Two-Seated Aerobatic Glider for REFLEX XTR²

MDM-1 Fox

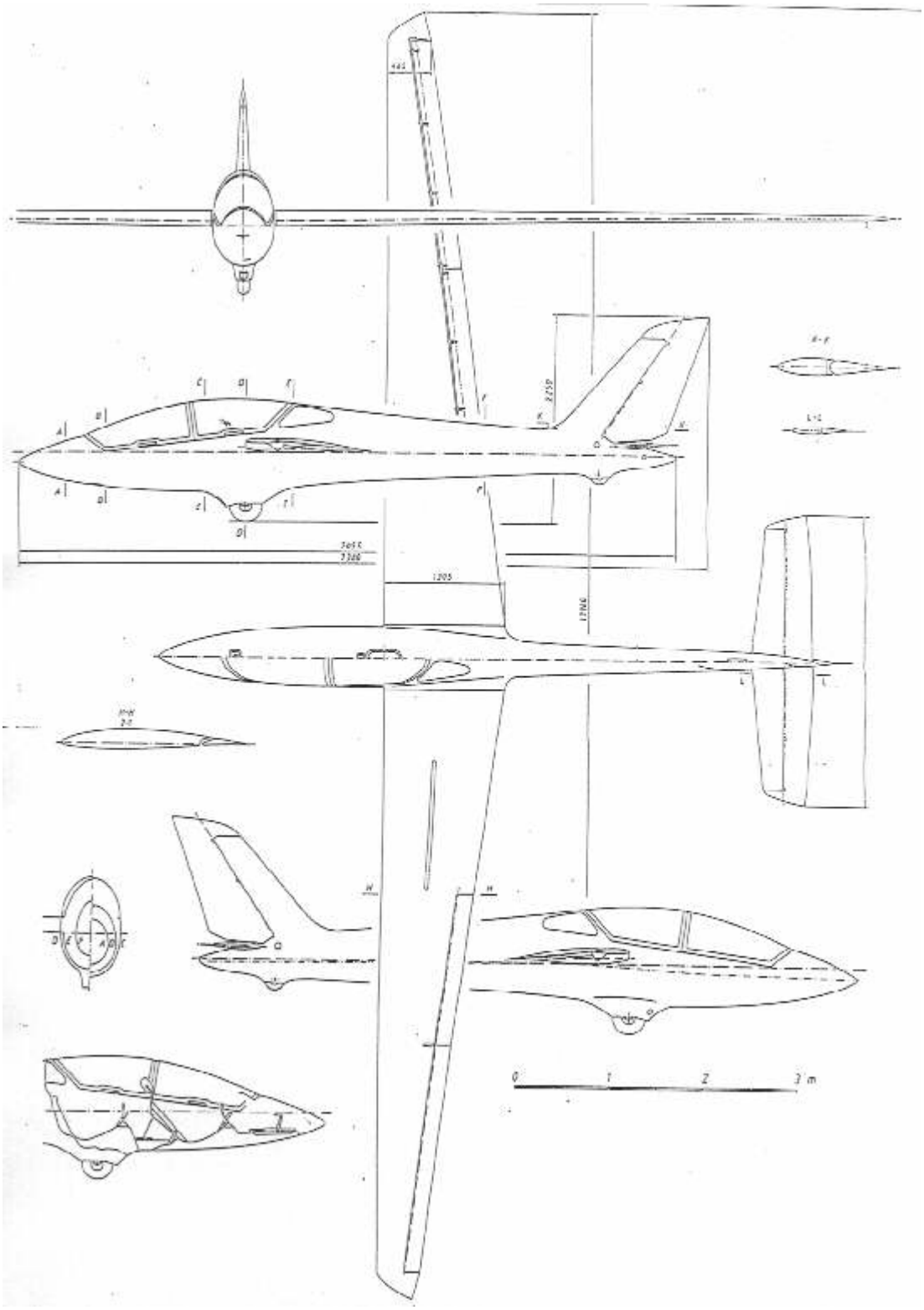
very good aerobat also in various model sizes

MDM-1 Fox is a Polish design and product, reminding of the great old Foka. There's very little information left on the Web, but you may look at the Wikipedia page, and a Web search will reveal a few private MDM-1 Fox pages (for instance the manufacturer's page, a private page, or the SAGA page).

The MDM-1 Fox is a very good and popular modern aerobatic glider, also as a model. There are several ones, many in big scales, for instance those made by Gewalt (Blue Airlines), Schadl Modellbau, Rödelmodell (discontinued), Airworld, and Bruckmann.

