DA40NG Orientation Briefing

The AFM supersedes all information provided in this briefing. This is a summary of the key differences pilots who are transitioning to a Jet-A powered Diesel engine DA40NG should know about.

- Fuels and fueling
- Check both oil levels
- Engine start
- Runup
- Engine shutdown
- Single power lever operations
- High altitude considerations
- Maximum performance (e.g. takeoff)
- Fuel management
- Other comments

<u>Fuels & fueling</u>

Always supervise fueling operations in person and keep the fuel caps locked when the plane is unattended. Allowable fuels are Jet-A (negative PRIST preferred), Jet-A+ (with premix PRIST), and Jet-A1. Details are in the AFM. The grounding tabs are under the cockpit footsteps on either side of the airplane. Take care that the line service person doesn't use the round OAT sensor on the co-pilot side of the airplane or the engine exhaust. Full fuel is just above the bottom of the tabs to which the wire rope that is connected to the fuel cap is attached. It is best to have line service point the nozzle toward the fuselage and fill slowly. The caps go on with the tabs toward the front of the plane, which is "backwards" compared to Lycoming DA40s.

The sump kit is double wrapped in Ziploc bags (behind the pilot seat) to avoid getting Jet-A smell into the cockpit (where it will persist for a very long time). Vinyl gloves are provided. The wing sumps use the black "poke" extension; the gascolator sump uses a "Piper-style" pull mechanism. It's best to do both wings first and then return the black extension to the inner Ziploc bag. In practice, we tend to sump "on condition", i.e. when we have reason to be concerned about fuel contamination because of the plane being outside in the rain or the quality of the Jet-A storage, truck, or delivery system is suspect. Remember to seal both bags and orient the fuel sampler with the opening point up before returning it to the seat pocket.

<u>Check Both Oil Levels</u>

There are two oil levels to check, both are done through the access port on the pilot side of the airplane. The gearbox oil level is checked through the clear sight-gauge (it looks like a hex nut with a glass middle located ahead of the engine oil sump on the side of the gearbox). If you can

see a yellowish tint or a line in the sight gauge, it's good. The engine oil is checked with the gauge attached to the oil cap. Halfway between MAX and MIN is ideal, and I add a half-liter of the special Diesel engine oil when it gets down to about 1/4 remaining before minimum. Spare oil and a funnel are located in the storage cubby behind the rear seats. The Austro engine burns relatively little oil compared to the Lycoming version.

Engine Start

Follow the checklist. After turning on the Engine Master key switch, wait until the G1000 is fully powered up. Make sure the power lever is all the way back to minimum/idle. After turning on the guarded Engine Master switch, be sure to wait until the GLOW annunciator goes out before turning the key switch to START. The engine starts surprisingly easy. Be sure to re-guard the Engine Master switch.

The Avionics master can be turned on after the correct idle RPM (710-730) is confirmed. The Aux Power can then be turned on if you're planning to use the air conditioner. The RPM indicator shows the propeller RPM, not the engine RPM.

Until the engine temperature gauges (oil temperature, gearbox temperature, coolant temperature) are in the green ranges, limit engine power to less than 40% (e.g. during taxi). It is normal for oil pressure to hover in the yellow range at low power settings.

Run Up

Follow the checklist. It's very important to wait until the engine temperature gauges are all in the green before performing the runup. After checking the VOTER switch operation, the runup is automated. If you're using the air conditioner, open the pilot vent window to normalize the cockpit pressure to ambient. Make sure the power lever is set to minimum/idle and hold the ECU TEST button in through the entire two cycles of runup. It is normal for the ECU error annunciations to show during the test and go out at the end.

In practice, I perform the available power test as part of the takeoff roll, i.e. confirming the engine is producing the expected power level (typically 100% unless very high density altitude) as the airplane accelerates.

Engine Shutdown

The turbocharger needs to cool down prior to shutting down the engine. The minimum is to run the engine at less than 10% for one minute; in practice, I do this for two minutes. If you start a timer when pulling off the runway and taxi at 10% or less, you'll likely get to your shutdown position after the required cool-down time.

Follow the checklist. Make sure the power lever is at minimum/idle. Make sure to turn off the Avionics Master and Aux Power (air conditioner) before turning off the guarded Engine Master

switch. Wait until the G1000 engine indications show all red Xes before turning off the Electric Master key switch. This give the G1000 the time it needs to store the flight data.

