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YAKOVLEV 52

A MEAN RED ★★★ MACHINE

Red stars over America

BY ALTON K. MARSH

Red stars are flying over the nation's capital—three of them, in fact—painted on the tails of Yak 52 aerobatic trainer aircraft based in the Washington, D.C., area. One of them is based a few minutes by air from Andrews Air Force Base, where officers devote whole careers to maintaining air superiority over Russian aircraft with, well, red stars on their tails. ■ The Yakovlev 52 is the descendant of a line of radial-engine aerobatic trainers used to train pilots of the former Soviet Union for nearly 50 years. The line began in 1946 with the Yak 18, a conventional-gear look-alike but powered with a 300-horsepower engine, compared to the Yak 52's 360 hp. Next came the Yak 50, which, like the Yak 18, also has a World Aerobatic Championship to its credit. ■ Like those earlier aircraft, the Yak 52 (a trainer version of the Yak 50) is the product of prolific Russian designer Aleksandir Sergievich Yakovlev,

PHOTOGRAPHY BY MIKE FIZER

who counts helicopters and supersonic long-range jet fighters among his successes. Yakovlev allowed members of the Komsomol youth brigades and civilian flying clubs to design this tandem-seat version of the Yak 50 in 1978. Manufacturing was done at Bacau Aircraft Enterprise in Romania under a Soviet foreign aid program.

It is a big Russian bear of an airplane, a "get out of my way," heavy-gauge aluminum brute that is almost truck-like in sound, ride, and power. This airplane doesn't *get* hangar rash; it *gives* it. Raw power, a warbird ambiance, and crisp aerobatic performance are all hallmarks of the Yak 52.

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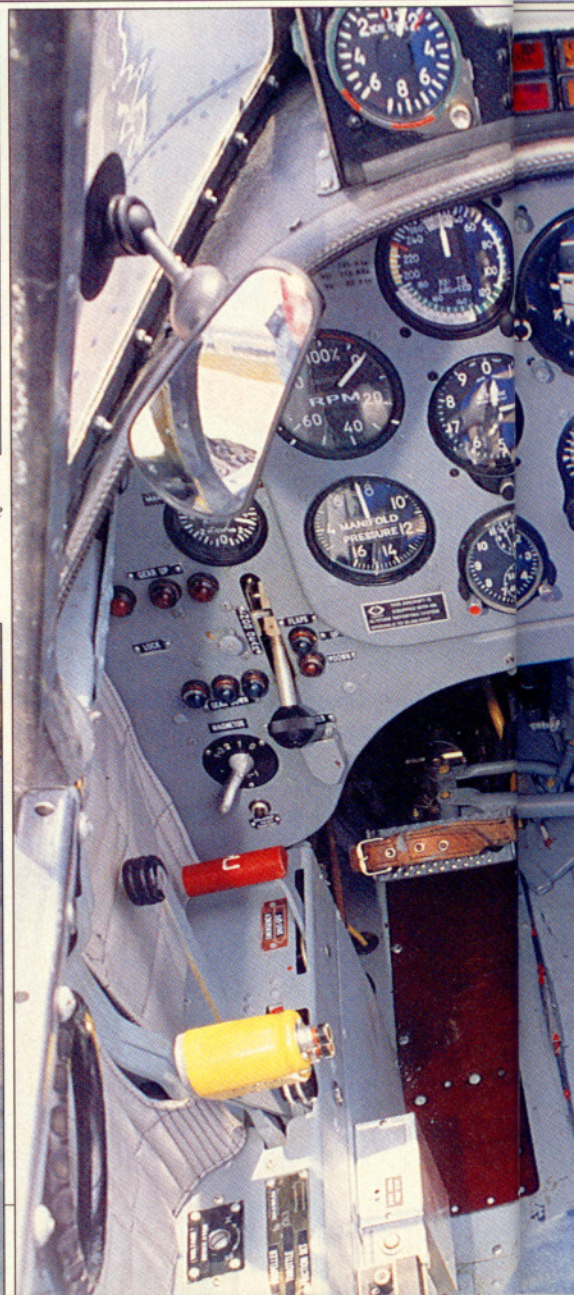
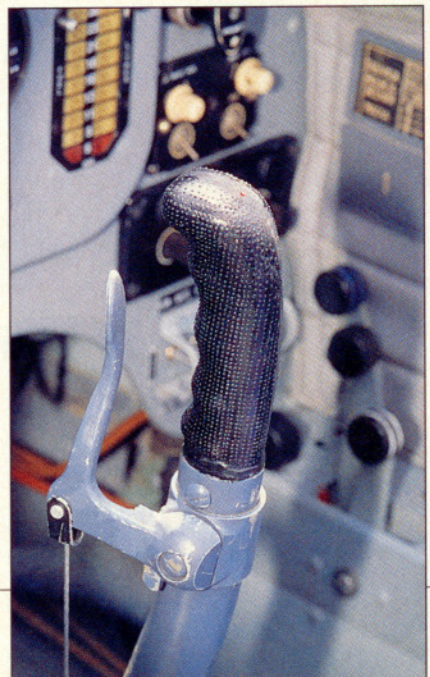
cadets—Soviet youth of the DOSAAF (All Union Voluntary Society for Assistance to the Army, Air Force, and Navy). It was also used by civil sport aviation clubs such as those in Lithuania, where the Yak 52s mentioned in this article were purchased. Many of the Yak 52's systems are similar to those in Russian military aircraft, such as the avionics, fuel system, and air brakes. The commonality provided a pool of trainees that could transition quickly to military aircraft in the event of a national emergency, as incongruous as stepping out of a radial-engine aircraft with fabric control surfaces into a jet might seem.