From the Airworld website:

From http://www.manfred-schadl.de/fox.html (from the flight manual):



The REFLEX models

In the first place, the airplane was rendered in the popular 1:3.5 scale, still giving 4 m / 158 in wingspan from the 14 m original. Only later also smaller and bigger versions were made. Smaller are 1:5 (2.80 m / 110 in) and 1:4 scale (3.50 m / 138 in), and bigger are 1:3 (4.67 m / 184 in) and 1:2.4 scale (5.80 m / 228 in).

Some information from the Web (e.g. Bruckmann and Rödelmodell, see above) led to basic design assumptions for the 1:3.5 scaled REFLEX model. Most important, overall weight is 7 kg / 15.5 lb what I feel is just right for pleasant slope soaring and aerobatics. For more powerful aerobatics (from big altitudes) or dynamic soaring, even 9 kg / 20 lb are possible, but in that case the model is a slug and doesn't fly as nicely as when being lighter. To me, only 5 kg / 11 lb weight even seems to give the best flight *behavior*. But Michael Heyder flies his 1:3.5 (158 in) Fox with even 11.5 kg / 25 lbs weight and praises just the good momentum.

The four versions (5, 7, 9, and 11.5 kg) are prepared for REFLEX. Since 2004 I had the Fox parameters, seeing several REFLEX versions. For quite a while I wasn't satisfied with the flight behavior, but after some subtle enhancements in the simulator and several in my parameters the model flies now really well. The only minor drawback is that there are no real spoilers in REFLEX, but they are replaced by similarly working flaps.

Like the original, the model has 1 degree wing dihedral and 1 degree wing incidence. Obviously, the dihedral compensates the tall vertical tail so there is no adverse roll when yawing.

The REFLEX model's airfoil is MH 32 (instead of NACA 64_1-412), a so-called semi-symmetrical (means: cambered) one, and there should be even 1 degree decalage (like on the real aircraft). That would give a typical "stable" glider flight. But I preferred to set zero decalage (meaning 1 degree stabilizer incidence) for a "neutral" flight behavior what I feel is better for slope soaring and aerobatics. Now the "correct" position of the center-of-gravity is at 0.135 m / 5.3 in behind the leading edge.

By now I think that the *aerodynamic* incidence has to be set in REFLEX. Because the MH 32 airfoil has -2 degrees geometric zero-lift angle-of-attack, 3 degrees are set in REFLEX. To get zero *aerodynamic* decalage, the stabilizer has to be set to 3 degrees as well. Anyway, the pitch attitude of the model in flight looks plausible now.

The REFLEX models are as "scale" as possible. However, the "laminar" wing airfoil, which does not translate well into model size, was changed. The stabilizer is not enlarged, but it has positive incidence, other than on the original, giving zero decalage. As well for neutral flight behavior, the center-of-gravity

is more aft. In that case, pitch damping is very good even with the original stabilizer size.

On the original the center-of-gravity has to be between 22% and 39% of the mean aerodynamic chord (MAC), or 8.4 to 14.9 inches from the wing leading edge. That would be between 2.4 and 4.25 inches for the 1:3.5 scale model, but consistent with zero decalage it is set to 5.3 inches. If the wing is left at 3 degrees (aerodynamic) angle-of-incidence and the stabilizer is set to zero (both settings like on the original airplane), then the 1:3.5 scale model with the center-of-gravity in foremost position at 2.4 inches is set up completely true-to-original and still well for fast slope soaring. Only in aerobatics it is a bit harder to accurately fly inverted and rolls.

The control throws of the original are unknown so they have just been set for easy aerobatics on the models. Maybe the +30/-30 degrees elevator throw is a bit too big (at least down), but the models need it for spins and snap rolls. The "neutral" versions, where the elevator is more effective, have 50% exponential set. The Frise type ailerons could only be "replaced" by 30% differential in REFLEX.

Additionally, the bigger and smaller versions are prepared. They are each set up as an aerobat. The C/G is set near to the neutral point so static trim is about neutral, and the zero decalage gives a virtually neutral flight behavior. It's easy to gain speed, then do a short horizontal flight, and then a pattern. It should also be possible to pull into a dynamic stall (as the real airplane is said to be able, too).

The "neutral" trim gives 4.6% static stability margin and 1.68 pitch damping ratio what is adequate to an aerobat. The true-to-original "stable" trim range results in static margins between 31.2% and 14.4% as well as pitch damping ratios between 0.64 and 0.94. While the damping ratios are adequate for an aerobat, the static margins seem exceptionally big.