Single Power Lever Operation

The FADEC power lever provides the setpoint for engine power output and propeller RPM. The propeller RPM setpoint curve can be found on page 7-25 of the AFM. The propeller RPM is controlled by the power lever position setpoint, not by actual engine output.

In an actual engine out emergency, best practice is to set the power lever to about 20% power for minimum RPM / maximum propeller pitch. The windmilling propeller generate the gearbox oil pressure that activates the servo controlled by the electrically set governor.

A power setting of about 10% is a good emulation of an engine-out approach. At the power lever idle setting the propeller pitch generates much higher drag.

High Altitude Considerations

Engine minimum power begins to increase starting at a pressure altitude of 6400 MSL (800 mbar). At a PA of 8100 MSL, the minimum (idle) engine power is 10%; at 10,000 MSL the minimum is 20%. At the service ceiling of 16,400, the minimum power is 30%. The increasing 'minimum' power is necessary to maintain the compression ignition of the Diesel engine. It can be a surprise when attempting to do a "zero power" rapid descent from high altitudes because the engine is producing more power than expected with the power lever set to idle.

Engine maximum power begins to decrease at a PA of 11,000 MSL. It typically becomes necessary to reduce the power lever (RPM setpoint) to avoid a propeller overspeed situation when operating at 13,000 MSL and higher.

This information is available in the Austro Engine operating manual on pages 3-4 through 3-6.

Maximum Performance (e.g. takeoff)

The engine, gearbox, and propeller can be operated at 100% power and 2300 RPM for up to five minutes, during takeoff and in certain maneuvers. The maximum continuous power is 92% and setting this precisely can be touchy to avoid a propeller overspeed situation. In practice, 90% is good enough for cruise climb at 88 KIAS.

Fuel Management

The DA40NG fuel system is substantially different than the Lycoming-powered model. The fuel selector switch in the middle of the console is never moved, except during an emergency. It has a "witness wire" attached to it.

In normal operation, fuel flows to the engine solely from the left (main) tanks. A fuel transfer switch, located next to the pitot heat switch, is used to transfer fuel from the right (auxiliary) tank into the left tank. The transfer pump only works when there is less than 13 gallons remaining in the left tank. It turns off automatically once the left tank reaches 13 gallons as a precaution – but please turn off the switch when sufficient fuel has transferred so the in-flight movement of the fuel doesn't turn the pump on and off repeatedly.

Each wing tank has two gravity-fed connected fuel cells. The inner cell holds 14 usable gallons and is what the G1000 fuel gauges measure. The outer cell holds 5.5 usable gallons. The maximum fuel imbalance is 9 US gallons. If you start with full fuel in both wings, you will need to transfer fuel from the right tank to the left tank before the left tank gets below 11 gallons remaining. It takes two transfers before fuel gauge for the right tank shows less than 14 gallons. After that, it's easier to measure and manage the fuel imbalance.

Other Comments

The DA40NG flies like a heavier version of the Lycoming-powered DA40. The target speeds during approach and landing are weight dependent, and higher than the Lycoming model. Read the AFM to gauge the target speeds for your mission. Maneuvering speed is also weight dependent, ranging from 101 KIAS at 2381 lbs. to a max of 113 KIAS above 2601 lbs.

With full fuel and an empty airplane, the weight of N718NG is just under 2390 lbs. The official empty weight is 2124.44 lbs. The maximum TO weight is 2888 lbs. The maximum landing weight is 2822. If you take off at max TO weight with full fuel, you'll need to burn 10 gallons to get below maximum landing weight. (That's more than 1.25 hours of flying at 90% power).

This model of the DA40NG has high landing gear than earlier Lycoming versions. The landing sight picture is different. Notice the sight picture during the initial part of the takeoff run.

Pay attention to the allowable flap speeds: 110 KIAS TO (first notch) flaps; 98 KIAS for LDG (full) flaps.

A suggested set of power settings for various flight operations is located in the black "checklist book" in the pocket behind the pilot seat.

The MT propeller generates a lot of drag when the power lever is in the idle position. This is useful when you need to "keep up best speed" during an approach at a busy airport.

Windmilling restarts should be avoided except in emergencies. The DOHC timing chain will need to be replaced.