

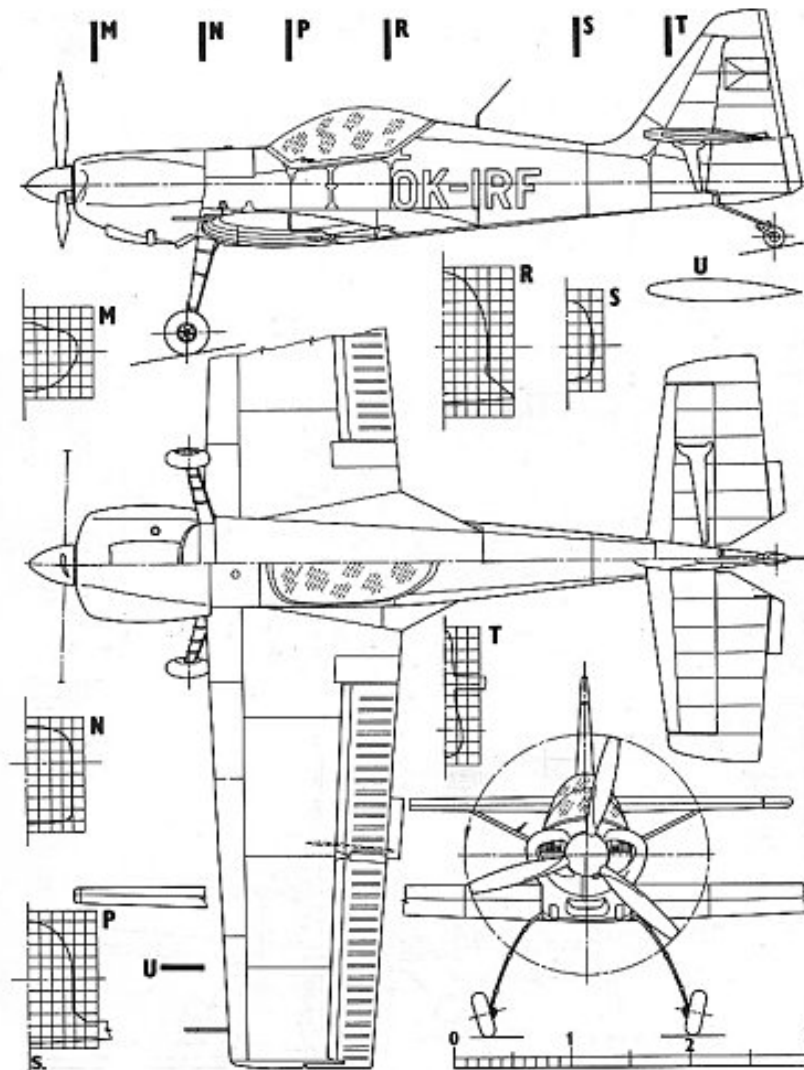
Special aircraft for classic aerobatics for REFLEX XTR²

Zlin Z-50 LS

True-to-reality behavior as a model but not 3D capable

The Zlin Z-50 was probably the first special aircraft for classic aerobatics produced in major quantities, namely by the Moravian works in the Czech Republic (<https://www.zlinaircraft.eu/>). *Gerd Gunzenhauser* created a model for the REFLEX XTR² flight simulator which is modeled after a real Z-50 LX. It's an aircraft of the Czech team [The Flying Bulls](#).

From <https://richard.ferriere.free.fr/3vues/3vues.html>:



In the mid 1970s, the Z-50 was designed from scratch for competition aerobatics, so not derived from another design. At this time, more and more flick (snap) and inverted maneuvers were flown in competition. That's what the design was optimized for, to be competitive to e.g. the Pitts biplanes.

The wing is quite slender (aspect ratio 5.9) to keep the induced drag low. It's slightly tapered (taper ratio 0.7) and has big ailerons for good roll rate. Symmetric wing airfoils allow for all inverted maneuvers. There were no special aerobatics airfoils yet, at least NACA 0018 (root) to NACA 0012 (tip) were used what gives a quite good-natured stall behavior. But effectively there is more wing taper (effective taper ratio 0.5). Stall now starts near to the wingtips and flick (snap) rolls are easy to do.

This design is classical since then. Without a stall-proof wing design, the flight behavior is not suitable for beginners. The seasoned pilot knows the limit to which the elevator may be pulled. In the real aircraft, he may be even warned by an aileron shake, produced by a sharp edge especially mounted to the wing leading edge. The model pilot has to restrict his stick movements to a certain limit. Snapping the elevator to the mechanical stop is done only for snap rolls in classic aerobatics, if at all. Even a spin is initiated smoothly (avoiding the so called flick entry).

The aircraft has big horizontal and vertical tail and big control areas. The horizontal tail area is 25% of the wing area. This and the wing design strongly remind of models. Maybe the Z-50 as a scale model is very well suited to fly true-to-reality. Just that's what I intended to check out in the simulator. In this package are several model versions for REFLEX differing from each other in size, weight, and drive. Of course, the basic design is the same in each version, just that of the original aircraft. That's why I wasn't tempted to set up any 3D version.

