Highlights and Margin Notes in
Wolfgang Langewieshe's

Stick and Rudder: An Explanation of the Art of Flying
Chapter 8 Notes

Perhaps my notes and observations will inspire you to buy your own copy and learn from this classic…or to take the copy you already own off the shelf and revisit its great lessons, just as I am doing again now.

Continuing my notes on Wolfgang Langewiesche's essential classic, ***Stick and Rudder***:

Part II: SOME AIR SENSE

Chapter 8: "That Thing Called *Torque*"

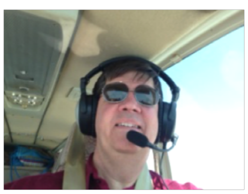
Page No.	Highlighted Text (Langewiesche's words)	My margin notes
137	Dives sometimes require left rudder pressure merely to keep straight	Airplanes are rigged for "normal" speed and engine torque. More torque requires more rudder; less torque requires less torque and may even require rudder opposite that needed in a climb
	"the only purpose of rudder is to cover up the mistakes of the designers."	
	Torque makes it impossible to use rudder in a consistent, logical fashion; because of torque we fly straight holding right rudder, we dive straight holding left rudder, and we sometimes go around left turns holding right rudder!	A climbing left turn needs *less* right rudder, but still requires right rudder
	Torque messes up our whole handling of the controls	
	"torque" is not really torque at all!	
138	An airplane turns to the left [because of] a "gyroscopic" effect. This is true—sometimes.	
	It "precesses" sideways, that is, evades the force at right angles.	
	In te case of an airplane with the usual clockwise-turning propeller, pulling the nose up produces a gyroscopic effect that swerves the nose to the right. Kicking the nose to the right by rudder produces a gyroscopic effect that makes the ship nose down. Pushing the stick forward makes the nose swerve to the left. Kicking the nose to the left by rudder makes it come up!	
	The precession effect is but faintly noticeable in normal maneuvering	
138-139	Why do many airplanes snap-roll more easily to the right than to the left? When at the start of the maneuver the pilot pulls the stick back and the nose swings up suddenly, gyroscopic force swerves the nose to the right, thus adding its effect to that of the pilot's right rudder and thus helping the snap roll along.	Are postwar airplanes like this too?
139	In a snap roll to the left, its force counteracts the pilot's left rudder, and this results in a more sluggish roll.	
	In practicing steep figure eights "around" two pylons—a maneuver that requires a rather whipping entry into a steep turn—he loses altitude on the right turns although he is not conscious of any control errors.	
	Gyroscopic precession…must be counteracted by both	

	stick and rudder.	
	Gyroscopic precession…must be counteracted by both stick and rudder.	
	There is a left-turning tendency during the take-off anyway—for other reasons. As the pilot raises the tail, the nose is bound to swerve to the left.	The opposite occurs when “rotating” a tricycle gear airplane for takeoff.
	Anticipate the need for foot action.	
140	The engine, in turning the propeller one way ‘round, turns itself (and thus the whole airplane) the other way ‘round.	
	This effect—is continually forcing the left wing down. The designer therefore puts the left wing at a slightly higher angle of incidence than the right wing, thus giving it some extra lift. But this gives it also some extra drag, and that extra drag would cause the airplane to yaw to the left. To keep the airplane from yawing the designer then sets the vertical tail fin at a slight angle, so that it has the same effect as if the pilot were continually holding right rudder. Thus the designer achieves an airplane that wants neither to roll nor to yaw. But he gets this perfect balance of forces only for one combination of flying speed and throttle setting.	Did they do this in postwar airplanes?
	The ship will turn to the left when flown at a slower speed and wider open throttle—as for example in a climb. It will turn to the right when flown at faster speed with the throttle less wide open…. This theory has flaws.	
141	Propeller torque is too feeble compared with the airplane’s own powerful inherent stability, its tendency to keep itself from rolling.	
	The propeller is so short and the wings are so long that any twisting force on the propeller cannot overpower the wings’ tendency to hold themselves level when in straight flight.	
	The “torque” theory does not explain the thing we seek to explain.	
142	There is one situation when torque can become really dangerous: when you are stalled or nearly stalled, and then gun your engine suddenly.	Go-around loss of control
	The true reason for the airplane’s left turning tendency is not torque at all.	
	Because of spiraling [slipstream] motion, this air stream hits the vertical fin at a slight angle, thus pushing the tail to the right and yawing the nose to the left.	
143	Underneath the tail…there is no tail fin down there to block [the slipstream’s] path. The net result is…the tail has received one shove to the right but no shove to the left. And hence it moves t the right, yawing the airplane to the left.	So Langewiesche feels the spiraling slipstream is the dominant left-turning tendency
	In slower flight at wider open throttle, when the propeller blades meet the air at a higher angle of attack, the spiraling is much more pronounce.	Not the higher AoA of the descending blade, which is nonetheless demonstrable (especially with a tailwheel airplane sitting on the ground), L. feels the propeller blade AoA primarily affects slipstream effect.
	In gliding flight, then there is no slipstream, there is of course no spiraling of the air; the flow over the tail is then straight.	In a glider, yes. In a power airplane at idle, there would still be slipstream, right?
	The offset of the vertical fin is then unnecessary, and in fact yaws the ship to the right; the pilot must hold slight left rudder. This becomes apparent to him, however, only if the glide is fast enough to be called a dive.	Rudder: Climb/high power: RIGHT RUDDER Cruise/cruise power: NO RUDDER Descent/Low power: LEFT RUDDER
	An airplane [shows] a very pronounced left-turning tendency while approaching a power stall. But when the “break” of the stall has occurred, the left-turning tendency temporarily disappears in some airplanes even though the engine is still wide open, and the ship	

	is still slowed up, and the pilot expects to have to hold much right rudder. This puzzles many pilots.	
144	Could this left-turning tendency be abolished altogether? It could be done by putting as much vertical tail fin underneath the tail as there is atop the tail. The reason it isn't done is that it would interfere with the conventional landing gear which calls for a tail wheel.	
144 - 145	Modern safety airplanes have no rudder and must therefore somehow get rid of the left-turning tendency. In such airplanes the problem is solved by providing a double tail, one small vertical fin at the tip of the horizontal stabilizer. This takes the vertical tail area almost entirely out of the slipstream, out into undisturbed straight-flowing air; the slipstream passes between the two fins.	"Safety airplane" of the era = Ercoupe. It actually still has movable rudders, just that they are connected to the ailerons and not independently controlled through rudder pedals.
145	What little then remains of left-turning tendency is compensated for by mounting the engine at a slight angle.	"Canted" engine mounts
	Too many pilots feel that an airplane isn't a "real airplane" unless it faithfully reproduces all the traditional vices over again.	Many safety advancements are squelched by "real pilots." 2018 note: CAPS on Cirrus airplanes as an example

I'll add chapter highlights and notes until we reach the end of the book. If you're impatient—and I hope you are—you won't wait for my musings, but instead will secure your own copy of *Stick and Rudder* now. Beyond simply reading its words, you'll truly analyze, criticize, mark up and understand Langewiesche's teachings to, as Adler suggests, **make this book your own**.

I look forward to your comments on these notes and the larger work. Please send your thoughts to me at mastery.flight.training@cox.net. Thank you.



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