



Leighton Collins



# Takeoffs & Landings

**The Crucial Maneuvers and  
Everything In Between**

Foreword by Wolfgang Langewiesche  
Photography by Tom Lippert

*Takeoffs and Landings*

By Leighton H. Collins

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Photographs © 2005 by Tom Lippert

*On the cover:* A de Havilland Tiger Moth departs old Mandeville Airfield  
in Gore, New Zealand

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## ***A Word...***

This is the only book that my father, Leighton Collins, wrote. The foreword, written by his old and fine friend, Wolfgang Langewiesche, covers what transpired prior to 1981, when this book was finished.

Both my father and Wolfgang are gone now, both after extraordinarily good and productive lifetimes. I still think about, and miss, both of them a lot. No two people were as devoted to the exploration of aviation as were those two and they both kept up with flying and general aviation for as long as they could. Both actively flew as long as they could, too.

They used to go off on trips together, to experience things aeronautical by day and who knows what by night. Their last trip was in a T-tail Piper Lance when that airplane was new and my father was a consultant to Piper. That was during the time this book was written and I am sure they had long talks about the book and about ways for my father to explore the subject.

As a kid, and later as an adult, active pilot, and participant in general aviation, I was always fascinated by their conversations. I could sit and listen for hours. Most fun was when they would reach a conclusion. My father would say “that’s the trick” and Wolfgang something akin to “a-ha.”

Anyway as I re-read passages from this book, I can hear them talking. My father had a Texas accent that never went away despite the fact he moved from there when he went to

college in 1919. And while Wolfgang spoke perfect English there was no question that he had started out in Germany. So, think about that as you read. If you, like I, feel like someone is talking to you when you read and visualize a book, think Texan and German, both smart and fine people with inquisitive minds and fine senses of humor.

***Richard L. Collins  
Ijamsville, Maryland  
September 2004***

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## *Introduction*

The title of this book may suggest that it deals with a limited even though prideful part of our flying. After all, how much of our flying time is spent in takeoffs and landings? Ten percent? Maybe less, hardly any more. But during this limited time, we produce roughly 70 percent of the reportable accidents each year. That's worth looking into.

As to the 30 percent of all accidents that occur out of the pattern and in the enroute phase, the bulk of these misadventures and catastrophes are weather related and lead into meteorological discussions that are beyond the purview of this book. It is well to note, however, that most of the weather and assorted enroute accidents are amenable to prevention by abstinence.

VFR pilots do not have to get caught on top of an overcast; they have to get there intentionally. Low- and high-time VFR, and occasionally IFR, pilots fly low in restricted-visibility conditions and hit whatever gets in front of them—mountainsides, trees, towers. Intended VFR flights start with the weather bad locally and known to be bad en route and at the destination; yet the pilots go and often, of all times, at night.

How can they be so bold, or optimistic, or misinformed? VFR pilots should never lose sight of the ground, but if they do and get on instruments, they are almost certain to get into a spin or spiral dive, the latter being the producer of structural overstress failures.

It is surprising how many pilots run out of gas flying cross-country, some even on an IFR flight plan, and also at night. This adds to the engine-failure and -malfunction list, which is already replete with easily avoidable carburetor-ice incidents.

Finally, no one has to engage in buzzing or low-altitude aerobatics, which have an 80-percent fatal rate if anything at all untoward happens.

## Chapter 1

# *Basic Concepts*



It would be convenient to say that takeoffs and landings are affected by three things—aircraft flight characteristics, atmospheric conditions, and pilot flight characteristics—and go on from there. But it is not that simple. The variations from these three sources are so tightly intertwined in so many of our flights that a better starting point is a review of some of the more important basic concepts, and particularly how we perceive and try to control angle of attack.

It is very straightforward to think of elevator movement as causing a wing to pitch about its lateral axis, or of aileron displacement as causing it to roll about its longitudinal axis, or of rudder displacement as causing it to yaw about its vertical axis. But lateral, longitudinal, vertical—you can see that since we're accustomed to operating with at least one foot on the ground, our control movements tend to be ground referenced.

Stick or control wheel back and the nose rises above the horizon. Stick or wheel to the right and the right wing goes down toward the ground and the left one rises. Right rudder, say, and the nose swings or yaws to the right with reference to some point on the distant horizon. In many situations, for instance in a straight-ahead climb or descent, or in correcting a displacement of the airplane in level flight, these reactions serve us well enough.

But we also fly round the bend, and next are thinking about using the controls to make the airplane go where we want it to go. And we're off to the races. Sometimes we get into trouble less than halfway around the bend. Because, in rough air, we are called upon to exercise simultaneously pitch, roll, and yaw control. In our turns we need to think in terms of how our three controls enable us to rotate the airplane about its own pitch, roll, and yaw axes rather than about ground-referenced axes.

Meanwhile, in our turns and sometimes even in straight flight, we tend to forget that the first prerequisite to keeping an airplane flying is our ability to keep the angle at which the wing pushes through the air within very narrow limits. Too large an angle and the wing quits flying: the airplane becomes just so much weight with no means of support, and we get into gravity's 32-feet-per-second acceleration routine, which is vertically ground referenced.

The Wright Brothers were not only the first, but the first to know all about angle of attack. With their pusher Flyer, they had a place out front where they could attach a string, which was free to align itself with the relative wind. They soon learned that in a proper climb or glide, the string would tilt, tail end up, aligning itself at a certain angle to the longitudinal axis of their machine. If they attempted to climb too steeply or glide too slowly, the string's angle would increase and they'd be in trouble because with the relative wind at that angle the wing would lose its ability to provide lift.

Later, when they departed from the straight and narrow and started exploring the turn phenomenon, they discovered that in a turn if they let (with elevator) the string's angle get higher than was proper in a climb or glide, they were in the same trouble as in straight flight, even though in the turn they might be flying faster than in a climb.

Today, these many years later, we have no string to tell us when we're flying too close to stalling angle of attack. So let us enter the labyrinth of how we do our best to keep our angle of

# Takeoffs & Landings

The Crucial Maneuvers and  
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"A master aviator writes down all he knows about takeoffs and landings. The result is a goldmine...Half a century of close observation and penetrating analysis has gone into this book. We are fortunate to have it. Read it slowly. There's a lot to get." —Wolfgang Langewiesche, author of "*Stick and Rudder*"

Photography by Tom Lippert



Leighton Collins' classic aviation book is all about the realities of flying into and out of an airport, the practical matters of taking off and landing safely, skillfully, every time. With photographs by Tom Lippert, it's well received and appreciated for its timeless advice from Collins, who founded and produced *Air Facts*

magazine for almost 35 years starting in 1938, a pioneering force in the improvement of aviation safety standards.

In *Takeoffs and Landings*, techniques are explained such as how to use the airplane's "gravity engine" for extra power, how to cope with sink, gradient wind, wind shear and more. Emphasis is on stall/spin avoidance and the inherent risks of flying low and slow. Here you will find not only one, but five different ways of touching down; not two, but three ways of landing crosswind; and an excellent description of a light twin on takeoff with one engine out. Then Collins provides a complete account, from takeoff roll to full stop, of a perfect flight and how a really good landing is concocted.

Collins' shared tips and secrets are gathered from a lifetime of experience in the field. The book's Foreword is by industry icon and author of the well known classic *Stick and Rudder*, Wolfgang Langewiesche.



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