It rides on air in more ways than one, lowering its flaps and gear, operating the brakes, and even starting the engine with compressed air from tanks behind the rear seat. Reliance on air, rather than electrically powered starters and other systems, helps the Yak 52 survive Russian winters as tough as the Yak itself.

As with MiG brakes (see "Cold Warbirds," July *Pilot*), the Yak has a handle much like that used for bicycle brakes, mounted vertically on the control stick. Squeeze when the rudder is in a neutral position, and both wheels



Cockpit detail includes a finely made clock (above) and a brake handle mounted on the control stick (below). The mounting bracket for a GPS receiver (upper right corner) was added by the American owner.



receive equal braking. Need a left turn? Estimate the amount of braking needed, convert that to a measure of forward travel of the rudder pedal, and squeeze the hand trigger again. Put your left foot in, then your right foot, and pretty soon you're doing the Yak hokey-pokey down the taxiway.

Each time the trigger is squeezed, a satisfying burst of air surges from the tanks, like a tractor-trailer pulling into a truck stop. Obviously, an air tank pressurized to 50 atmospheres might one day leak, preventing the gear from being extended. But the Romanians thought of that and provided an auxiliary air tank just in case. After takeoff, it takes the engine-driven air pump 10 to 20 minutes to replace the pressure lost during gear retraction.

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The aircraft is either a student's nightmare or an instructor's dream, depending on whether you're in the front student cockpit or the rear instructor station. The rear control stick has a button on top that most pilots would mistake for a push-to-talk switch. However, Soviet instructors used it to fail the brakes as a training exercise (or to override a student's overeager efforts at braking). Other switches allow the instructor to fail the non-tumbling attitude indicator and other instruments for partial-panel training, thus making it a good all-around trainer. Student overconfidence can be cured by simply flipping all the switches, holding the brake failure button, and sitting back to watch the fun.

Two Yaks were flown in researching this article: The one photographed is owned by Rob Montague, based in Winchester, Virginia, and was once owned by the Kaunas Flying Club in Lithuania. The other is owned by Lewis M. Cathro and is based at Potomac (Maryland) Airfield, near Andrews AFB. Montague and Cathro bought their Yaks through Stephen J.

Beaver, of Winchester, Virginia, who has aided in the sale of 17 Yak 52s in America and offers these tips for buyers: Starting with the 1984 model, the Yak 52 was manufactured with a beefed-up main-spar carry-through. Older aircraft had a kit installed to strengthen the main-spar carry-through, but it spoils the aircraft's appearance. You should be able to find a used Yak 52 from 1987 on up with only 200 hours on it for about $55,000. That includes an overhauled engine, flight manuals, and a pilot check-out.

