CHECK PILOTS MONTHLY

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Publisher: Kalitta Continuing Education Series (KCES)
Editor: Steve Vaught
Contributing Authors:
Check Rides: Mark Handren
Lear 35 Aerodynamics: Erik Lund
Aviation Safety: A. Marie Zeeb

Climb, Climb Away……

This is the second in a three-part series on Lear Jet aerodynamics and subsequent effects on fuel consumption and climb performance from take-off to Mach changeover. We will incorporate supporting data to show the critical importance a smooth control touch during landing based on the nature of low aspect ratio lifting surfaces. The expressed intent of these articles is to develop a deeper understanding of aircraft's performance should you encounter an operational need to fly outside a published profile. Next month's issue will include a discussion of long-range techniques including altitude selection and jet stream behavior.

Looking Good!

A little holiday frost…..

Climb and Descent Profiles

By Erik Lund, Contributing Author

A question asked the other day was, what is the most efficient climb profile for the Lear 35/36?

To answer this question, it first must be made clear that no one climb profile can always produce the best climb performance due to changing conditions (weight at takeoff, terrain, temperature, winds aloft, specific aircraft performance, and ATC request, are just a few of the variables). Careful planning and alerting ATC to your needs may be required to get what is necessary to make a flight possible. Under certain conditions, it may be necessary to refuse an ATC request.

The Standard Lear jet Climb Profile (SCP) at Kalitta Charters is based on manufacturer provided test flight data. The charts and descriptions can be found in the Manual in each aircraft. To execute the maneuver, apply maximum climb power or a maximum of 795 degrees ITT (whichever is less in Fan Speed) and climb at 250 KIAS until the Mach transition. After transition, the T1 profile calls for maintaining .70 Mach to cruise altitude. The theory is to reach the first cruise altitude in as short of time possible then use a low cruise speed (no greater than .76 Mach) to achieve the lowest fuel burn. While the speed is being held at 250 KIAS, the power is also being maintained at 795 degrees ITT or charted climb Fan Speed requiring a reduction in throttle position during the climb.

Modified Climb Profile: For the purposes of discussion, a Modified Climb Profile (MCP) is defined as maintaining 280 KIAS after passing through 10,000 MSL until reaching Mach transition. The power setting for the MCP is 90% to 92% Fan Speed set after leaving final segment climb. This technique more closely matches other aircraft in congested airspace and allows more convenient sequencing with ATC. The MCP also offers a greater distance-to-climb ratio.

These climb profiles offer different advantages and disadvantages. While the SCP is a procedure and the MCP is a technique, pilots should evaluate their trip goals and consider the best options for mission completion.

Climb Rate/Climb Distance: A SCP and MCP offer almost similar climb rates. The combination of the higher angle of attack (more drag) cancels out the higher power sitting in the SCP. Because the speed is lower, the distance covered during the climb is shorter than is covered during the MCP. This means that you are

burning more fuel during the climb portion of the leg. In the case of winter operations (lower jet stream), any advantage to get above FL 300 to achieve reduced fuel burn rates is the desired outcome. In tail wind conditions, the ratio of time-to-climb versus distance-to-climb are more forgiving. The technique chosen during the trip becomes critical to long range, over water and time critical operations.

Recorded Flight Data:

I have found that using a higher speed of 280 knots out of 10,000 MSL to .70 transition is, for the most part, a better option. This reduces the induced drag and allows the airplane to climb at the same rate of climb at a lower power setting, while covering more distance at a lower fuel burn rate.

I have timed both climb profiles, and there are some differences. In both examples, the timing is started at takeoff, with a notation of time as the climb clears 10,000 MSL. The speed of 250 KIAS is maintained until Mach transition. Then .70 Mach is held until FL350. The time-to-climb from 10,000 MSL to .70 Mach transition (which happened at FL310) was 17 minutes. Total time from takeoff to FL350 was 27 minutes. This resulted in an average vertical rate of 1296 ft/min.

On the second climb (using the MCP), the airport elevation and the temperature during both takeoff and climb phase was the same. The weight was nearly the same, as we used full fuel in both climbs. On this climb, I held 280 KIAS leaving 10,000 feet. The resultant time-to-climb from takeoff to FL350 was 36 minutes. The difference in the time from 10,000 to FL 350 was 9 minutes. The average vertical climb rate at 280 KIAS to Mach transition was 972 ft/min.

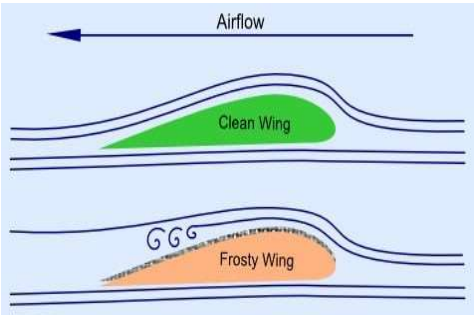
The time-to-climb from take-off to 10,000 MSL and Mach change-over to .70 (FL310) were the same for both profiles. Differences in the techniques included average true airspeed during the climb from 10,000 to FL350 and power management. By setting the power to 90% at 10,000 MSL, minimal changes are required during the climb to FL 350 to maintain 795 degrees ITT or less.

Fuel Burn: Fuel burn data specific to the climb phase of flight not recorded.

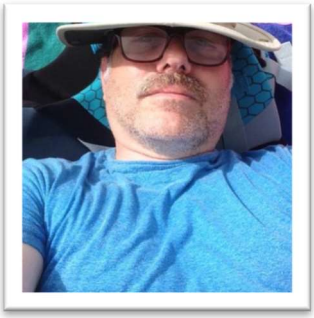
Distance-to-climb: Data not recorded due to ATC restrictions.

