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Red Tails Movie Night

Our next Chapter meeting will be a **Dinner and Movie night**. We will be going to **Harbor Bay Restaurant** for dinner, followed by **Showplace Cinema at North Park** to watch the new George Lucas flying movie **Red Tails** on the big screen.

Wednesday February 8, 2012

Dinner Reservations 5:30 PM Harbor Bay Restaurant
North Park Shopping Center.

Individual menu service.

7:15 PM Movie **Red Tails** at North Park Showplace Cinema.

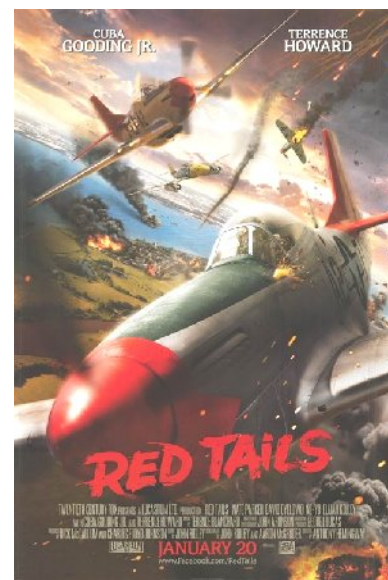
Adult ticket price \$6.50
Senior/Children \$6.00

We encourage everyone to bring a friend, spouse, aviation enthusiast, seafood enthusiast or anyone that just wants to get out of the house.

Harbor Bay has asked me to call Wednesday morning with a head count; so, everyone that plans to go please **send an e-mail to** rsvp@eaa21.org so we will have an idea of the count to give them.

There will be five door prizes. Four individual free tickets to the show and one \$25 Harbor Bay gift card.

Steve Eberhart
President EAA Chapter 21
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WolfGang Langewiesche and the Modern Safety Plane

I was reading a chapter of the book **Stick and Rudder** a couple of weeks ago, and came across several pages of commentary where Wolfgang Langewiesche describes various aspects of the design and flying nature of the Ercoupe. I didn't know these passages existed until I happened upon them.

Since we now have three Chapter 21 members who own Ercoupes, plus another one soon to arrive, I thought I'd delve into the history of that aircraft, and also share what old Wolfgang had to say about it.

Fred E. Weick

Any discussion about the Ercoupe has to start with Fred E. Weick. He was an aeronautical research engineer who worked for NACA—the National Advisory Committee on Aeronautics. In 1931 he started working on an experimental aircraft that would incorporate safety features not found on aircraft of that day. It would be an aircraft that was

easy to fly—unlike the available aircraft that were largely based on World War I design and technology. Some of the design goals were:

- Tricycle landing gear with castering nose wheel, steerable if desired
- Suitable longitudinal and lateral stability with limited up-elevator deflection, to prevent loss of control due to stalling and spinning.
- A glide-control flap
- Two-control operation using controls for pitch and roll

Weick left NACA in 1936 and joined ERCO's (Engineering and Research Corporation) fledgling aircraft team as chief designer, primarily to continue improving his aircraft design. Focusing his efforts on a number of design issues, primarily simplicity and safety, Weick strove to create a reasonably priced aircraft that would not stall or spin. Retaining

the tricycle gear, for ease of maneuvering on the ground, and limited stall-spin features, Weick switched to a low-wing monoplane configuration in his new model, powered by an engine in tractor configuration.

The first Ercoupe made its first flight in 1937, and the first production model came out in 1939. Wolfgang Langewiesche published *Stick and Rudder* in 1944. Here's what Langewiesche had to say about the Ercoupe, which he calls the "Modern Safety Airplane":

The Automatic Rudder

The Wright brothers knew what the rudder is for. They had the whole airplane figured out much more brilliantly even than most people realize even now. They knew that an airplane could not be successfully turned by rudder but would have to be turned by leaning it into a bank and lifting it around with the flippers. [elevators] Their first glider didn't have a rudder! But they also soon discovered the adverse yaw effect: when their first attempt to bank to the right produced a turn to the left, and a crash. The Wrights then fitted a rudder; but they understood the nature of the rudder better than most airmen have understood it since. They knew that it was merely a device for counteracting the adverse yaw effect. They hitched their rudder up mechanically with their aileron control. Thus giving aileron the to right would automatically always be accompanied by right rudder: aileron to the left, by left rudder; aileron in neutral, neutral rudder. What we now call "coordination of stick and rudder," what we spend tedious hours learning, and—as the accident record shows—never learn quite well enough, was reduced to a mechanical device!

