MU-2B Myth-Perceptions

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High wing loading makes the MU-2B difficult to control due to low power loading:

This myth is based on the premise that with a wing loading of up to 65 psf (pounds per square foot) the MU-2B wing has a considerably greater wing loading than comparable turboprop airplanes. Typically wing loading values that are provided in flight manuals and reference documents are predicated on the flaps being in the retracted (faired) position. Thus, without further analysis, it could be misperceived that the wing loading value of approximately 65 psf for the MU-2B is applicable for all phases of flight. However, unlike other turboprop airplanes that use less sophisticated flap designs (plain, split, etc.), the MU-2B utilizes a full span, fowler style flap which increases the wing area approximately 12.3 percent when the wing flaps are in the landing or takeoff configuration.

An appropriate comparison to other turboprop airplanes would be to measure the wing loading with takeoff flaps selected (for the respective operation), since the primary concern is controllability during the takeoff phase of flight with an engine failure immediately after rotation. The MU-2B "wing loading" with the flaps in the "takeoff" position is comparable to that of the King Air 350. Additionally, the "power loading" is also comparable. Thus, it is reasonable to conclude that the wing loading of the MU-2B during takeoff is **as safe as** that of the King Air, and currently the controllability of the King Air due to wing loading is not under scrutiny.

Model	MU-2B-60/36A/36	MU-2B-40/26A/26	MU-2B-35/30	MU-2B-25/20	King Air 300*	King Air 350*
1.Wing Loading (lb/ft_) Flaps up	65	57	60.7	55.7	46.2	48.4
2.Wing Loading at Takeoff Flaps (lb/ft_)	57.6	51.6	53.2	48.9	46.2	48.4
3.Power Loading (lb/hp)	8.1	7.9	8.1	7.5	6.7	7.1
4.Ratio	7.0	6.6	6.6	6.6	6.9	6.8

* King Air flap system actually causes a very small increase in wing area, small enough that it is assumed for this comparison that wing area at takeoff flaps equals wing area with flaps up.

Flight Spoilers "destroy" the lift on the wing:

“Destroy” is not a word in the aerodynamic lexicon and unfortunately it is used most often to create an emotional response. Flight Spoilers, when deployed only reduce the lift-efficiency of the wing in which the spoiler is deployed. The deployment of the flight spoiler to intentionally induce a roll (typical of a turn) is similar to and results in the same effect as raising the trailing edge of an aileron. Flight spoilers are used as the primary flight control for roll in numerous air transport category airplanes, military airplanes and some general aviation airplanes.

Flight Spoilers cause loss of lift as compared to ailerons:

Obviously, flight spoiler deployment, similar to raised aileron, does reduce the lift efficiency of the wing and increase drag proportionally to amount of deployment. However, the drag increase from spoiler deployment is relatively negligible compared to the drag which results from incorrect rudder inputs (causing a skidding of the airplane) during an OEI (one engine inoperative) event. This was clearly captured on video during a demonstration flight (shown during the PROP seminars) that revealed that the proper and timely application of the rudder during the OEI event improves climb performance dramatically and causes a marked decrease in the flight spoiler deployment required to maintain attitude. In fact, nearly all of the climb improvement and drag reduction after an engine failure is realized with the appropriate rudder input. This is true of any non-centerline thrust, multi-engine airplane, whether it is equipped with ailerons or flight spoilers. In the MU-2B, **after the appropriate rudder input has been established** and the appropriate aileron trim (used on the MU-2B to reduce the aerodynamic loads on the flight spoilers that are felt by the pilot in the control yoke) has been applied to relieve the aerodynamic forces on the flight spoilers during the OEI, an additional, but small improvement in climb performance will be evident. This is due to the fact that the performance (drag) penalty is negated as compared to an aileron-equipped airplane because the flight spoiler is trimmed to a recessed or faired position.

Flight Spoilers are not as effective as ailerons at slow speeds, because larger control yoke movements are required for the MU-2B in turbulence during approaches:

This myth has been disproved in numerous flight tests that compared the roll authority of ailerons and flight spoilers. Roll rates at cruise speeds for the King Air 200 and the MU-2B-60 were found to be approximately equal when the flight control was exercised to their respective maximum control position. At approach airspeeds with full roll control authority exercised, the MU-2B continued to achieve greater roll rates than the King Air 200. The genesis of this myth likely stems from the fact that flight spoilers are most effective when they are at their maximum deflection. And though there is a nominal change in roll rate during the initial application of the flight spoiler, the rate progressively increases as the flight spoiler is deployed until it achieves its maximum rate at maximum deployment. Conversely, the roll rates in an airplane equipped with ailerons will be the greatest at the initiation of aileron deflection and progressively decrease with increased aileron deflection. Therefore, although the pilot may be required to manipulate the control yoke slightly more (than in an aileron-equipped airplane) to initiate a roll action in the MU-2B, the roll authority will progressively increase proportionally to the increase in control yoke displacement in the direction of the desired turn.

