PILOT REPORT: MIG-29

Benjamin Lambeth

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Flying with Mikoyan’s chief test pilot, a Westerner puts a Soviet fighter through its paces.

The USSR first demonstrated the MiG-29 to Western viewers in 1988 at the Farnborough Air Show. Since that time, the Mikoyan Design Bureau has become a major force in Western aerospace circles. MiG-29 flights were key attractions in 1989 at the Paris Air Show and the Abbotsford Air Show near Vancouver. For the latter, MiG-29s flew via Elmendorf AFB, Alaska, the first time since World War II that Soviet combat aircraft have landed on US soil. At these events, I built up close contacts with Valery Menitskii, Mikoyan’s chief test pilot. On one occasion, I noted that I would welcome a chance to be the “first American analyst” to fly a MiG-29. On August 16, 1989, when the MiGs landed at Elmendorf on the way home, I was part of USAF’s greeting party. There, Menitskii extended an invitation: On my next trip to Moscow, I could plan on flying. No reciprocal gesture from me was sought. The occasion for my flight was a previously planned research trip to Moscow with two RAND colleagues.

By Benjamin S. Lambeth

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piloted the MiG-29 on December 16, in weather as nonconducive to flying as any I have experienced. Menitskii had ferried Mikoyan's two-seat MiG-29UB company demonstrator from Soviet Flight Test Center at Ramenskoye to Kubinka AB, southwest of Moscow, where I boarded the aircraft after a short briefing.

The original plan was for me to fly the aircraft from the front cockpit. Because of severe weather, however, Menitskii decided at the last minute that he should sit up front. I had no quarrel with this. We manned up in blowing snow, with a low ceiling and very poor visibility. Indeed, our first attempt to get airborne was scrubbed in hopes that the weather would improve.

Within an hour, the ceiling had lifted to the point where Menitskii was ready to give it another try. We gathered our gear and returned to the aircraft, which Mikoyan personnel already had cleared of snow, and prepared for another attempt.

With ground power back on and the canopy down to the cracked position, Menitskii and I did a quick intercockpit communication system (ICS) check. We then got the report from the automatic terminal information service, had a terse exchange with the command post, and began the engine start sequence as Menitskii closed the canopy fully. Our call sign was Menitskii's pilot number—817.

The Tumansky R-33D engines in the MiG-29 can only be started from the forward cockpit. Menitskii selected an automatic start sequence. The right engine cranked first and stabilized in idle at around seventy percent rpm, at which time the left engine start sequence commenced automatically.

The fan turbine inlet temperature (FTIT) gauges showed no movement in the rear cockpit, even though we had a steady rpm rise and it was obvious that we had accomplished a good lightoff on both engines. When I informed Menitskii of this, he replied that the FTIT readout was selectable to the front or aft cockpit and that he was getting a good indication. Maj. Bob Wade, a Canadian Forces pilot who had flown the MiG-29 at Abbotsford, later told me that the FTIT peaked at 750 degrees Centigrade. 

The MiG-29 (called "Fulcrum" by NATO) is a twin-engine combat aircraft about the size of a US Navy F/A-18 Hornet. It is very similar in design to the Sukhoi Su-27. Although operated primarily as a counterair fighter, the MiG-29 has full dual-role combat/attack capability.
on each engine during start and then stabilized at around 450 degrees Centigrade at flight idle. As both engines attained idle rpm and the generators came on, the inlet foreign-object damage prevention doors cycled shut and the alternate louvers on each wing root leading-edge extension came open. The inlet doors remain closed until weight comes off the nosewheel during rotation. Then the louvers close and the hydraulically actuated inlet doors cycle open.

We got taxi clearance and rolled out of the chocks no more than four minutes after start sequence began. This told me that either Menitskii had entered a stored heading into the inertial navigation system (INS) before shutting down after his arrival at Kubinka or that the aircraft has a very fast-aligning inertial platform. In such marginal weather, it is unlikely that Menitskii would have accepted anything less than a full alignment for our flight.