The aircraft was designed to be maintained by untrained hands. The Soviet approach to maintenance was to beat the life out of them for five years, then fix everything that is broken in one super inspection.

Most pilots find it is a big step up to a Yak 52, not only because mastery of the aircraft requires lots of practice, but also because used Yak 52s don't come with steps that were designed to latch onto the rear of the left wing. Getting into the aircraft provides a side benefit of ownership: an aerobic stretching exercise. The wing is nearly 3 feet off the ground.

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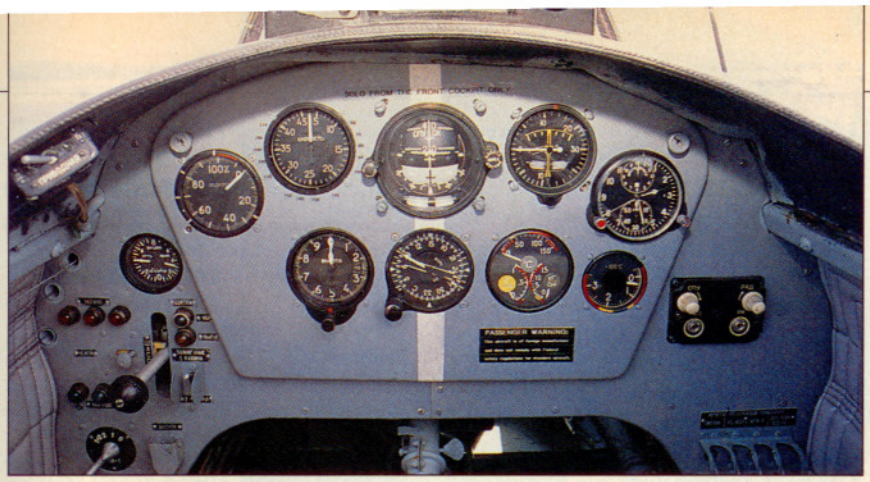
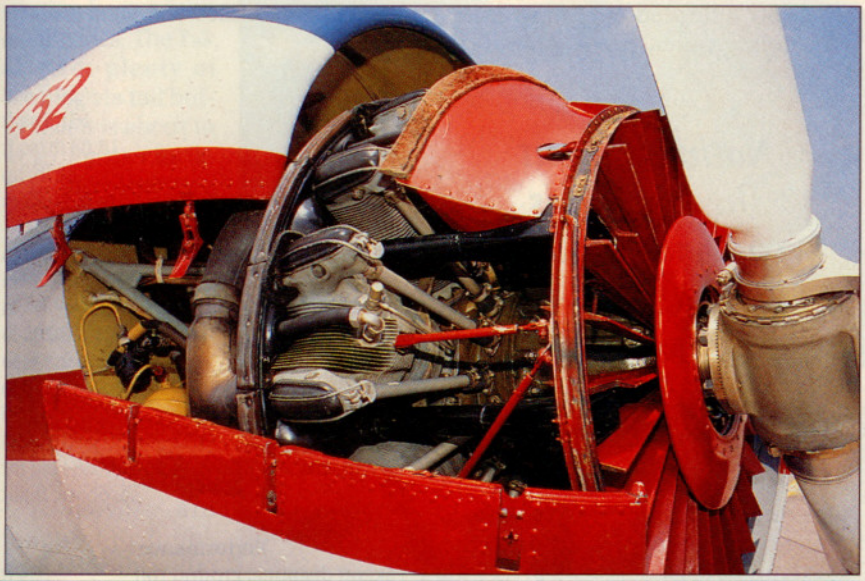
Cathro has left some of the original Russian Cyrillic writing on gauges and controls in the rear cockpit, although the Federal Aviation Administration required English-language labels in the front cockpit. To make the aircraft legal in the United States, Cathro had to add an encoding transponder, an altimeter graduated in feet, an airspeed indicator in knots, an emergency locator transmitter, and—for aerobatics—American parachutes.

