MU-2 Potpourri

by Rick Wheldon

Over the years, at my annual training events, I have picked up a fair number of "interesting" facts, procedures, and recommendations from many fine instructors at Flight Safety, SimCom and Howell. Once you get past the basic systems review, you can delve more deeply into the subtleties of operating the MU-2. This is where training becomes interesting. I thought for this article I would share some of these tidbits I've picked up over the years with you.

Starting

The MU-2 AFM instructs us to use series starts whenever the OAT is below 10ºC, primarily due to low oil temperature. We need the extra voltage of a series start to overcome the resistance to rpm acceleration of the high viscosity oil. Not stated is whether series is necessary with warm oil on a restart, even though the OAT is below 10ºC. My feeling is that the series start works just fine with the "warm oil"/cold day condition, so why not use it? Better yet, use a power cart.

The Beechcraft AFM for the TPE-331 powered King Air 100 model provides additional conditions where the use of series starts is recommended. Beechcraft suggests using series on high altitude starts (above 4000 ft. pressure altitude) or warm OAT starts (above 40ºC) as well as for the cold OAT starts. The logic is that series starts cause quicker engine acceleration and, when the air density is low, will promote cooler starts and reduce the possibility of a hung start. The language in the MU-2 AFM does not prohibit the use of series in this manner, so the selection of series is up to the operator. Note that series starts cause a larger "drain" on the batteries. If series is selected, and NiCad batteries are installed, pay extra attention to battery temperatures.

AC Power

The DC-DC converter is installed to provide sufficient voltage to the selected inverter during start, ensuring that the necessary engine instruments are adequately powered. It does this in part by load shedding various non-essential AC instruments during start. If the DC-DC converter should fail, an INVERTER FAIL annunciator would illuminate when the start button is depressed, because system voltage can drop to below 20V, which is insufficient to fully power the inverter. Of course, the pilot should also note the lack of fuel flow indication at 10% and oil pressure indication by 50%, even though the engine would be starting (as confirmed by EGT or ITT rise). Once the starter disengaged at 50 or 60% rpm (depending on your MU-2 model), AC systems including fuel flow and oil pressure would return to normal. I believe, though, that the pilot should have already aborted the start before 50% rpm due to lack of oil pressure and other engine indications.

AC power is used to power the flight instruments, including the pilot's attitude gyro. If inverter voltage drops slightly, the attitude gyro can slowly precess without a warning flag or annunciator. Nominal inverter output is 115V, but the INVERTER FAIL annunciator is set to illuminate at 70V, and the ATT flag will typically come into view somewhere just above that. The pilot's best defense to a slowly decreasing AC voltage is to scan the secondary instruments. When the attitude gyro and the secondary instruments don't agree, check the backup gyro on the copilot's side or, for many of you, check the standby gyro you installed as an after-market installation. Once precession is observed, select the other inverter.

Engine Shutdowns

One of the best memory aids I've learned over the years is the GABBSI acronym, which is used to "cleanup" the engine systems after a shutdown. I believe that this should be committed to memory by all MU-2 pilots and utilized when time permits after an engine failure. (Obviously, the AFM/checklist memory items must be completed first. The memory steps require placing the malfunctioning engine's Condition Lever to Emergency Shutoff and the corresponding Power Lever to Takeoff.) Here are the GABBSI "cleanup" actions:

- G – Generator off
- A – Amperage on remaining generator within limits
- B – Bus tie checked (for airplanes with split bus system.)
- B - Bleed air for the failed engine off
- S – Synchronizer or synchrophaser off
- I – Ignition off

Note that the GABBSI acronym can also be used for a generator failure, with the first 3 items only being applicable.

Engine Oil

Oil level is properly checked after shutdown within one hour, when oil is distributed throughout the engine as it is during normal operation, at a temperature near normal operating temperature. If the oil is low on the dipstick during preflight, the engine can be motored or scavenged by hand to remove oil from the gearbox and send it into the oil tank. Note that residual oil will normally drain into and accumulate in the gearbox slowly after shutdown. Because the scavenge pumps have a higher capacity than the oil delivery pumps, cranking or scavenging by hand will result in net oil being drawn from the gearbox and into the oil tank. Excessive cranking or scavenging by hand will not normally be necessary, though.

Be careful when checking oil after the propeller has been feathered (for example, after an inspection.) When a propeller is returned to the start locks, it will usually be done with the unfeathering pump. This will draw oil from the oil tank, and the oil tank will subsequently appear under filled. If the oil tank is now serviced, there will be too much oil in the system. The next time the oil cap is removed (i.e., the next preflight), the pilot will get a lap full of oil. I'm speaking from experience here!

Ground Operations

The ground turning radius is different for left and right turns depending on your model. Aircraft with 4 bladed propellers will turn tighter to the left, while aircraft with 3 bladed propellers turn tighter to the right. This is because of airborne Vmc considerations. MHI provided more rudder throw in a direction appropriate to counteract P-factor. This additional rudder throw to the left (4 bladed props) or right (3 bladed props) kept the speed below which directional control is lost roughly equal for left and right engine failures on all models, although Vmc is published only for the critical engine.

Emergency Descents

I had a good discussion last year on the various considerations for electing to use the high or low speed emergency descent profile. Although it takes more time to conduct a low speed configuration change and emergency descent, as compared to a high speed descent, the time difference is really quite small. Let's look at some of the factors that might be considered:

1. Aircraft condition – This is the most obvious factor in the decision. Is there a known condition where a high speed descent might not be preferable? Is the windshield cracked or have you lost a cabin window? Have you experienced some other structural failure or has the door blown open which would increase drag? Is there an unusual airframe vibration? If any of these conditions exist, you probably should elect to use a low speed descent, even if it is a clean, low speed descent.

2. Controllability – A jammed elevator or rudder might preclude a high speed descent. Jammed and partially extended flaps or gear would affect the ability to use a low speed descent profile. You might consider whether you can raise the gear or flaps once you attempt to level off. Is there doubt whether you could maintain level flight when reaching normal breathing altitude? A number of years ago, there was a prominent accident where a propeller hub failed, throwing the propeller out of balance. The engine consequently detached from its forward mounts, twisting inward and puncturing the hull. The pilot elected a semi- high speed descent, but once down to 10,000 feet, he advanced the power but found he could not maintain altitude due to the added drag of the partially detached and twisted engine. If he had considered the condition of his aircraft, he might have checked earlier whether altitude could be maintained with the remaining engine. This could have affected his choice of emergency destination and prolonged his single engine range and options.

3. Turbulence – A high speed descent in turbulence should probably be avoided. The structural force of a vertical gust on the aircraft at 250 KIAS is nearly twice what it would be at 150 KIAS.

4. Icing – If descending into icing, the choice of a low speed descent with gear and flaps extended should probably be rejected. A high speed descent, though, might result in ice buildup behind the top of the wing boot, thus affecting stall speed. Perhaps a descent in a clean configuration at an "intermediate" speed (above the published minimum speed in icing) would be a good compromise.

5. Distance to travel – A low speed descent takes fewer "air miles" to get down, so if the destination is close by, this could be a consideration. Conversely, if the anticipated destination is some distance away, a high speed descent might be preferable.

These are some of the fine points I have learned at recurrent training over the years. There have been many more, and I usually pick up a few new ones at each training session. That's what makes training fun for me. But that's a topic for a future article. **AAOG**