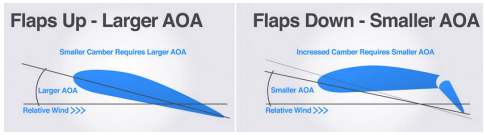
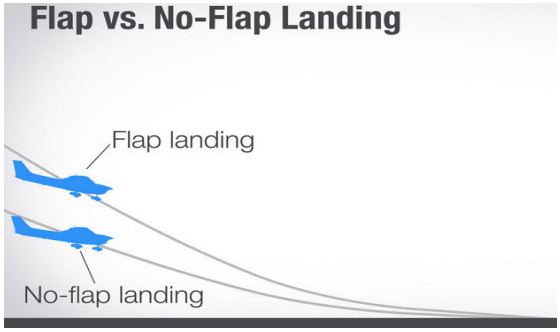
The Aerodynamics of Wing Flaps

When you extend the flaps on your aircraft, you lower your aircraft's stall speed, and at the same time, increase the drag. This all happens because extending flaps increases the camber, or curvature, of your wing. When your wing has a higher camber, it also has a higher lift coefficient, meaning it can produce more lift at a given angle-of-attack.



Extending flaps reduces your aircraft's stall speed for a simple reason. Because your wing creates more lift with the flaps down, you do not need to as much angle-of-attack to balance the four forces of flight. And because you can fly at a lower angle-of-attack with flaps extended, your stall speed will be lower as well. When you produce more lift, you produce more induced drag. This gives you two distinct advantages: 1) you have a slower stall speed, which means you can land slower, and 2) you produce more drag, which allows you to fly a steeper descent angle to the runway. The pilots view is also significantly improved with flaps.



A variety of electrical and mechanical failures could require you to perform a no-flap or partial-flap landing. You may also find a no-flap landing helpful in a few non-emergency situations. If you are flying a light airplane into an airport with a long runway, you don't have to worry as much about stopping distance. Choosing to fly a no-flap landing could help you in extremely windy conditions, especially when you need to maintain positive control of the aircraft in a maximum crosswind situation. And if you are flying into a busy airport, no-flap landings could allow you fly a much faster final approach to landing, making ATCs job a lot easier for faster jets behind you. Approach and landing in icing conditions might necessitate a no-flap landing as well.

Adjusting Your Circuit: If you are flying a circuit without flaps, you will find yourself with a relatively nose-high attitude, as compared to flaps extended. Losing altitude will be more difficult without the benefit of increased drag, which means you will typically need less power. To make things work, you might need to fly a slightly wider / longer circuit. This will ensure you do not "rush" the approach and build up excessive airspeed during your final descent.

Sight Picture: Since you will be flying with a more nose-up pitch attitude, it might make it difficult to see the runway. Judging height and distance is more difficult with a nose-up attitude and you will need to use peripheral vision to tell your height-above-runway. Do not forget that if you fly the prescribed speed, you're well above stall speed. This nose-up attitude has resulted in many pilots abruptly forcing the nose over to prevent a stall, even with plenty of airspeed, leading to a risk of a prop-strike or nosewheel landing.

Flare, Touchdown, Rollout: In light airplanes, no-flap landings are not exceptionally difficult or dangerous. No-flap landings may require up to 50% more runway distance for stopping. With flaps retracted and power

reduced, the airplane will be slightly less stable around the pitch and roll axes. Since you do not have the benefit of increased drag, the airplane will tend to float considerably. While you should avoid the temptation to "force" the airplane onto the runway, you also should not flare excessively, which might result in a tail strike. The best thing you can do is focus on a solid, firm landing without too much concern for greasing the wheels on. On rollout, you will find yourself having to use more braking to slow down without the added drag of flaps.