

Factors that affect Vmc

When an aircraft is certified the manufacturer must use the following to establish Vmc:

1. Aircraft at max takeoff weight - The aircraft flies at a higher angle of attack and therefore has more P factor. The 5 degrees of bank generates a horizontal component of lift. A lighter weight means less lift and less horizontal component of lift, but the lower angle of attack produces less P factor. As a result, a heavy weight vs a lighter weight doesn't change Vmc that much.
2. CG at aft limit - The shorter moment arm from CG to rudder creates less total force than if the CG is forward resulting in a longer moment arm. A forward CG means a lower Vmc.
3. 5 degrees of bank into the good engine - The horizontal component of lift lowers Vmc. More than 5 degrees of bank will lower Vmc (but performance is degraded).
4. Flaps in takeoff position - Lowering the flaps decreases angle of attack and lowers P factor, lowering Vmc.
5. Aircraft out of ground effect - Being in ground effect lowers Vmc by lowering angle of attack and P factor.
6. Critical engine failed and windmilling - The left engine on most light twins is the critical engine because the offset thrust line (with a positive angle of attack) on the right engine is further from the aircraft's centerline. Therefore more rudder is required to cancel the yaw than if the right engine were failed.
7. Sea level, standard day (15C, 29.92) - Higher density altitude decreases engine horsepower which lowers Vmc.
8. Landing gear up - Lowering the gear will reduce Vmc by creating the "keel effect" the helps keep the aircraft straight. The accelerated slipstream behind the engine at full power encounters the gear and creates excess drag. That drag helps to counter the turning tendency.
9. Operating engine at max power - Reducing power will lower Vmc.
10. Aircraft trimmed for takeoff - Using rudder trim (on aircraft with a rudder trim tab) will raise Vmc because some of the rudder area is being used to move the rudder and not countering yaw.
11. Cowl flaps in the takeoff position - Closing cowl flaps raises Vmc due to loss of "keel effect."