MU-2 Flight Manual Changes Prompted by SFAR 108

By Rick Wheldon

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On February, 6, 2008, the FAA published Special Federal Aviation Regulation No. 108 – Mitsubishi MU-2B Series Airplane Special Training, Experience, and Operating Requirements. While this rule was long in coming, it was widely anticipated and should not have been a surprise to anyone. In the process of rulemaking, a number of changes to the Airplane Flight Manual were enacted through the cooperation of Mitsubishi, the FAA, and the Japanese Civil Aeronautics Board (JCAB). For early model MU-2s certificated under the A2PC Type Certificate, the AFM changes were distributed in February, 2008. On the later A10SW model MU-2 aircraft (mostly N, P, Solitaire and Marquise models), the revisions to the AFM were approved by the FAA and distributed in April of 2009. In this article, I will discuss changes in the Operating Limitations and the Emergency Procedures sections of the manual which relate to engine malfunctions.

Prior to these AFM revisions, the Negative Torque Sensing (NTS) Start procedure was only required to be completed before to the first flight of the day and before intentional engine inflight shutdowns. It was not necessary to perform this procedure on the second and subsequent flights on any given day. The new requirement is that the NTS Start (and the Supplemental NTS check, for four bladed models) will be accomplished before all flights. The Operating Limitations section of your AFM (Chapter 2) was revised to add this requirement. Also, the old "Starting Engines" procedure (which did not have an NTS check component) was completely removed, replaced exclusively by the NTS Start procedure. Operationally, there should be little difference in the way most of us fly – the NTS Start procedure is nearly as easy to complete as the previous normal start procedure, takes no more time to get done, and adds an additional element of safety on every flight.

There have been substantial revisions to the engine failure procedures in the takeoff regime. First, the titles have been changed to clarify the applicability of these engine failure profiles. The old "Engine Failure After Liftoff – Gear Down or In Transit to Up" procedure has been replaced by "Engine Failure After Liftoff – Continued Climb Not Possible." Also, the old "Engine Failure in Takeoff Climb – Gear Fully Retracted" procedure has been replaced by "Engine Failure After Liftoff – Continued Climb." These name changes are made possible by the addition of the new POM climb performance charts at takeoff flap settings. With proper preflight planning, the pilot now has data prior to takeoff whether continued climb is possible with an engine failure, shortly after liftoff. (Note: these POM single engine climb charts are also available in the performance section of the new checklists, for pilot convenience.)

For the "Continued Climb Not Possible" procedure, if the airplane cannot climb due to weight, altitude and/or temperature considerations, there are no differences between the old and new pilot actions, and a straight ahead landing with the gear down and the flaps in the takeoff

position is still required. Emphasis should be on maintaining adequate airspeed, so as to avoid slowing towards single engine stall speed. Legally, you can takeoff without single engine climb capability, but doing so is a demonstration of poor judgment, and good, safety minded pilots would never have to execute this procedure.

With the "Gear Fully Retracted" procedure in earlier AFM revisions, the pilot was previously required to accelerate to 140 knots minimum, raise the flaps to 5˚ or UP, and then shut down the engine with the condition lever. The new procedure calls for first checking the landing gear up, then climbing at V_{XSE} for the flap configuration and shutting down the engine once the climb is established. The difference is that the takeoff flap configuration at V_{XSE} is maintained until the pilot determines that adequate ground separation is achieved, at which point the airplane can be leveled off and accelerated, and a clean climb continued. Acceleration from V_{50} to V_{XSE} is very manageable, with only 12 knots of acceleration required at flaps 20. This is a very similar profile to that used by jet aircraft under the more stringent FAR Part 25 Certification Requirements.

There are a couple of other changes to the "Continued Climb" profile which bear mentioning. The new procedure calls for landing light retraction as the first non-memory step. Although landing lights do not create a great deal of drag, they can have a small adverse effect on marginal climb rates. My personal habit pattern is that, when I raise my landing gear, I immediately retract the landing lights as well. Since the two switches are operated together, this ensures that a minimum drag configuration is achieved soon after liftoff.

Another change to the Engine Failure - Continued Climb procedure is the addition of a Warning saying, in effect, that if your engines are not producing rated power, the climb charts are not reliable. During preflight, check your power assurance charts in the AFM (or in the new checklists) and ensure that your engines produce rated power. Abort the takeoff and investigate if full rated power is not achieved.

The Engine Shutdown Procedure was revised to include a "BUS TIE" check as a cleanup item. This check applies only to aircraft with the split bus system, which include all FAA certified models and the JCAB certified long body models. The bus tie check after an engine shutdown ensures that the operating generator, not the battery, is powering all aircraft systems. It requires a careful look at each voltmeter. If the main bus tie circuit breaker is closed, the remaining generator will be powering both main busses and the voltages will be 27 to 29.5 on both sides. However, if the main bus tie circuit breaker is open, the voltmeter on the side of the inoperative engine will read battery voltage of 22 to 24 volts.

It is important to find out early if the bus tie breaker is open because the isolated battery will be powering high load items, including one of the heated windshields on most models, one radio bus, possibly an inverter, and, in some cases, the landing gear. Precautions should be observed to ensure that battery power remains available to extend the landing gear prior to

landing. Load shedding might include turning off the appropriate windshield heat and radio master switch, as well as selecting the inverter powered by the operating generator. Obviously, a self induced emergency gear extension would be most unwelcome in a single engine situation, and later gear retraction, if required, would not then be an option. If the left main bus becomes battery powered, the pilot's radios become an area of primary concern when instrument approaches are necessary.

A short but very significant change has been made to the Single Engine Landing procedure. Previously, the landing gear extension was performed "Beginning final approach descent or base leg: (approximately 1,000 feet agl)." Landing gear extension is now moved to the "When landing is assured" section of the procedure. This change is consistent with the training profiles that restrict the lowering of the landing gear on approaches where a level off might be anticipated prior to touchdown. These approaches include single engine circling and single engine non- precision approaches to an MDA. In both of these cases, a gear up, flaps 5˚, 140 knot configuration is maintained until the runway is in sight and a normal glidepath can be maintained to touchdown, at which point, with landing assured, the gear are extended, the flaps lowered to 20˚, and a slow deceleration to threshold speed is begun. Gear and flap extension can easily be accomplished as low as 400 feet above the ground. While shooting video of this maneuver for PROP 2008, I lost less than 100 feet during the transition from gear up, flaps 5 to gear down, flaps 20.

Note that the new AFM language still allows for the landing gear to be lowered at the final approach fix on a precision approach, abeam the runway in a normal traffic pattern, or on final on a straight in approach where a normal glidepath can be maintained.

A last engine related change to the AFM deals with the "Engine Fire" procedure. Previously, after pulling the fire handle, the pilot was directed to close the main fuel valve switch. That step was deleted from the revised manual since the main fuel valve had already been closed by the fire handle. By deleting the main fuel valve switch from the procedure, the manual effectively eliminates a redundant step. It also reduces the chances of inadvertently closing the operating engine main fuel valve.

The SFAR 108 process included a complete review of all MU-2 operating procedures as well as training issues. Some of the changes are addressed in this article. However, it would be worthwhile for MU-2 pilots to closely review all the AFM changes when they are received for a better understanding of how best to safely operate our aircraft. I can be reached at Turbine Aircraft Services, 972-248-3108, if anybody has any questions or comments. Also, I would be glad to pass any suggestions for AFM improvements on to Mitsubishi if you so desire. Fly safe!