Conclusion: Climb profiles are designed to produce predictable flight data (fuel burn, rate of climb, speed etc.) and incorporate into flight planning for each leg. The most critical use of this data is applied to extended over-water operations and long-range planning. What technique will best accomplish your mission?

Recommendation: During flight legs with large safety margins, experiment with rate-of-climb, airspeed and fuel burn. The specific intent of this article is to inspire a deeper understanding of your assigned aircraft.



Oooo! Freezing rain…….



"Check Ride"

"Hello, I'm Kevin Murphy and I will be administering your check ride today."

A continuing series by Kevin Murphy, *Contributing Author*

"Stall Series" by Mark Handren

Flight Maneuvers: Stall Series

The Stall Series during your semi-annual or annual evaluation can be one of the most stressful maneuvers for a check ride candidate. This article will help to alleviate some of those concerns.

There are three stalls required by the FSIMS 8900.1 during an IFR Competency or IFR Proficiency evaluation: clean configuration, take-off configuration and landing configuration. One stall must be conducted with a bank of 15 to 30 degrees and one maneuver with the autopilot engaged[3]. The pilot requirement is to "recognize and recover from an impending stall." At Kalitta Charters, we train for minimal-to-no altitude loss during our initial and recurrent training sessions.

First big question: How do I configure the aircraft and what power setting are required? Check out the profile and training documents for your assigned aircraft for specific details. In regard to the Lear 35/36 and Falcon fleets, configuration speeds are the same as any normal approach to landing. Power settings are generally 50% in a clean configuration, 60% in an approach configuration and 65% in a landing configuration in a turbofan equipped aircraft. In CF700 equipped aircraft, add 10% to the power settings.

Recovery process:

1) Power to maximum and reduce by one inch of throttle position.
2) Reduction in angle of attack
3) Clean up the aircraft configuration
    a. Clean configuration-Not required
    b. Approach configuration- No change until Vref. Positive rate-gear up. Vref +10 flaps 8 or 15. Vref+30 flaps up.
    c. Landing configuration- Autopilot OFF. No change until Vref. At Vref-flaps 20 or 25. Positive rate-gear up. Vref +10 flaps 8 or 15. Vref+30 flaps up.
4) Reduce the power to maintain no more than 200 KIAS in preparation for the next maneuver.

Remember this: In a full stall use your rudders to maintain heading until you accelerate to Vref.

The first and probably most important idea to reducing "stress about stalls" is to understand Vref. Velocity Reference Speed (Vref) is 1.3xstall speed based on configuration. That means at Vref you have 30% of your KIAS available before the wings stall. When the aircraft gets below Vref during approach and landing configuration maneuvers; simply breathe, look for the signs of a stall and recover. The instructor will have planned plenty of air below you if something goes amiss and is prepared for any unlikely events. Your check pilot also has the option to conduct less than three stalls if the candidate shows proficiency.

Recently, we have begun using the clean configuration stall to discuss high altitude options. Power margin is generally not available for stall recovery above FL 350. The application of maximum power at high altitude can cause compressor stall and possibly flame out an engine. The only method of recovery then becomes a reduction of angle of attack to increase airspeed and momentum. This means our pilots have to be aware of their surroundings and act (not react). We have to be able to accept significant altitude loss at higher flight levels and be patient during the recovery. Gently apply back pressure on the yoke and continue to fly to prevent the induction of a secondary stall. Yes friends, there will be paperwork. In the big scheme of things, paperwork is a better option than an obituary. An accident report is attached here and available in the "references" section to demonstrate the hazards of overcontrolling the aircraft at high altitudes.

Aviation Safety Network: https://aviation-safety.net/database/record.php?id=20180311-0

Aviation Safety: Part 2

By A. Marie Zeeb, Contributing Author

Recap from Part 1: Aviation Safety is a team sport. We are all a part of an effective safety culture. Stay up to date with the procedures and systems knowledge in your assigned aircraft. It is critical to have clear and effective communication on the flight deck: monitor each other, announce corrections and avoid complacency. Standardized checklist use is a crucial part of effective CRM.

An effective Safety Management System is a critical pillar in a safety culture. I know most of us do not enjoy filling out Event Logs. It is time consuming and can be confusing. But having that system in place saves us a lot of grief down the road. By letting the company know what happened and talking about how it could have been avoided or how it should be corrected in the future, we could be preventing other crews from having the same issue.

The last pillar of safety is accountability. If you see someone do something unsafe, it is up to us to talk to them. Do not allow someone to continue in an unsafe manner. As an FO, it is scary to say something to a Captain if you think they are unsafe. Just asking them the question though could relieve that fear. Maybe they had a reason for doing what they did. As a young FO, you are still learning and asking the question could be a great training opportunity. Follow the training we were given and ask questions if you are unsure.

Safety is not the job of one person, but a responsibility we all share. It is a constantly changing landscape and we each have to fulfill our roles. Stay safe out there.

From the Publisher's Desk

1) Powerful concepts for a better life:
    a. Situational Awareness
    b. Effective self-evaluation
    c. Strong work ethic

2) Any thoughts or articles for next month's edition are due by 15 Dec 2021. Send to mhandren@kalittacharters.com .

LET'S DO WHAT WE DO BEST.....WE FLY!!!!

References and Citations:

1) Aerodynamics for Naval Aviators, U.S. Navy Naval Air systems Command and H.H. Hurt Jr., Feb 2015
2) Take-off, Climb, Enroute and Landing Performance Charts: See your assigned aircraft.
3) FSIMS 8900.1 Volume 5, Chapter 3, Section 2, Paragraph 5-831 D.
4) Aviation Safety Network, 11 Mar 2018, https://aviation-safety.net/database/record.php?id=20180311-0

Switching to missiles!!