Cockpit highlights include a detailed and finely made clock (which, like the engine, winds to the left), a military-style throttle, an annunciator panel in front and back cockpits resembling a Christmas tree when fully lit (Montague has labeled one of the lights "Panic Button"), and a chan-

The huge wooden propeller requires tall landing gear to provide ground clearance. There are attachments under the left wing root for a stepladder, although it is not included with used aircraft.



Manually operated vanes behind the propeller control cooling air to the nine-cylinder Vendeneyev M14P engine. The rear instructor's station contains switches for failing systems in flight.



nel-tuned automatic direction finder.

The primer is a two-position switch: One position—used in the event of engine failure—sends fuel to the cylinders, while the other sends fuel to the primer intake for engine start. If the fuel pump fails in flight, the pilot must select the primer's manifold position and continuously pump the primer to pressurize the manifold.

Flying the Yak 52 is an adventure, starting with preflight. Arrival at Potomac Airfield finds Cathro pouring oil into the engine from a 5-gallon can. A joke told in Lithuania suggests oil tankers arrive simultaneously with fuel trucks to service Russian aircraft, with both trucks pumping equal quantities. The Yak holds 4.25 gallons (16 liters) of oil and can operate with a minimum level of 1.12 gallons (8 liters).

Nothing about the aircraft is conventional by American standards, from its left-turning 360-hp supercharged engine (although it is not fuel injected, it uses a pressurized carburetor) to its automatic altitude compensation mixture control. The automatic mixture control is biased toward extremely cold temperatures and has been a nuisance in warmer U.S. climates. Because the engine is left-turning, left rudder, not right, is needed for climb-out. Takeoff with a right crosswind has proven difficult for some owners because torque and p-factor are already pulling the aircraft to the right. The nearly 8-foot-long wooden propeller has tips as big as canoe paddles.

Engine start is a complicated handdance that begins as pressurized air is released into the engine with a loud pop—timed to operate each of the cylinders in turn. The pilot must hold down a button with the left hand to release the air and trigger a shower of sparks into the cylinders. Once it is confirmed the prop is actually turning left, the pilot flips the magneto switch with the third finger of the left hand to a position marked "1+2," meaning "both." The right hand is standing by the primer in case additional fuel is needed in the cylinders. Once the engine starts, the left hand goes to the throttle quadrant to adjust rpm to 40 percent. (Expressing power in percentages prepares the pilot for jet transition later.)

Rapid takeoff acceleration leaves little doubt of the aircraft's power. Shortly after rotation at 75 to 80 knots, the vertical speed indicator settles on

1,300 feet per minute (some operators claim 2,000 to 3,000 fpm). The nose is pitched up 15 to 25 degrees to maintain 80 to 85 knots. Power is set at 80 percent rpm and 80 millimeters of mercury (the equivalent of about 30 inches of manifold pressure).

Cruise power is left at 80 percent rpm for most aerobatics, and manifold pressure is adjusted as needed. Cross-country flights are made at 70 percent rpm and 70 of mm manifold pressure. For best endurance, use 60 percent rpm and 60 to 65 of mm.

Engine cooling is controlled by manually operated Venetian-blind-like cooling vanes in the front of the engine cowling.

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The main landing gear retract forward and attach themselves to hooks near the leading edge, with wheels protruding several inches into the slipstream, à la Douglas DC–3. As with the DC–3, the Yak can land with its gear up and still roll to a safe stop with brakes fully operational. One did that in the old Soviet Union; the wooden prop was smashed, of course, but was replaced and the aircraft made operational in an hour or so, without anyone bothering to inspect the engine.

The first turn out of the Potomac pattern is a crisp roll to a 30-degree bank that stops smartly. Even slight aileron pressure is enough to take advantage of the Yak's impressive roll rate, which can reach 150 degrees per second with full control deflection. The airplane begs to be played with; by the end of the flight, I was making all turns—even small heading changes—by snapping into a 60-degree bank, then snapping the wings level again. Too bad the fun has to end so soon, with only a 90-minute fuel supply (more than two hours at lower cruise power settings). Another restriction is the FAA Experimental/exhibition category of certification, which limits all flights to within 100 nautical miles of home base (soon to be 300 nm if a proposed regulatory change is approved). The aircraft can, of course, be used for proficiency and flown farther than 100

