
# New training for MU-2 reduces accident rate

by Matt Thurber

In 2008, the FAA issued new rules affecting pilots who fly the remaining fleet of more than 350 Mitsubishi MU-2 twin turboprops. Following a spate of MU-2 accidents and yet another review of some aspects of the MU-2's certification in 2005, the FAA enacted a special Federal Aviation Regulation (SFAR 108) that makes pilot training mandatory for new MU-2 pilots, those who used to fly MU-2s but hadn't recently (requalification) and for those who want to continue flying MU-2s (recurrent).

The MU-2 SFAR is the first such requirement the FAA has created for a turboprop-powered airplane and joins an SFAR that applies to Robinson R22s and R44s. The SFAR process is used rarely, but in the case of the MU-2 and the Robinson the rule has had an enormous beneficial effect on safety. Since the MU-2 SFAR was issued in 2008, and even well before it took effect early last year, there has been only one accident (a crash in Ohio on January 18 that killed four people) and one nonfatal MU-2 accident. In the 30 months before the 2005 safety evaluation, there were 14 accidents (10 fatal). There were three fatal accidents in 2006.

The MU-2 SFAR is unusual in that it is much stricter than a type-rating requirement, which applies to aircraft weighing more than 12,500 pounds or those powered by jet engines (without propellers). Although type ratings involve a checkride to test the applicant's abilities, there is no regulatory requirement for training for a type rating, and type-rated pilots are not required to obtain recurrent training. The fact that type- rated pilots do obtain initial and recurrent training has more to do with insurance requirements than FAA regulations. As the proposal for the SFAR noted, "The SFAR allows the FAA to mandate actions that are far more stringent and broader in scope than what would be achieved through a type rating alone."

Even though MU-2 manufacturer Mitsubishi Heavy Industries America, which has consistently supported the fleet even though production ended in 1986, repeatedly asked the FAA to change the rules and require a type rating for the MU-2, the SFAR does much more than a type rating. And the SFAR has been so beneficial for the MU-2 community, one can't help wonder whether the FAA is considering new regulations that would cover training for other turboprop airplanes.

Accident research firm Robert E. Breiling Associates conducted an analysis of turboprop accidents between 2001 and 2005 and found that the MU-2 had a lower fatal accident rate than the Merlin/Metro, DHC-6/7/8, Cessna 406, Piper PA-46-500TP Meridian and Piper Malibu turboprop conversion. Some turboprop aircraft with fatal accident rates lower than the MU-2 included the Piaggio Avanti, all Beechcraft King Airs, Twin Commander series, Pilatus PC-12, Socata TBM700, Cessna 208 Caravans and 425/441 Conquest I and II and Piper Cheyennes. The rate is accidents per 100,000 flight hours, but the hours-flown numbers used for any type of accident research are derived from surveys and estimates.

Asked if there are plans to consider an MU-2-style SFAR for other turboprops, FAA deputy associate administrator for aviation safety John Hickey said that continuing operational safety of all types "is a central part of our role." But the agency has no plans to seek a type rating or mandatory training requirement for other turboprop types. "I don't believe that the data suggests each airplane model needs its own pilot training program," he said. "Mostly because, especially if you look at general aviation, the characteristics of single-engine or twin-engine turboprops describe any kind of configuration you want; they fly quite similarly. And it turned out in this particular case, this airplane, as most pilots of the MU-2 will tell you, really doesn't handle like a prop. It has a quality and characteristic more akin to a jet, so it's unique in that sense."

### SFAR Requirements

Central to the MU-2 SFAR are specific requirements, such as mandatory initial, requalification and recurrent training; completion of special-emphasis items and all items listed in the training course final phase check; training done with an instructor who meets SFAR qualifications; training done in accordance with an FAA-approved MU-2 checklist; having logged at least 100 hours of PIC time in multi-engine airplanes; takeoff and landing currency maintained in an MU-2; flight review must be done in an MU-2; and single-pilot operation requires a functional autopilot or qualified copilot.

Training programs must provide a minimum of 20 hours of ground instruction and 12 hours of flight instruction for initial/ transition courses, 12 ground/eight flight for requalification and eight ground/four to six (depending on training device type) flight for recurrent training. Six hours of in-aircraft time are required during initial training.

Appendices in the SFAR go into great detail on the content of the training curriculum, but it is Appendix D that is a key part of the MU-2 training program. Appendix D covers MU-2 maneuver profiles, which essentially normalize all MU-2 maneuvers with the MU-2 flight manual to make sure pilots are all learning the same procedures.

This is important because before the SFAR, any private pilot with a multi-engine airplane rating could legally fly an MU-2 without any training whatsoever. This remains true for any sub-12,500-pound airplane, including complex twin- and single-engine turboprops, although outside the U.S., pilots are generally required to obtain a type rating in most aircraft types.

A problem with this lack of regulation was that there was a great variety in the way MU-2 pilots were being trained. The SFAR forces all MU-2 trainers to work from the same set of standards, especially the detailed maneuver profiles, and the result has been a much more consistent training experience that produces pilots taught to fly by the book instead of according to a crusty instructor's long-held belief about the best way to operate the airplane. ❑

## MU-2 training at SimCom

SimCom Training Centers is the official factory MU-2 training provider. In early December, I spent four days with SimCom instructor Tom Goonen to train in the MU-2 flight training device (FTD) and a long-body MU-2B-60 Marquise. The normal initial course is nine days.