Taxi and Takeoff

Once the canopy was closed, a periscope mounted atop the canopy center frame popped open, and a small rectangular mirror extended downward to permit visibility of the taxiway and runway over the nose from the aft cockpit. The image was focused on infinity, with the horizon on the mirror precisely aligned with the true horizon. This gave the effect of looking through the ejection seat headrest in the front cockpit. Use of the periscope is optional, and it must have been selected by Menitskii, since I did nothing to open it. The periscope closes automatically upon gear retraction and reopens when the gear is selected down.

It took a five to ten percent increment of thrust above idle to get the MiG moving. Menitskii taxied down the parallel taxiway to the departure end of Runway 04, then taxied the length of Runway 04 before making a 180-degree turn at the end for takeoff on Runway 22. Final external inspection of the aircraft must have been done by Mikoyan technicians before we left the parking area, since we did not hold for a last-chance quick check in the arming area as is standard US practice. The runway and taxiway were covered with packed snow and ice.

During taxi for takeoff, I tried to decipher the vertical fuel-quantity indicator. It read in liters and featured several pointers whose function was not clear. I abandoned the effort and later found myself periodically asking Menitskii about our fuel state. Invariably he would laconically answer, “Normalno.”

With Menitskii holding the brakes, power was advanced to 100 percent. The nosewheel oleo strut compressed noticeably from the added thrust, with the pitot tube seeming to spike itself into the runway. There was no tendency for the tires to rotate on the wheels at full military power.

Because of the poor weather and Menitskii’s desire to conserve fuel in case a divert became necessary, we made a nonafterburner takeoff. After a quick scan of the engine gauges, Menitskii released the brakes and said, “You’ve got it.”

I came on the controls at that point and performed the takeoff sequence. The MiG-29 comes with nosewheel steering, which I assume was selected to a low-gain mode. It took considerable rudder pedal movement to keep the nose centered in the first fifty to sixty kilometers per hour (kph) of takeoff roll. The aircraft accelerated rapidly in military power, and the rudders became effective almost immediately. As briefed, I came back with the stick at 200 kph indicated and rotated the aircraft to a five-degree nose-high attitude for takeoff. The aircraft flew itself off the ground at around 230 kph.

The stick required a noticeable tug to bring the nose up, although the feeling was not unnatural. At that moment, I ceased thinking “MiG-29” and told myself that I was flying a generic fighter, with certain airspeeds and other parameters to monitor. I decided that I would simply concentrate on flying the airplane and make mental notes about its handling characteristics whenever they caught my attention.

As the MiG accelerated in a gradual climb, I called for gear and flaps, which Menitskii selected up. Maximum allowable gear-down speed is 500 kph indicated. We were at or beyond that as we approached the end of the runway. Menitskii called

The author suits up for his flight. Contrary to Western practice, Soviet pilots wear their G-suits, made of a light, thin, nylon-like material, under their flight suits. The rest of the Soviet cold-weather flying ensemble includes heavy socks, flight overalls, boots, a summer-weight flight jacket, a winter jacket, helmet, mask, and gloves. The helmet, though substantially larger than USAF-issue, is surprisingly light and comfortable, with an internally mounted visor. The mask microphone is supplemented by a strap-on throat microphone.
for a right turn out of traffic, which I executed, noting as I looked back that we were pulling a slight smoke trail.

**Straight and Level**

I had barely rolled wings level on a northeasterly heading when we entered solid overcast at 200 meters above ground level (AGL). I heard Menitskii talking with what I assumed was a departure control agency. I could feel him overriding me on the controls to stay on his desired heading as I continued an instrument climb.

I began to feel the effects of the language barrier at this point, though my Russian was more than adequate and I had made a strong effort for weeks to master basic fighter operations terminology. We didn’t have the banter between cockpits that would have been normal under other circumstances. I had to be deliberate in what I asked, although Menitskii always understood me and, for the most part, I understood him. Anytime I felt clueless, which was often while we were in the weather, I would simply say “Valery pilot” and give him back the aircraft.

