 2. Golf Ball, 2 of 4 point rolls up and down (U) –** From upright, pull through a 1/8 inside loop to a 45° up line before center, hesitate, perform a 2 of 4-point roll, hesitate, push through a 3/4 outside loop to a 45° downline, hesitate, perform a 2 of 4-point roll, hesitate, pull through a second 1/8 inside loop to exit upright.

Downgrades

- Track of up and down lines not 45°.
- Loop segments not round and of equal radius.
- Change in track during loop segments or lines.
- Roll elements not centered in 45° lines and on Center Pole.

- 3. Humpty Bump w/Roll Options (½ roll up and down or ¼ roll up and down), exit inverted (T):** From upright pull a ¼ inside loop to a vertical up line, hesitate, perform a ½ roll, or optionally a ¼ roll on this up line, hesitate, pull or optionally push through a ½ loop to a vertical down line, hesitate, perform a ½ roll or a ¼ roll, hesitate, push a ¼ outside loop to exit inverted.

Downgrades:

- Track not vertical in up line and down line.

- Rolls (as specified) not centered in respective vertical lines.
- Over or under rotation on prescribed roll. Apply “One Point per 15 Degree Rule”.
- Loop segments not round with same size and radius.
- If optional cross box roll is used (1/4 roll), 1/2 loop not 90 degrees to the flight line.

4. **Roll Combination, 1/2 roll, full roll, 1/2 roll, all rolls opposite, exit inverted (D):** From inverted 1/2 roll to upright, immediately (a brief hesitation is acceptable) perform a full roll in the opposite direction, and then (a brief hesitation is acceptable) perform a 1/2 roll in the opposite direction to exit inverted. At the roll reversals, wings are parallel to the horizon. Center is as the model passes through inverted in the full roll section.

Downgrades:

- Changes in track during rolls.
- Changes in altitude during rolls.
- Roll rate not constant for all rolls.
- Under or over rotation of prescribed roll elements. Apply “One Point per 15-Degree Rule”.
- Wings not level at beginning or end of roll sequence. Apply “One Point per 15-Degree Rule”.
- Roll reversal not immediate or with only a brief hesitation.
- Model not inverted in the full roll at box center.

5. **Half Cuban Eight, 2 of 2 point roll, (T):** From inverted, push a 5/8 outside loop to a 45-degree down line, hesitate, perform a 2 of 2 point roll, hesitate, then pull a 1/8 inside loop to exit upright.

Downgrades:

- Loop segments not round with the same size and radius.
- Track not at 45 degrees during downline. Apply “One Point per 15 Degree Rule”.
- Changes in track in loop segments or after roll element.
- Roll element not centered in 45 degree line.
- Over or under rotation of roll. Apply “One Point per 15 Degree Rule”.

6. **Stall Turn, 1 1/4 roll up, 3/4 roll down, upright exit (U):** From upright pull a 1/4 inside loop to a vertical upline, hesitate, perform a 1 1/4 continuous roll, hesitate, perform a stall turn to a vertical down line, hesitate, perform a 3/4 roll, hesitate, then pull a 1/4 inside loop to exit upright.

Downgrades:

- Track does not become exactly vertical.
- Loop segments not round and of equal size and radius.
- Wings not level during loop segments.
- Changes in track during loop segments or prescribed roll elements.
- Prescribed rolls not centered on lines.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.
- Roll rate not constant.

- Pivot radius greater than half wingspan.
- Pendulum movement after stall.

7. **Knife Edge Humpty, ½ roll down, exit inverted (T):** From upright, pull a ¼ inside loop to a vertical upline, hesitate, perform a half loop in knife edge flight to a vertical downline, hesitate, perform a ½ roll, hesitate, then push a ¼ outside loop to exit inverted.

Downgrades:

- Track not vertical in up line and down line.
- Rolls (as specified) not centered in respective vertical lines.
- Over or under rotation on prescribed roll. Apply “One Point per 15 Degree Rule”.
- Loop segments including knife edge not round with same size and radius.

8. **Triangle loop, 2 of 4 point rolls up and down, full roll on top, exit inverted (D):** From inverted, push a 1/8 outside loop to a 45° upline, hesitate, perform a 2 of 4 point roll, hesitate, pull a 3/8 inside loop to level inverted flight, hesitate, perform a full roll, hesitate, pull a 3/8 inside loop to a 45° down line, hesitate, perform a 2 of 4 point roll, hesitate, push a 1/8 outside loop to exit inverted.

Downgrades:

- Climbing and diving paths not 45°. Apply One Point per 15-Degree Rule”.
- Climbing and diving paths not of equal length.
- Loop segments not round and of equal size and radius.
- Wings not level during loop and line segments.
- Changes in track during loop segments or prescribed roll elements.
- Prescribed rolls not centered on lines.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.
- Roll rates not constant.