Yakovlev 52
Base price: $50,000 to $120,000

Specifications

Powerplant	Vendeneyev M14P, air-cooled, 360-hp, nine cylinder
Recommended TBO	Not specified. Some owners suggest 900 to 1,500 hr (using American oil, some dealers promise 2,250 hr)
Propeller	Vendeneyev V530 D-35, constant-speed, two-blade wood, 96-in diameter
Length	25 ft 6 in
Height	9 ft 8 in
Wingspan	30 ft 8 in
Wing area	161.5 sq ft
Wing loading	18.08 lb/sq ft
Power loading	7.88 lb/hp
Seats	two, tandem
Cabin length (per cockpit, front and back are the same)	36 in
Cabin width	30 in
Cabin height	44 in
Empty weight	2,205 lb
Gross weight	2,838 lb
Useful load	578 lb
Max G loading	+7/-5
Fuel capacity, std	32.2 gal (30 gal usable)
Oil capacity	4.25 gal, 2.64 gal for aerobatic flight

Performance

Takeoff distance, ground roll	594 ft
Max demonstrated crosswind component	11 kt
Roll rate	240°/sec
Cruise speed/endurance w/45-min rsv @ 70% power (fuel consumption, 14 to 18 gph)	130 kt/1.5 hr
Service ceiling	13,000 ft
Landing distance, ground roll	975 ft
Inverted flight duration	two min

Limiting and Recommended Airspeeds

V_X (best angle of climb)	80 KIAS
V_Y (best rate of climb)	91 KIAS
V_{FE} (max flap extended)	93 KIAS
V_{LE} (max gear extended)	110 KIAS
V_{NE} (never exceed)	227 KIAS
V_R (rotation)	75 KIAS
V_{S1} (stall, clean)	60 KIAS upright, 76 KIAS inverted
V_{SO} (stall, in landing configuration)	55 KIAS

For more information, contact Marcus Bates in Odessa, Texas, at 915/563-2285, or International Jets in Gadsden, Alabama, at 205/442-8099. For information on used Yak 52s, call Stephen J. Beaver at 703/667-2130.

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.

nm to places of exhibition. In aerobatic flight, it burns 33 gallons per hour, but 70 percent brings fuel consumption back to 18 gph. The aircraft is stressed for plus 7/minus 5 Gs, tough for its time but no match for aircraft used by today's top competitors.

The flight demonstration begins with a stall series. The Yak 52 gives plenty of warning via tail buffet that it is about to let go. Further backpressure induces a full stall accompanied by the left wing dropping (common in many high-performance aircraft), offering a hint that the normally polite Yak 52 can lose its temper as quickly as a trained circus tiger.

Wingovers are followed by loops and aileron rolls. Loops are entered at 162 knots, 82-percent rpm, from level flight and aileron rolls can be entered at any speed above stall. There is energy to spare as we go over the top, without so much as a hint of a stall. Then it's time to return to Potomac Airfield for a low pass and a landing or two.

ALTON K. MARSH

Landing the Yak 52 can be tricky for pilots transitioning from low-slung American single-engine aircraft, because the Yak pilot's eyes are nearly 7 feet above the runway. On downwind, 70 percent rpm and 40 mm of manifold pressure will keep the aircraft flying level at 90 knots. Lower the gear abeam the point of intended touchdown, and push the prop control to maximum rpm to descend at 85 knots. Once the runway is made, lower the flaps (they have just one position—45 degrees) and slow to 80 knots.

The flaps produce a huge air-braking effect that requires the nose to be lowered toward the threshold. Look at the red and white barber-pole indicators—wires sticking up through the wing—to confirm that the gear is down. At the threshold, reduce the throttle to idle, and raise the nose as if landing a tail-dragger in a three-point attitude. The aircraft touches down at 50 knots.

Once Cathro demonstrated a greaser landing, it was back into the air for another Potomac River cruise.

Flying through an evening sunset along the Potomac River south of Washington, we pass over a military laboratory used to test aircraft electronic systems. Parked about the grounds of the research center are America's front-line fighters: F–14s, A–6s, and F–15s. And up here, the red star—a unique juxta position. □