The REFLEX models

In any case the model supplied by *Gerd Gunzenhauser* is used, but different drive sounds. In the first place, there is a heavy version scaled 1:4 and equivalent to a real model by [Airfly](#). This model feels like a quite heavy sports model. With a different engine (glow instead of gas) weight was reduced a bit and flight speed was increased. This gave a noticeably better behavior. Reducing a real model's weight to 11 lb seemed possible, including reduced moments of inertia. This version proved to be better for the Z-50.

Scale	Wingspan		Weight			
1:2.0	169 in	4.29 m	133.0 lb	60.5 kg		
			74.0 lb	33.5 kg		
1:2.3	147 in	3.73 m	49.0 lb	22.0 kg		
1:3.0	113 in	2.86 m	35.3 lb	16.0 kg		
1:3.5	97 in	2.45 m	13.9 lb	6.3 kg		
			13.5 lb	6.1 kg	1	
			13.5 lb	6.1 kg	2	
			13.5 lb	6.1 kg	3	maybe best version
1:4	84 in	2.14 m	13.5 lb	6.1 kg	4	
			16.1 lb	7.3 kg		Airfly
			15.7 lb	7.1 kg		
1:5	68 in	1.72 m	11.0 lb	5.0 kg		
			4.8 lb	2.2 kg		electric

This was duplicated in a big (1:2) scale. The heavy and slow version flies big radii in patterns whereas the light and fast version is able to fly somewhat "angular". It should be even possible to build such a big model with the quite low weight.

Finally, Z-50 models in 1:2.3, 1:3.5, and 1:5 scales were rendered in REFLEX to compare with the corresponding Su-26M, EDGE 540, and Extra 300S models. Only the light variants were set up. The relative (cubic) wing loading of the Z-50 is slightly lower than that of the Su-26M and significantly lower than that of the EDGE 540 and Extra 300S, as it is in reality.

Differences in flight behavior show up in any scale. Geometry, weight, and power determine an aircraft's characteristics. Each of the four types is typical for its time but still has some peculiarities. Maybe flick rolls and spins are the strong point of the Z-50, whereas the Su-26M has outstanding roll ability and the EDGE 540 and the Extra 300S are able to fly especially fast and extreme patterns.

Thrust/weight ratio is a bit below 1 in all REFLEX versions of the Z-50. Rudder deflection is 25 degrees because there is a mechanical restriction. Elevator and aileron deflection are set to 25 and 20 degrees, respectively.

Some expo is set in REFLEX since it's needed to get a smooth flight, at least with my transmitter. Elevator deflection may be limited by dual-rate to avoid wing stall. This way the model may be flown quite slowly and a real model might be even used as a tug.

The four additional 1:3.5 versions are experimental. From theoretical considerations, the 13.5 lbs weight has been assumed as especially "scale" in the first place. Otherwise, version 1 differs from the 13.9 lbs version only in a few enhanced parameter settings. Version 2 has more aggressive control throws and is trimmed quite neutral, meaning it virtually doesn't need any elevator input both upright and inverted. In return, vertical patterns come out not exactly vertical and in knife-edge the airplane loses heading and rolls in or out.

That's much better in versions 3 and 4. Vertical maneuvers and knife-edge are nearly perfect, what is surprising for this configuration with low wing, high stabilizer, and a bit dihedral. Probably this is because (like in the manufacturer's drawing, see page 1) both wing and stab of the simulator model have positive incidence angles. Version 3 has nearly as rear a C/G as versions 1 and 2. In upright flight no elevator input is needed, inverted only a little bit. Version 4 has a far forward C/G, what is preferred by several pilots today. It flies nearly perfectly but always needs quite a bit of elevator both upright and inverted.

Please try yourself!

The REFLEX Model Files

The installer program creates the folder (directory)

...\\Flugzeug\\Zlin\\

and stores the par files and some other files there. Also the file „ZLIN Z50LS.MOD“ from the zip file published on RC-Sim has to be in this folder, renamed to „Z-50LS.mod“. If the original package by *Gerd Gunzenhauser* has been installed in the right place before, the installer copies the mod file automatically from there.

I prefer a model engine's sound for the REFLEX model, even if I don't have the „correct“ one. *Herbert and Janning Quint* recorded the sound of a ZG 38 and published it on RC-Sim. This quite sonorous sound is assigned to the biggest model versions (use permitted by *Janning Quint*). The sound of a Zenoah G20ei is assigned to the medium versions. The small versions have the O.S. 120 AX engine sound as a perfect fit. *Jorma Kinnunen* published an electric P-47 model for REFLEX on RC-Sim. The included sound of a Hacker A30-26 brushless motor is quite well suited to the electric version and is used here with his permission.

The drive sound files are

ZG38-1550.wav and ZG38-1550_.wav,
ZenoahG20ei.wav and ZenoahG20ei_.wav,
OS120AX.wav and OS120AX_.wav,
HackerA30.wav and HackerA30_.wav.

Now all should be available, including a demo flight, and this text should be accessible in the program menu „Programs\\REFLEX\\models“. Of course, the demo flight „Z-50LS“ (hit F9 in REFLEX) is intended to show the (great) abilities of the aircraft and not my (small) ones. Especially the flick (snap) and spin ability is remarkable.

Enjoy!

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<https://erdlenbruch.de/Burkhard/Modellflug/textReflex.html>

More REFLEX models and the latest versions are on my page

<https://erdlenbruch.de/Burkhard/Modellflug/textDownloads.shtml>

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