9. **Half Square loop on corner, ½ rolls, exit upright (T):** From inverted, push a 1/8 outside loop to a 45° upline, hesitate, perform a ½ roll, hesitate, pull a ¼ inside loop to a 45° upline, hesitate, perform a ½ roll, hesitate, push a 1/8 outside loop to exit upright.

Downgrades:

- Square not 45° from level. Apply One Point per 15-Degree Rule”.
- Loop segments not round and of equal size and radius.
- Changes in track during loop segments or prescribed roll elements.
- Prescribed rolls not centered on lines.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.
- Roll rates not constant.

- 10. Double Immelman, full roll on bottom, 2 of 2 on top (U):** From upright, push a  $\frac{1}{2}$  outside loop immediately followed by a full roll to level inverted flight, hesitate, then push a  $\frac{1}{2}$  outside loop immediately followed by a 2 of 2 point roll to exit upright.

Downgrades:

- Loop segments not round and of equal size and radius.
- Changes in track during loop segments or prescribed roll elements.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.
- Roll rates not constant.
- Length of horizontal segment (including roll element) not equal to diameter of half loops.
- Visible line between loop segments and prescribed roll elements.

- 11. Top Hat from top,  $\frac{3}{4}$  roll down,  $\frac{1}{4}$  roll up (T):** From upright, push a  $\frac{1}{4}$  outside loop to a vertical down line, hesitate, perform a  $\frac{3}{4}$  roll, hesitate, push a  $\frac{1}{4}$  outside loop to level inverted flight, hesitate, push a  $\frac{1}{4}$  outside loop to a vertical up line, hesitate, perform a  $\frac{1}{4}$  roll, hesitate, push a  $\frac{1}{4}$  outside loop to exit upright. The vertical up line, down line and horizontal line at the bottom of the maneuver are not required to be of equal length.

Downgrades:

- Loop segments not round and of equal size/radius.
- Up line and down line not vertical. Apply “One Point per 15-Degree Rule”
- Prescribed rolls not centered on vertical lines.
- Changes in track during loop elements, up and down lines.
- Over or under rotation of prescribed rolls. Apply “One Point per 15 Degree Rule”.
- Wings not level.
- Roll rates not constant.
- Horizontal line at bottom not inverted scores zero (0).

- 12. Hourglass (middle entry, top first)  $1\frac{1}{2}$  snap roll down, exit inverted (D):** From upright, pull a  $\frac{1}{8}$  inside loop to a  $45^\circ$  upline, hesitate, pull a  $\frac{3}{8}$  inside loop to level inverted flight, hesitate, pull a  $\frac{3}{8}$  inside loop to a  $45^\circ$  down line, hesitate, perform a  $1\frac{1}{2}$  snap roll (snap roll may be positive or negative), hesitate, pull a  $\frac{3}{8}$  inside loop to level upright flight, hesitate, pull a  $\frac{3}{8}$  inside loop to a  $45^\circ$  upline, hesitate, pull a  $\frac{1}{8}$  inside loop to exit inverted.

Downgrades:

- Climbing and diving paths not  $45^\circ$ . Apply One Point per 15-Degree Rule”.
- Loop segments not round and of equal size and radius.
- Wings not level during loop segments.
- Changes in track during loop segments or prescribed roll elements.
- Snap roll not centered on line and in center of box.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.
- Snap roll not a snap roll scores 0.

- 13. Figure 6 with stall turn, ½ roll down (T):** From inverted, pull a ¾ inside loop to a vertical upline, hesitate, perform a stall turn through 180 degrees to a vertical down line, hesitate, perform a ½ roll, hesitate, pull a ¼ inside loop to exit upright.

Downgrades:

- Track does not become exactly vertical.
- Loop segments not round and of equal size and radius.
- Wings not level during loop segments.
- Changes in track during loop segments or prescribed roll elements.
- Prescribed roll not centered on line.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.
- Roll rate not constant.
- Pivot radius greater than half wingspan.
- Pendulum movement after stall.

- 14. Loop, full roll integrated over the top 90 degrees (U):** From upright, pull one full inside loop to exit upright. A full roll is integrated into the top 90° of the loop.

Downgrades:

- Loop not round and of constant radius.
- Wings not level during non-rolling loop segments.
- Changes in track during loop.
- Prescribed Roll not integrated into top 90° of loop. Apply “One Point per 15-Degree Rule”.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.
- Roll rate not constant.
- Model not upright and level at apex of loop.

- 15. Reverse Sharks Tooth, one snap roll up, ½ roll down (T):** From upright, pull a 1/8 inside loop to a 45 degree up line, hesitate, perform a snap roll, hesitate, push a 3/8 outside loop to a vertical down line, hesitate, perform a ½ roll, hesitate, pull a ¼ inside loop to exit upright.

Downgrades:

- Loop segments not round or of equal radius.
- Climbing path not 45°. before and/or after prescribed roll. Apply “One Point per 15-degree rule”.
- Vertical down line not vertical.
- Model changes track.
- Roll not centered on 45° line.
- Snap roll not a snap roll scores 0.