We broke out at around 1,500 meters AGL and found ourselves between heavy cloud decks, with no blue sky and practically no horizon reference. I noticed a lighter area off the left wing and suggested to Menitskii that we might work to the north in search of a partial clearing. The horizontal situation indicator (HSI) in the MiG-29 is similar to the standard USAF HSI with an analog DME (distance-measuring equipment) readout in kilometers in the upper left-hand box and a needle inside the compass card to indicate the heading to the selected station. It was reassuring to have this, since we were above a solid cloud cover throughout most of the flight. As it turned out, we never ventured more than thirty kilometers from Kubinka.

The rear cockpit featured a Western-style altimeter that indicated in feet. This had been installed in the demonstrator aircraft so the pilot could comply with air traffic control in transits through international airspace en route to and from the air shows. I found little problem orienting myself to unfamiliar airspeed indications in kilometers, but I found it comforting to have a “real” altimeter that read in feet. Particularly when one is close to the ground in an unusual attitude, such as a split-S recovery, it helps to know immediately just how much play room one has left without going through the mental gymnastics of converting meters to feet.

**The Flight Profile**

It quickly became obvious that we were not going to find better flight conditions. Menitskii indicated that we should press ahead and make the best of what we had. The maneuver sequence we flew consisted of these events:

- Three loops, one flown by Menitskii and two by me.
- A split-S performed by Menitskii and a second one by me.
- Four consecutive high-rate aileron rolls by me, followed by three maximum-rate aileron rolls and two seconds of inverted flight by Menitskii.
- An unloaded roll by me.
- Two hammerhead turns, with Menitskii first demonstrating and me then repeating.
- Finally, a hard level turn at 7.5 Gs by me.

Once Menitskii completed the first loop, I resumed control of the aircraft and got us established, wings level, at about 6,000 feet for the next one. With throttles at military power and airspeed accelerating through 500 kph, I began a four G pull and immediately began looking for a horizon reference. The effect was like flying inside a milk bottle. Without a distinct horizon and no ground reference except barely discernible cloud tops below, I looked back in the cockpit to cross-check the attitude indicator.

The attitude reference system was unlike anything I had ever seen, with a vertically rotating drum to indicate pitch attitude and a separate airplane symbol superimposed that rotated through 360 degrees of arc to indicate bank angle. Considerable rudder input was needed to hold the nose in a constant plane as I maneuvered the aircraft past the vertical. I could feel Menitskii continuously adding rudder corrections as the airspeed bled off.

With the attitude indicator giving me disorienting cues as the aircraft approached the halfway point, I looked back outside and rolled wings level to the nearest horizon, which was a ragged ceiling at around 12,000 feet. We came over the top inverted at around 200 kph and completed the loop sequence. I applied more back stick during recovery than Menitskii thought necessary, but the aircraft never exceeded 5 Gs, and I experienced no sensation of buffet at any point throughout the maneuver. Evidently the aircraft does not automatically trim to 1-G flight as does the F-15/16/18 class of fighters, since I recall having to trim during airspeed transients during the loop and at other times.

I could observe the maneuvering flaps sequencing on the flap-position indicator and assumed they were automatic. Since it was impossible for me to see any part of the wing from the aft cockpit, even with the seat raised to the full up position, I was unable to monitor the leading-edge flap. Nor could I tell whether the ailerons washed out at high angles of attack, since all I saw was the top half of the vertical stabilizers through large rear-view mirrors mounted on either side of the rear canopy bow.

Visibility from the aft cockpit was noticeably poorer than from any current US fighter. Visibility from the front seat (or out of the single-seat) is undoubtedly better, although it continues to be limited by high canopy rails and an obstruction in the 5:00–7:00 cone created by the aft canopy bulkhead.

