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Lancair 360 mk2 performance

Norman E. Howell Originally published in November 1993, this is not your usual EAA chapter newsletter article. The recent events of chapters 49 and 1000 prompted me to write this paper on the quality of the handling of Rancail 360. As you know, EAA Chapter 49 member Bob St. Clair of Palmdale damaged Lancel 360 (N123ST) in a landing accident on September 29. Previously, Bob only flew aircraft for about 14 hours of the 18 on the aircraft. The accident scenario went as follows: Bob landed on Runway 07 in Mojave after flying a 1.9-hour mission, reporting that it was the smoothest landing he had ever made on an aircraft. The configuration was 10/D (flap 10°, gear down), and the CG at the time was FS 25.7 (inch), which was in the forward range of the CG he flew, but not extreme. He previously fed in CG from FS 25.19 to FS 29.1 during the flight test program. The CG limit issued is FS 24.5 through FS 30.3 from NEICO. After the touchdown, Lambier's nose began to go up and Bob corrected with a small amount of forward stick pressure. The nose kept rising and Bob added more forward stick pressure and actually moved the stick a bit to put the nose down. He was aware of the need for a small response measured in the pitch of flares from previous flight tests and other reports in the Rancail newsletter. But he was unable to arrest his nose speed fast enough or accurately, causing his plane - which was now in the air - to stall, fall from about four feet and fail all three landing devices. Why did this accident happen? But in comparing all the data collected by chapter 1000 members on Bob St. Clair's plane before the accident with my own experience with Larry Wright's Lankir 360, I come to the following conclusion: the Lambier 360 (180hp parallel valve lycoming engine, constant speed prop) is very much affected by pilot-induced pitch vibrations in approach and landing configurations. The lancer 360 (same configuration) shows medium to negative longitudinal static stability through most of the acceptable CG range. The Rancail 360 (same configuration) has very low maneuvering stability and makes the lowest stick force per g allowed for USAF or USN jet fighters. Rankeil 360 (same configuration) has poor lateral stability without an identifiable bihedral effect. As stated in Neiko's information package, the mission of Rancail Design is fast. You would expect to fly cross-country using that high speed. Aircraft that have any utility in cross-country should be fully possible of IFR day/night operations. Many Rancail builders are equipped with their aircraft with thisTherefore, conclusions from 2, 3 and 4: Rancail 360 (same configuration) is not a suitable mission for IFR operations. Now I recognize that these are some pretty strong statements. And I should probably exonephras them to apply only to stock lancer 320/360 aircraft with Lycoming parallel valve 180hp engine and constant speed props. However, my observations and those of two other test pilots (Doug Shane, Doug Shane in Eaa Chapter 1000, and Chuck Berte of CALSPAN) were about the same, and these observations were drawn from three completely separate examples of this aircraft/engine configuration. These observations and recommendations do not apply to other configurations of the Lancel 320/360, and do not apply to permuting Lancer 235 aircraft. Because these combinations have not been tested, you cannot draw observations. What's wrong with this photo? The first sub-question is why is this plane difficult to land? For good landing characteristics, FAR Part 23.175 (demonstration of static longitudinal stability), paragraph (d) (approach and landing) states: The stick force curve must have a steady inclination at speeds between 1.1 VS1 and 1.8 VS1. with-(1) wing flap at landing position: (2) landing gear expansion: (3) § 23.161 (c) (2) (ii) :(4) both power off and enough power to maintain a 3 degree descent angle. For the Rancail 360, VS1 is 62 mph. Therefore, the slope of stable trim should be obvious from 68 to 113 miles. Also, the trim speed must be 1.3 VS1 (81 mph). We have the following data: These data are preliminary and do not match FAR 23 in that the trim speed exceeds 81 mph and the gear is up. Note, however, that if the elevator position is 10/U-100 CG 27.92 (10° flap, gear up, trim speed 100mph, FS 27.92 CG), it will not change at all. The 30/U-90 curve of this CG is a dead straight line. The other two curves are slightly better. What we want to see is the deflection of the elevator steadily increasing as the aircraft slows down. The stick force associated with the above conditions should also have a nice negative slope. It's easy to get confused here, but for a stable slope of long statistics as described in FAR, I'd like to see a graph of stick force and stick (elevator) deflection vs. speed running downhill from left to right. This assumes that one calls the pullstick force a positive value. The RV-6's recent Sports Aviation CAFE report used pushforce as a positive (non-standard) and further confused the problem. Associate it with what you feel in the cockpit. you're taking the final approach by plane1.3 Do it in VS1. After that, the airs per hour slows down by 10 mph. You should expect to pull slightly backwards in a slightly larger rear stick (yoke) position (slightly larger elevator deflection), and if you let go of the stick, the plane will want to return to the trimmed