

## **The Last Thirty Seconds©**

If only we could go back and do the last thirty seconds of every landing over again. I have written about the flare before as well as other aspects of the approach and landing before. Now I will try to touch on the myriad reasons no two landings can ever be the same. I might as well be talking about snowflakes.

Constant repetition at one airport in one pattern will not organize all the variables into a blue print fitting all other airports. Even by setting all the pilot controlled constants the uncontrollable variables will make every landing a unique experience. The purpose of landing practice should, after pilot control of airspeed is standardized, be directed toward learning to adapt to and use the variables to make safe landings.

Without regard to how they occur in the sequence or in importance we have variations of airspeed, approach angles, aircraft attitudes, power settings, power changes, density altitudes, heights of flare, smoothness of flares, ground effects both high and low, wing lengths, wing positions on aircraft, landing gears, wind velocities, wind variations, and angles, flap configurations, flare altitude, pilot anticipation, pilot reaction, pilot perspective, control effect, timing, patience, runway alignment and more.

During WWII the phenomena known as ground effect was for the first time fully studied. Ground effect occurs when ever an aircraft is within half a wing span of the surface. The actual effect is very complex but it allows an aircraft to remain aloft with less drag and less power than is possible have even slightly higher altitudes. All other variables relating to landings have influence on ground effect. The pilot's ability to control ground effect depends on how he both anticipates and reacts to these other variables.

The closer to the ground the flare, and the greater the airspeed the more pronounced will be ground effect in causing float and ballooning. Once again variables of density altitude, wing length, wing position on aircraft, get to have their say. An aircraft with a relatively short wing may fall right through ground effect at below specific airspeeds. The same aircraft with a relatively long wing will float ...if only a slightly high airspeed is used into the flare. The flare into ground effect in the early morning will need a completely different touch in the mid-afternoon due to changes in the air density of the ground effect. A combination of a short wing, a hot day, and a low airspeed makes a landing more like a crash. A long wing, a cool day, and a high airspeed will cause you to float till tomorrow.

The airspeed, flap configuration, and approach angle to the runway is one group of variables that affect the accuracy of the landing. A constant airspeed will not bring you down to the runway at a constant angle if the wind velocity varies. The wind velocity always varies on an approach. The proper approach airspeed only allows us to flare in ground effect to bring the sink rate to zero. The flare transfers the energy of descent into forward motion in ground effect. Too slow may reduce the efficiency of ground effect. Too fast and the improved efficiency of ground effect results in either a balloon or float. The problem of the pilot is to adapt all the variables to the existing ground effect so as to accomplish an acceptable landing.

The pilot's best opportunity for an acceptable landing is to set as many constants as he can. The easiest to acquire are those of power, attitude,

airspeed, and configuration. Power is set quickly by sound and feel, then checked visually for fine adjustment. Attitude is set by knowing by predetermined trim amounts to be finely adjusted later. Airspeed is set by attitude and small trim adjustments. As configuration changes predetermined changes in attitude and trim are made to acquire desired airspeeds. On short final we have committed ourselves to an approach angle that is best varied by small power reductions if high and timed full power changes if low.

Reaching the round-out and flare all of the constants we have acquired come into conflict with variables that will be reacted to by inexperience and anticipated by experience. You will make and are expected to make mistakes during the flare to landing. Your instructor will even create the opportunity for you to make and learn from mistakes. The importance of this phase must not be underestimated by the student. You need to learn how to deal with variations of winds, ground effects, perspective and control effects. This is not easy. It is literally impossible to recreate the same situation twice in a row. If it were possible the landing process could be taught more quickly with a greater sense of success.

We have now reached the last thirty seconds of the landing process. Each landing, good, bad, and indifferent will be a combination of reaction and anticipation the timing of which will meet with varieties of success. This is the way it has been from the beginning of aviation and will be until we have full movement simulators for small aircraft such as exist for airliners.

As in the approach, there are some new constants that can be taught and used in the last thirty seconds. My first recommendation is that you learn to develop a smooth speed increase in yoke movement that corresponds to the deceleration of the aircraft. Along with this yoke movement you want to acquire a kinesthetic (Butt/stomach) feeling, augmented by sight, for ever so slight rising and falling of the aircraft. This sense and the anticipation-reactions that you use will adjust the aircraft attitude during the last thirty seconds. You are trying to keep the aircraft at a near constant altitude above the runway. The airplane should land when it is ready; not when you want it to.

Now the variables come into conflict with your effort to keep a constant altitude. A slight difference in approach speed either fast or slow will make a significant difference on how well you anticipate or react to the ground effect. You will need exposure to both high and low approach speeds. You will learn how different speeds require different control application to achieve the equivalent result. The flap configuration must be varied according to wind conditions. More or less flap extension will make a significant difference in the lift to drag ratios that occur in the flare. You will need exposure to all landing configurations from no flaps to full flaps. You will need to make a full range of flare altitudes from high to low. You will learn when to wait, when to react, when to anticipate and most of all when to go-around.

As a student, you will never get a chance to do all the variations. You will be given the learning tools to perform basic landings safely. Only by continued exposure to the variables will you become proficient in landings. It is the variables that give students a sense of intimidation and lack of progress. Every landing will be different and only relatively good when compared to what is possible. Seek not perfect landings but safe landings.