**A Different Operational Philosophy**

This is not surprising, though, considering that the MiG-29 has been designed according to an operational philosophy very different from that behind Western fighter design—at least up to now. The Soviet concept of fighter employment remains heavily tied to off-board command and control, from either a GCI (ground controlled intercept) site or an airborne command post. Under this arrangement, the mission controller will continue to give steering commands to the pilot until the terminal stages of an intercept are attained and he is near a firing solution.

Apparently in keeping with this
employment doctrine, the MiG-29 cockpit is not configured to maximize pilot situation awareness. A typical engagement profile would more likely feature a high-speed slashing attack, followed by a buzz-through, rather than a pitchback, to engage the opponent in a turning fight. In addition to restricted visibility, the absence of handgrips around the cockpit indicates that the MiG-29 is not routinely operated with high-G wrenching and turning or close-in, high angle of attack maneuvering in mind, though it possesses outstanding performance characteristics in that regime.

Completing the loop and split-S sequence, I accelerated to 600 kph (maximum speed on the flight), pulled the nose twenty degrees above the horizon, and executed four consecutive high-rate aileron rolls to the left. I did not apply any rudder and noticed a slight tendency of the nose to hunt around the roll axis. My control input (less than full stick deflection) produced a roll rate of around 270 degrees per second.

Menitskii then took the aircraft and performed three consecutive maximum-rate rolls, cracking my helmet against the canopy and generating a roll rate close to 360 degrees per second. In both Menitskii’s and my consecutive roll sequences, I noticed no roll-coupling tendencies. Immediately thereafter, Menitskii trimmed to level flight and rolled inverted, sustaining this attitude for ten seconds as we hung in the straps.

A Flashy Finish
Next, Menitskii demonstrated his well-known hammerhead turn, which others had told me he could perform with a degree of virtuosity that “would do any crop duster proud.” I was not aware that a modern fighter with limited rudder authority at slow speed was capable of performing this maneuver, at least not without a large application of asymmetrical thrust to help drive the nose around the yaw axis. After Menitskii completed his demonstration, I took control of the MiG-29. With no instruction from him and having never tried this trick in a high-performance aircraft, I simply tried to emulate Menitskii by repeating my own last hammerhead maneuver—in a Beechcraft T-34 more than ten years ago.

At 500 kph indicated, I entered a 4-G pull and continued bringing the nose up until the aircraft reached an eighty-degree pitch attitude, at which point Menitskii said, “Stop.” I then held that nose position with the throttles set at military power and let the airspeed decay to around 250 kph, at which time I applied full left rudder and enough opposite aileron to keep the outside wing from picking up as it generated extra lift in the yaw.

I could feel Menitskii on the controls with me intermittently throughout the maneuver. The nose of the aircraft carved an effortless arc around the yaw axis during the float from right to left. I felt that I was in full control throughout this maneuver and could vary the yaw rate easily by playing the amount of rudder input. I could see enough horizon to complete the maneuver symmetrically using visual references. I allowed the nose to arc through as we headed back downhill, left the power where it had been set at the time of entry, and executed a 4-G pull to a wings-level recovery on a reciprocal heading.

I did not get to perform two briefed maneuvers, no doubt because of Menitskii’s reluctance to get into exaggerated flight regimes in such poor weather. The first was a full aft-stick, wings-level stall, with the angle of attack pegged at thirty units (the redlined maximum indicated) and the stick held back to override a stall warning system. The other was the tailslide that attracted world attention when done at Farnborough by Anatoly Kvochur.

Earlier, Menitskii had spoken proudly of the MiG-29’s stable handling characteristics in the tailslide and told me to expect completely controllable and predictable performance throughout. I said that this could hardly be considered a serious combat maneuver, since it would be foolish to sacrifice all of one’s energy in such a manner, even in a last-ditch situation. He concurred and said that its purpose was to demonstrate the exceptional aerodynamic efficiency of the aircraft.