Goonen is a former U.S. Navy major who flew P-3 Orions and logged 1,000

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***During the four-day training session, SimCom instructor Tom Goonen, below, walked the author, left, through a number of the 28 mandatory maneuver profiles covered during the nine-day initial training course.***

hours instructing in Navy T-34Cs. The P-3's Allison T56 engines are, like the MU-2's Garrett (now Honeywell) TPE331s, direct-drive constant-rpm engines, and there is little hesitation between throttle movement and power changes. As with the P-3, the MU-2's big propeller area can cause problems if an engine fails because the arc covered by the blades acts like a huge draggy flat plate stuck in the airstream. Thus the MU-2 and P-3 both have negative-torque systems (NTS), which automatically move the propeller blades toward (but not into) feather, reducing drag by about 70 percent and enabling the pilot to maintain control of the airplane while feathering the propeller. Goonen's familiarity with the P-3 and the T56 engine infuses his instruction of all aspects of MU-2 operation.

Part of the reason the initial training takes so long in the MU-2 is not only the requirement for in-airplane time but also the mandate that the student practice all 28 flight profiles. We didn't have time to cover all of the profiles, but we did practice some in the simulator and in the airplane.

Goonen spent some time going over fundamental facts about the MU-2, pointing out that the seemingly small wing area grows considerably when flaps are actuated, as much as 28 percent with just five degrees of flaps. Pilots who fly other aircraft types have to be careful not to try to transfer their knowledge to the MU-2. For example, during single-engine operations, it's important to retract the landing gear but not the flaps, because so much lift is added with flaps deployed. "That's why you need to know your airplane," Goonen emphasized. "Don't fly it like your Seneca or Baron."

The big difference between the MU-2 and other turboprops is that the Mitsubishi uses spoilers–not ailerons–for roll control. The MU-2 does have trim ailerons for lateral trim. The spoilers are effective in a wide range of speeds and they are located on the wing ahead of where airflow is disrupted during a stall, so plenty of roll control is available at low speeds.

With the spoilers so effective, pilots need to learn that roll rates at low speeds are almost as quick as high-speed roll rates. In a King Air, when the airplane slows, the ailerons are less effective and roll rates are lower. That is not the case in the MU-2, and one fatal accident involved a pilot causing an accelerated stall low to the ground.

Why did Mitsubishi engineers use spoilers instead of ailerons? Goonen explained that to achieve the goals of an airplane that could fly out of a 3,000-foot strip and cruise at 300 knots while burning 500 gph, designers needed a small wing with large flaps. Ailerons that are effective enough would not leave enough room for the full-span double-slotted Fowler flaps.

In actuation, the spoilers cause no adverse yaw. One wing's spoiler moves up into the airstream and generates drag, while the other moves deeper into the wing (not for any aerodynamic purpose–that is just the way the rigging works).

Goonen devotes a lot of time to explaining how the TPE331's NTS works and the importance of the NTS test during engine start. Failure of the NTS is a critical and no-go item because if an engine fails in any phase of flight without NTS, it's unlikely the pilot will be able to recover unless the bad engine's propeller is feathered instantly.

Oddly, the NTS failure isn't one of the 28 mandatory maneuver profiles. But Goonen makes the student see what happens during an engine failure with NTS not working, in the FTD, of course. I was lucky in that during my training in the airplane, I got to witness a failed NTS test during start. The procedure in this case is to allow the engine to warm up and circulate warm oil through the propeller, shut down, then run the NTS test and start again.

During the simulator session in SimCom's FTD, Goonen failed an engine shortly after takeoff and made sure the NTS didn't work. The purpose of this exercise is not only to teach the student how critical the NTS is but also to keep fighting to fly the airplane down to the ground instead of giving up. I was able to crash in a semblance of staying right-side up, which is better than what the airplane was trying to do, which was flip us upside down.

The MU-2's landing gear is simple and strong. One big electric motor drives the mains and nose gear with multiple shafts and (for the nose gear) a chain. Main gear doors are electrically driven while the nose gear doors are mechanically actuated. SimCom has a terrific way to show how all this works in the MU-2 classroom: an actual short-body MU-2 fuselage with clear plastic panels covering the landing gear system so the student can watch all the monkey motion in action.

### Flying Time

The simulator is an excellent training tool but–like most FTDs–sensitive on the ground and thus difficult to take off and land smoothly. SimCom's new visual display system is impressive, with the ability to display much improved clouds and weather as well as conflicting traffic and other more vivid details. When I got into the airplane, I found it much easier to fly than the FTD.

In 2.8 hours in the airplane, Goonen ran me through a generous helping of MU-2 training, including steep turns, slow flight, six landings (including normal, one-engine simulated inop, no-flaps, flaps 20 and flaps 40), a localizer back-course approach, single-engine VOR approach, single-engine operation with one engine feathered and air restart and emergency descent (which is extreme and requires a dramatic nose-down attitude).

The day of in-aircraft training with Goonen proved valuable as two days later I flew MU-2 N794MA from Kissimmee, Fla., to Addison, Texas, with MU-2 guru and designated pilot examiner Pat Cannon in the right seat. Cannon is vice president of Turbine Aircraft Services, the independent MU-2 support organization. The MU-2 was in Florida for about a month so SimCom's four MU-2 instructors could spend time in the airplane, something that the training provider does with most of the airplanes that its courses cover.

The flight to Dallas took exactly four hours, interrupted by a fuel stop in Alexandria, La., because of 80-knot headwinds. Even though my training session lasted only four days, I felt comfortable in the MU-2 and appreciative of its excellent performance. The airplane is not at all hard to fly, is easy to land smoothly (this is the long-body version; the short-body's nose tends to drop firmly after touchdown) and delivers exactly what is asked as long as it is flown according to Mitsubishi's and the FAA's dictates. *–M.T.*

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