- 16. Eight (8) Point Roll (D):** From upright, roll through 360 degrees, hesitating at each 45° point, to exit upright. Center is middle of inverted flight.

Downgrades:

- Rolls are more or less than 45°. Apply “One Point per 15-Degree Rule”.
- Model does not hesitate with equal duration after each roll element.
- Roll rate not constant.
- Changes in altitude.
- Changes in track.
- Wings not level at beginning or end of roll sequence. Apply “One Point per 15-Degree Rule”.

- 17. Half Square Loop, 2/2-pt roll up, reversing, exit inverted (T):** From upright, pull a ¼ inside loop to a vertical upline, hesitate, perform a ½ roll and with no more than a brief hesitation, perform a ½ roll in the opposite direction, hesitate, pull a ¼ inside loop to exit inverted.

Downgrades:

- Loop segments not of equal radius.
- Model track not vertical before and after prescribed roll.
- Prescribed roll not on middle of vertical line.
- Over or under rotation of prescribed roll. Apply “One Point per 15-Degree Rule”.
- Changes in track in loop segments or during prescribed roll.
- Roll rate not constant.
- Roll direction not reversed between the first and second halves of the 2 of 2 point roll scores zero (0).

- 18. 2-1/2 Turn Inverted Spin (U):** From inverted, approach center box with decreasing speed until stall occurs at box center, perform the required 2-1/2 turns of rotation (spins) and stop with the wings perpendicular to the flight line in a vertical down line, hesitate, perform a ¼ inside loop to exit upright. Stall is the center of the maneuver and should occur directly over the center pole for Center Box presentation. All spins begin and end with a horizontal line. In order to accomplish a spin, the model must be stalled. The entry should be flown in a near horizontal path with the nose high attitude increasing as the speed decreases. The nose then drops as the model stalls. Simultaneously, the wing drops in the direction of the spin. Spin entry (i.e. stall/break) for center maneuvers should occur directly in front of the judges on the center line/pole. The stall may occur while the airplane has forward motion with respect to the ground.

Downgrades:

- Snap roll or unstalled entry -0 pts.
- Model climbs or dives during entry. Apply “One Point per 15-Degree Rule” (entry ends with the stall).
- Model climbs or dives during exit. Apply “One Point per 15-Degree Rule” (exit begins at completion of ¼ loop recovery to level flight).

- Wings not level during entry or exit.
- Wings not perpendicular to flight line at end of required number of turns. Apply “One Point per 15-Degree Rule”.
- Spiral dive or pure rotation around roll axis of more than one half (1/2) turn -0 pts.
- Tail of model does not describe a cone during rotation -0 pts.
- Wing passes through vertical plane before nose passes through horizontal plane (snap roll entry) – 0 pts.
- Fuselage reaches a vertical attitude before rotation begins (simulation of stall by application of elevator) -0 pts.
- See Description of Maneuvers (Spins) in AMA Competition Regulations for additional criteria.
- Over or under rotation of prescribed rolls. Apply “One Point per 15-Degree Rule”.

**19. Landing Sequence (U):** The landing maneuver will be scored in half point increments from 10 to 0. The maneuver will start two (2) meters from the ground. The model flares smoothly to a nose high altitude, dissipating flying speed, and then smoothly touches the ground, within the landing zone. The maneuver should be considered complete once the plane has slowed below flying speed and rolled 10 meters or comes to a stop and no further downgrades shall be applied after that point.

The landing zone shall be marked by lines placed perpendicular across the runway and spaced 30 meters apart. The width of the landing zone is normally the width of the runway but in no case shall exceed 30 meters. Landing is not a centered maneuver and there is no downgrade for displacement of the touchdown point left or right from center as long as the landing is in the landing zone. If the touchdown is within the runway but not in the landing zone it should be downgraded proportionate to the distance outside the landing zone. The Contest Director may designate any landing zone appropriate to the field if safety considerations dictate. If the landing zone is anything other than standard it should be thoroughly discussed with the pilots and judges before flying is started and no downgrade shall be applied due to the touchdown in the non-standard landing zone.

The landing will not be downgraded if:

- Wing dips which are caused by air turbulence unless they are not immediately corrected.
- The pilot “slips to a landing” to handle a crosswind condition in which case a wing will be low.
- The model rolls to a controlled stop within 10 meters.
- Displacement of touchdown point left or right as long as the landing is in the landing zone.

Downgrades:

- Model passes behind the judges line, 0 points.
- Model impacts the runway due to lack of flare.
- Model bounces.
- Changes in track.
- Model ends on its back, 0 points.
- Model lands outside landing zone.
- If any undercarriage retracts before the landing is complete, 0 points.

- Aircraft “porpoises” and or wanders during approach or flare.
- Aircraft lands outside the landing area or runway, 0 points.
- Aircraft touches down while not straight to runway and ground track.