Though I did not get to do the tailslide, Major Wade performed it twice at Abbotsford. As he recounted, he entered at about 3,000 feet AGL, brought the nose up to the pure vertical, retarded both throttles to idle, allowed the airspeed to bleed to zero, and then advanced throttles from idle to full afterburner in a single movement while still in a fully developed tailslide. He reported achieving a simultaneous afterburner lightoff in two seconds and was easily able to
bunt the nose forward out of the maneuver for a nose-low recovery, with full stabilizer authority and no tendency of the aircraft to roll off at any time.

Descent and Approach

After the hammerhead sequence, Menitskii resumed control, contacted ATC, and reentered the weather on an en route descent to Kubinka. We broke out at around 900 feet AGL, headed toward the runway at an angle of about forty-five degrees left to right. Menitskii brought us down to about 200 feet AGL and directly overflew the headquarters building, at which time I shook the stick, took the aircraft back, and asked if I could do a little low-level flying. Menitskii replied that low flying was prohibited in that area. He also was not eager to let me take the aircraft out to its normal operating limit of 9 Gs. I did, however, execute a hard level turn to the left just below the cloud deck, continuing through about 270 degrees of turn and peaking at 7.5 on the G meter. I sensed the G-suit starting to inflate at about 3 Gs but otherwise was rarely aware of its operation. With constant G maintained through most of the turn, the airspeed bled from 550 to about 400 kph. I sensed absolutely no buffet either then or at any other time.

At this point, Menitskii again took control of the aircraft with the airfield at our 4:00 position. He set up for an instrument landing system (ILS) approach on Runway 22 and allowed me to resume control as he extended the gear and flaps. I was instructed to maintain 300 kph on the approach. The pitch and bank steering command bars on the HSI worked about like ours. I called the runway in sight and flew a long straight-in approach while straining to orient myself outside the cockpit. I did not see a visual approach slope indicator, though there were bright white runway threshold lights and a row of red lights to assist with line-up. I could barely make out the runway over the nose, even with the periscope, so I continued to fly the ILS while visually cross-checking the airfield environment until I lost the runway under the nose altogether.

Throughout, we used the basic control augmentation mode (one of six flight-control system modes). Apparently Menitskii had selected a coupled CAS-ILS mode for the approach, because at one point I heard a female voice warning, “Glissad opasno” (“Glide dangerous”). On cross-checking the HSI, I noted that we were about one bar-width low, so I added power to reintercept the glideslope.

As we neared the airfield perimeter, Menitskii said “Valery pilot” and took the aircraft back at the last moment for a perfect spot landing on the cleared portion of the snow-covered runway. We touched down at 240 kph indicated. Menitskii made no effort to aerobrake and instead promptly lowered the nose for a firm touch on the runway. A few seconds into the rollout, he deployed the drag chute just as I had hit the ICS button to ask if we would be using it.

My flight was never intended as a formal performance evaluation. I am not a test pilot trained to detect the handling subtleties apparent to one with greater experience. The weather limited us to sampling a small portion of the MiG-29’s operating envelope, though Menitskii had intended to show me more.

My flight was far more significant for its political than for its aeronautical implications. Over fifteen years, I have entered twenty-seven fighter, attack, and jet-trainer aircraft types into my logbook and flown with every major component of USAF, Navy, and Marine tactical air arms, as well as with foreign air forces. None of these experiences matches my precedent-setting half-hour sortie in the winter sky over Moscow. Mikoyan’s chief designer confirms that I am the first American to fly the MiG-29 and the first Westerner to fly any type of fighter or attack aircraft in Soviet airspace since World War II.

This is yet more evidence that the USSR is changing in ways few would have expected, or even imagined, a year ago. If current trends continue, a day may come when Soviet test pilots (perhaps including Menitskii) will have a turn in a frontline US fighter and US pilots will do likewise in the Soviet Union. As the Soviet Union continues its reform effort, open dialogue between defense professionals such as Valery Menitskii and me could become increasingly commonplace. Despite all the issues that divide the two superpowers, it strikes me as a goal worth pursuing.

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