airskilled. It doesn't have to go back very badly, but it doesn't have to stay in 1.3 VS1-10. Now let's take a look at the Lancer 360 stick force data using a mental image that has the forces caused by the off-trim state in mind in the landing approach: note the lack of stick force queues in the 30° flap configuration. Also, in a 10° flap configuration, there is a slightly stable slope to the point where it flares, and then the force curve is reversed. Also, these data are for forward CG conditions! So how do you solve this problem? Many people will say that they will solve this through good pilot training. In a letter to lambier builders on the tail issue (dated March 93), Neiko Aviation said: The existing tail configuration provides good stability over all documented cruising ranges. At a slower rate, the rear CG segment of the envelope is stable and neutral. This essentially means that the stick (and the aircraft) does not return to its previously trimmed attitude and stays where you put it. In the real world, this means you're not flying hands off during a short final approach! Are we unique? While it is interesting to note that so many aircraft (many military aircraft) are neutrally stable through most of the flying envelopes, sailboat pilots typically ballast water on gliders to achieve overall neutrality stability that improves performance through reduced trim drag. [Emphasized in the original]. I am generous and polite by stateing that these explanations are empty. These planes are highly trained and designed to fly to a handpicked crew, so the example of a military plane doesn't matter. Still, I would question the conflict of neutral long statistics through the majority of flight envelopes for military planes. The sailplane example is interesting, but the main reason the sailboat is water ballasted is to shift the entire drag pole, allowing for faster in the race. A decrease in trim drugs is a side effect, which is offset by an increase in drag caused by a higher total weight. And oh, by the way, sailplane drivers all throw away water before landing! Neiko offers a bigger tail for The Lancel 320/360 to comply with AustraliaPeter Denholm, an Australian rankeier builder, reports excellent results against the FAR 23 standard with carbon fiber 360 horizontal stabilizers. I consider the big tail a mandatory revision of all future Rambier 320/360 aircraft. Those who are still building, and those who are flying but dissatisfied with the landing characteristics, will need to renovate their larger tails. In addition, friction in pitch control systems tends to significantly reduce handling quality. The maximum allowable friction of the runcil pitch axis must be 0.0000 lbs. I got it. The big tail should take care of the first three major flaws I mentioned at the beginning of this article. Fourth, lateral stability is poor and correction is not easy. Mr. Denholm attached an out-of-the-way canned wing to his lankir to enhance the effective bihedal. That may not be the solution for everyone. I think a good wing leveler or autopilot is enough to handle lateral stability issues and make an aircraft suitable for IFR flight. This article will definitely cause a lot of reactions in our hobby. I hope the people of Stoddard-Hamilton take the same stance as they did with the problems and solutions of the Grassea II-S, and 1) admit that there are major processing quality issues with the Lambier 320/360 design. 2) Provide tail kits at low cost to everyone who wants it, and 3) make a commitment to fully refine (through substantial and documented flight testing) to recognized standards before releasing the kit to the public for construction. I look forward to the improved tail Lankir flight test when the opportunity arises, and would like to report the same observations chuck Berté made at The Gracea Super II-S in the October issue of Kit Plains: The Gracea Super II-S is an excellent example of a case where the designers have recognized the problem and thoroughly corrected it, and the result is an airplane with excellent flight characteristics. This shows me that our homemade industry is really mature. The people of Stoddard Hamilton should be proud of this performance. Norm Howell is a USAF test pilot currently assigned to the F-16 CTF. He is a graduate of the U.S. AF Test Pilot School and a member of the Experimental Pilots Association. His flying experience includes an enviable number of different types of aircraft from many aircraft, including his record setting Quickie, Mighty Sherpa (C-23), the latest F-16, and many of the sailing ships, spam cans, and house-making. In addition to his tour as a military instructor pilot, he recorded numerous outs and outs of F-4G wild weaci during desert storms!... [--Contributing Editor] Related article: Rancail 360 First Flight - June 1993 Test Pilot Report - Rancail 360 First Flight - June 1993 Presidential Column - December 1993 -Semi-official non-official Non-Compatible Big Tail Lancer 360 Update to Handling Qualities - September 1995 EAA 1000 Homepage Email: erbman@pobox.com URL Website Director Russ Elb: State-of-the-art content and Content is the author's perspective. No claim has been made and we are not responsible for the technical accuracy or safety of the material presented. The expressed perspective is not necessarily that of Chapter 1000 or the Experimental Aircraft Association. Revised -- March 2, 1997 1997

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