The latest trend is back toward the same idea. In the modern safety airplane, pioneered most successfully by Fred E. Weick, the rudder is once more hitched up mechanically with the same steering wheel that also moves the ailerons—and once more there are no rudder pedals! Such an airplane has restricted flippers and thus cannot be badly stalled; hence it does not need an independent rudder for control in stalls and spins; it has no "torque" and hence needs no independent rudder action merely to keep straight. It has a tricycle landing gear with steerable front wheels and hence needs no rudder for control on the ground. Because of its tricycle landing gear, it can afford to touch the ground in a cross-wind landing with some sideways drift; hence it doesn't need an independent rudder to produce sideslip. Whenever the pilot uses the ailerons in such an airplane, the rudder goes over at the same time. Whenever the pilot neutralizes his ailerons, the rudder, too, returns to neutral. Such a ship is built, then, on the clear-cut theory that the rudder's only purpose is to counteract the adverse yaw effect of the ailerons. And such an airplane flies a perfectly coordinated turn and "coordinates" perfectly also in straight flight through rough air. In very fast flight, when the ailerons' adverse yaw effect is very slight, it may skid a little from slightly too much rudder action; in very slow flight, when aileron yaw is pronounced, it may yaw a little from insufficient rudder action. But experiment has proved that even the most expert pilot cannot in the long run "coordinate" as well as does such an airplane, and that he will occasionally produce skids or slips much worse than such a "two-control" airplane could possibly produce; and of course such an airplane's control action is infinitely better than that of the mediocre pilot or the scared pilot or the confused and tired pilot.

That proves it then: The only real purpose of the rudder is to

counteract the adverse yaw effect of the ailerons. And—some designers go even farther. Ailerons can be designed that cause practically no adverse yawing effect; hence we ought to be able to do not only without the rudder pedals but actually without the rudder itself: without any movable vertical surface on the tail. Some light yawing tendencies might remain, but they can easily be stopped by the fixed vertical tail fin—if the fin is only big enough and the tail long enough. Along this formula Prof. Koppen of M.I.T. has built rudderless safety airplanes which "coordinate" extremely well; and he goes so far as to say this about the rudder, "The only purpose of the rudder is to cover up the mistakes of the designer."

Our Landing Gear is Wrong

[I]t turns out that our conventional undercarriage is all wrong—considered as a landing gear. It is excellent take-off gear. What makes the airplane *prefer* to ground-loop is simply the fact that its center of gravity is behind its main wheels. In this respect, too, the tricycle landing gear is the solution. We have seen that, on the conventional landing gear, the airplane would really prefer to roll tail first and that the ground loop is really nothing but the airplanes attempt to get its tail out front. Well, the tricycle landing gear, "hind side to" as it first appeared to many pilots, takes advantage of that tendency of the airplane. It puts the center of gravity forward of the main wheels, where it "wants" to be during the landing run: The airplane is suddenly rendered stable. On a tricycle landing gear, the airplane "prefers" to run straight ahead. Should some outside force—such as a cross wind or the pilot's clumsy footwork on the brakes—start a swerve, the plane will then not "want" to curl up into a ground loop. The centrifugal force produced by any swerve will tend, not to tighten the swerve, but to counteract the swerving: The airplane will "want" to straighten out. And here again, this fact is bound to have a deep influence upon the controls. For it rids us of one more situation in which a rudder is badly needed in

an airplane. Next to control in the stall, the most important role of the rudder is to keep the airplane straight on takeoffs and landings. With the airplane stabilized, *wanting* to keep itself straight, we can get rid of the airplane's most unnecessary and trouble-making control.

Of course, some way must still be provided to steer the airplane on the ground, since in addition to stability you always want to have control. If the airplane were simply stable in the landing run and nothing else, it might still mean that it would roll beautifully straight smack into the administration building. Most airplanes therefore (and for other reasons) retain the rudder. But some of the safety planes solve the problem more brilliantly by making the front wheel steerable and linking it up with the same control which also operates the aileron, that is, with the pilot's stick or control wheel.

The Cross-Wind Landing

When a pilot trained on conventional airplanes is first asked to fly such an airplane he will usually exclaim: "But what about cross-wind landings? Without a rudder, how am I going to land in case of a cross wind?" It may be well to take up briefly the technique of cross-wind landings, both on the conventional airplanes and on the new rudderless tricycle-gear safety airplanes.

On the conventional airplane, the cross-wind landing requires definite and finely gauged action on the pilot's part. Since the airplane is drifting in the wind, it will touch the ground, should the pilot do nothing about it, while going sideways as well as forward. And because of the instability of the conventional landing gear, this sideswiping sort of ground contact will almost instantly trigger off a



ground loop. Hence the pilot must kill the sideways motion just before the ship touches the ground. If you understand wind drift, as explained earlier in this book, you can see that there is only one way of having straight, head-on motion over the ground while flying in a cross wind: The airplane must slice sideways through the air. If the cross wind is from the left, the airplane will tend to move, relative to the ground, sidling toward the right; and the only way to make it go straight relative to the ground is to make it slice leftward through the air.

There are maneuvers which will do this. One method is to dip the left wing slightly down by aileron, at the same time keeping it from making a left turn by putting on some right rudder. This results in a sideslip toward the left. If done to the correct degree, this leftward motion of the airplane *through* the air will just cancel its rightward motion *with* the air and the net result will be straight forward motion relative to the ground. This sideslip is usually blended into the hold-off of the three-point landing. Just before the final touchdown the wings are usually leveled, though it is entirely permissible, in a strong cross wind, to make even the actual ground contact with the windward wheel first.