Flight Spoiler deflection causes a loss of altitude due to a lateral rotation about the opposite tip tank:

The origin of this myth is based on the perception that in the MU-2B, when the flight spoiler is deployed to induce a roll (typically a turn) the ascending wing (moving upward) does not increase lift in the turn but rather the descending (downward moving) wing loses lift and the rotation occurs around the outboard portion of the wing rather than the lateral axis of the airplane. An aileron equipped airplane, by contrast, increases lift on one wing while decreasing it on the other. Thus, it is mistakenly believed that the aileron equipped airplane rotates around the lateral axis that runs through the center-of gravity (CG) i.e., through the middle of the fuselage, and that the MU-2B, which is believed to have only a loss of lift on one wing, thus the airplane rotates around the opposite wingtip. This premise is fundamentally flawed and not supported by the basic aerodynamic principles (or the current laws of physics) that state that the lateral axis of the airplane transits from nose to tail through the middle of the fuselage, and always intersects the CG.

Flight Spoilers lose their effectiveness in a stall:

The assertion has been made that flight spoilers are less effective in controlling roll in an aerodynamic stall than ailerons. In fact, the reverse is true. In an aerodynamic stall, airflow separation progresses from the trailing edge to the leading edge of the wing, and typically progresses from the wing root to the tip. Since ailerons are placed at the trailing edge of the wing where the airflow separation occurs first, the ailerons are affected at the onset of the stall. Aircraft designers protect the effectiveness of the ailerons in this condition by building "twist" into the wing so the inboard portions of the wing will stall before the tips and the ailerons will remain effective. However, in a deep stall, the ailerons tend to lose all effectiveness and the risk of experiencing a control reversal is probable. By contrast, the MU-2B flight spoilers extend over most of the span of the wing and are located in close proximity to the leading edge. Therefore, when the airflow separation occurs at the trailing edge, the flight spoilers continue to operate in undisturbed airflow and remain effective to control roll.

An unsubstantiated myth asserts that the MU-2 has an "unknown corner" of the flight operation envelope that negates the pilot's ability to control the airplane during an OEI event:

This myth is without merit and not supported by fact. The JCAB and FAA have scrutinized the flight operation envelope of the MU-2B and have neither identified any circumstances nor imposed any type of operational limitations that would suggest an unsafe condition exists with the MU-2B. Further, the MU-2B has been operated for hundreds of thousand of flight hours by a variety of pilots (with varied skill levels) that have flown the airplane safely in an OEI event. Thus, it is evident and logical to conclude that if a pilot operating an MU-2B has, 1) developed the tactile skills necessary to fly the airplane, 2) reacts accordingly and timely to an abnormal or emergency event (i.e. OEI) and 3) operates the airplane in accordance with the manufacturers' recommended airspeeds, the airplane can be flown efficiently and safely.

The large difference between takeoff and blue line causes a difficult and large acceleration requirement with an engine failure after takeoff:

This myth results from a poor understanding of the MU-2B flap system and engine failure procedures. The MU-2B does have a wide range between takeoff speeds and Vyse (single-engine operating speed). This is also applicable to most turbojet airplanes with advanced flap systems. Thus, a pilot operating a turbojet airplane is taught to fly at V_2 (or above) and to maintain flap position during an OEI that occurs in the early phase of flight. Similarly, the MU-2B pilot is also taught to maintain takeoff flap position and accelerate to Vx and/or Vy for the takeoff flap setting (as stated in Chapter 3 of the AFM). At flaps 20^0, the airplane only needs to accelerate 12 knots (the difference between the airspeed at 50 feet (V_{50}) and Vx).

Every landing is a crash landing:

This myth was published recently in newspaper articles and attributed to "expert" pilots who have never flown the MU-2B. When flown within the CG envelope, the MU-2B has sufficient elevator authority to flare the airplane to the desired landing pitch attitude and cushion the touchdown. Most accomplished pilots develop the tactile skills quickly and are able to perform consistently good landings. Although this is true regardless of the model, there is however, a characteristic of the "short body" models related to pilot technique. The airframe geometry of the short-body airplane incorporates a relatively long moment arm between the center of lift and the main wheels which results in a tendency for the nose of the airplane to descend rapidly once the main landing gear has touched down. Though the nose gear is structurally capable of handling the higher contact loads, the skilled pilot develops tactile techniques to minimize this tendency and cushion the nosewheel touchdown.