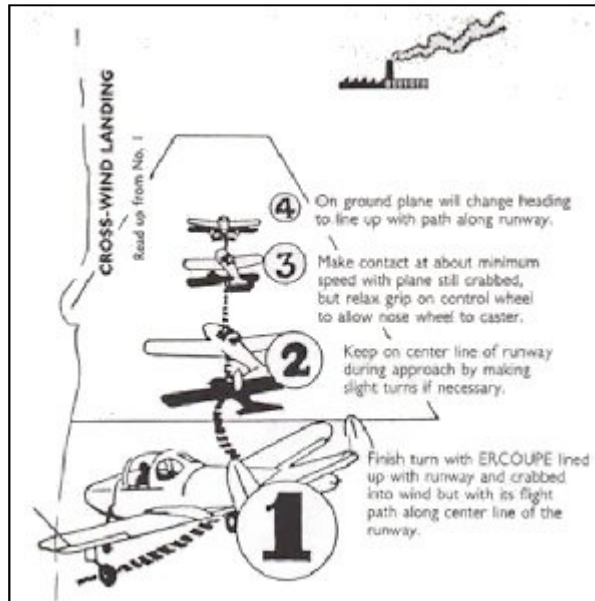
Another method is to fly the airplane in a normal fashion, allowing for drift in the usual way by “crabbing.” In that case, the pilot simply makes sure that his actual flight path is exactly down the intended runway. With a cross wind from the left, this means of course that the airplane is *pointed* to the left of the intended landing direction. Just before ground contact, at the very last half second, the pilot then applies rather abrupt right rudder and thus yaws the nose into the direction in which the airplane is actually traveling—that is, straight

down the runway. The wings are held level during the yaw maneuver. If you analyze the maneuver you will find that it, too, amounts to a momentary leftward slicing of the airplane through the air.

You notice that both methods require the use of a rudder. Hence the question, in regard to the rudderless safety airplane: “But what about the cross-wind landings?”

The answer is that on the stable tricycle landing gear, the airplane can afford to touch while “crabbing,” that is, while moving relative to the ground in a sidling fashion. The resulting sideswiping sort of ground contact will simply give the landing gear a chance to show its stability. Consider once more our example, where the cross wind is from the left and the airplane’s nose thus points to the left of where the airplane is actually going. The nose wheel, remember, is free to caster, and the ship’s center of gravity is ahead of its main wheels. At the moment when the main wheels make their slightly sideswiping contact with the ground, the ship will cock itself sharply around toward the right until its nose points in the direction in which it is actually moving. And it will then move more or less straight ahead, with no tendency to ground-loop. In a strong cross wind, when ground contact is very markedly sideways, this initial cocking around happens instantly

and with surprising quickness. In ships whose nose wheel is steerable and connected with the aileron control, the quick castering of the nose wheel is felt by the pilot’s hand as a distinct kick of the control wheel. But since this swerve around is a stable reaction rather than an unstable one, an anti ground-looping swerve rather than a ground-looping one, it makes no demand upon the pilot: the pilot simply lets it happen.



Did you know the first aircraft featuring tricycle landing gear was the 1911 Curtiss Pusher? When Fred Weick developed the modern tricycle landing gear in the early 1930s, he patented it in his own name. When he left NACA for ERCO he took that patent with him.

EAA 21 Logbook Editor Taking a Break

I’ve been keeping a secret from most Chapter 21 members for a couple of months, and it’s time to come clean. I have a medical condition called myelodysplastic syndrome, or MDS for short. You’ve never heard of this condition because it’s very rare. In effect it is the increasing inability of the bone marrow to reproduce and develop properly, resulting in low blood cell counts.

Since about last Thanksgiving, my condition has worsened, resulting in ever lower red and white blood cell counts. Since there are no outward symptoms, it hasn’t been apparent to those around me of my illness, but it has gotten to the point where my life is now in danger. The only cure for this condition is a bone marrow transplant. In the past few weeks I have made several trips to the IU Medical Center in Indianapolis to prepare for this. They would like to start the procedure, which will take two to three months, before the end of February. I will be a resident of the hospital there throughout.

This will, of course, prevent me from being able to do any of the things I’ve been doing, including preparing this or any other newsletter. Perhaps Steve can find someone to take my place.

I have put preservative oil in my airplane engine because I won’t be flying it for awhile. I have been told it will be at least 6 months before I’ll be able to fly again, and maybe longer. I should be able to resume my newsletter editor activities sooner than that though.

I have every intention of resuming this newsletter, and flying my airplane, as soon as I can. Once the bone marrow transplant is accomplished, I will again be physically normal. Until then I will be away for awhile. I will have my laptop with me, so I should be able to communicate via email, even while I am hospitalized.

As General MacArthur once said, I shall return.

Pete

EAA Chapter 21

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Upcoming Chapter 21 Events

EAA21 Chapter Meeting: Wednesday February 8th, 7:00 PM, Showplace Cinemas North
Showplace Cinemas North is located at 4200 N. Third Ave. (Near North Park Shopping Center)

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