Still the true-to-original stable trim is interesting as well. Because several REFLEX parameters have to be changed at the same time, all model versions are additionally prepared this way. The installer program offers the option to choose either the neutral or the stable setups. If you once want to try the other alternative just run the installer again.

In any case, you’ll notice that the Fox is a very well flying aerobat and will let you look good as a pilot. But also notice that its amazing flight characteristics are faithfully rendered in REFLEX.

The REFLEX Model Appearance

So far (since 2004) I hadn't time and interest to make a 3D model for the airplane's appearance, but now (2010) there is a "real" 3D model for the current REFLEX version. The model comes in different paint schemes. All these paint variants are freely interchangeable: hit F5 "Model parameters", select another "Model appearance" (Fox1 ... Fox4).

This should be an original factory paint scheme. It is used by Airworld for their model with the Polish (prototype?) registration, but it is also shown by Schadl Modellbau on an Austrian-registered airplane.

The pilot is "borrowed" from REFLEX. Actually, he's sitting in the pilot's seat of the SG-38 training glider, exposed to the weather without a cabin. That's why he wears his blue jumpsuit and red bobble cap. The bobble has been removed, the cap had to stay there, but that even somewhat suits the Fox. For instance in the Hörnle scenery it's winter and gets cold in the unheated glider. Anyway, the pilot had to be made only a bit thinner to fit well into the Fox with his arms and legs. There is only one pilot because the Fox is intended as a competition airplane rated for unlimited aerobatics in "solo flight".

Engage the tow rope, keep wings level, and there you go. (Only in reality, unfortunately not in REFLEX).

There is no tow release in the fuselage tip, it's only a small hole there for the instruments (ram pressure). The dark patch at the fuselage bottom, below the canopy's front edge, designates the airplane towing release. The dark patch at the front of the main wheel fairing designates the winch launch release.

After landing at the Mill Hill this entirely white model presents the whole beauty of the Fox. The harmonious design is not interfered by any decoration. Only on the wing bottom is an unusual pattern which looks especially dynamic in aerobatic patterns.

The original is used for aerobatic displays and has "sound rods" on the wing tips. On the model, they are aligned parallel to the airfoil chord line. I don't know if that's right but it looks reasonable. Supposedly, a bearing is taken on the tips to make the verticals in aerobatic maneuvers exactly vertical.

Slender wings and horizontal tail, big vertical tail.

Well visible in the side view are the mid-wing configuration as well as the tail-wheel landing gear. The main wheel's axle sits exactly below the wing's leading edge. That's in accordance with an old rule-of-thumb used full-size as well as in modeling.

Otherwise again mere beauty. Well visible the curvatures of the drooped front fuselage and the canopy as well as the thick vertical tail airfoil.

The Swiss Aerobatic Gliding Association (SAGA) owns a Fox featuring an interesting paint scheme. The SAGA fox page explains that the oblique lower edge of the canopy lets the verticals in aerobatics look not exactly vertical and the judges in competition deduct points for that. The blue upper side of the fuselage nose and especially the wedge-shaped stripe below the canopy make up for that quite well, at least if the airplane is well illuminated and not in backlight. You can see that even in the simulator.

I don't know if the "sound rods" are correct as shown here since there is only one incomplete picture of the SAGA Fox with them.

Seems they are too far back. The absolutely straight wing leading edge is well shown here. Sleek fuselage and big vertical tail.

The wings are really thin, 12% on the original and as shown here, only 8.7% on the model with the MH-32 airfoil. Spoilers are only at the wing top.

You may only guess the 1 degree wing incidence angle. But it should be visible that the wing top has no dihedral while the wing bottom has. Effective dihedral is 1 degree according to the drawing in the flight manual, even though the text there strangely specifies zero.

Looks great, huh?

For me the Fox is actually the most beautiful glider. And it's possible to render that beauty in REFLEX, as you may notice here. Even shading and highlights are so good that the simulator model looks nearly like a real model even though the textures are not photos but simple computer graphics.

This should be another original factory paint scheme. Anyway, it is yet another way to distract the observer's eye from the oblique lower edge of the canopy. To this end a single, pointed stripe is used here, which runs nearly from the nose tip to the tail tip. Additionally, the colored tips of wings and empennage accentuate the flight direction with their inner edges and stripes parallel to them.

That's better seen in the rear view.

The colored tips of wings and empennage together with the pointed fuselage stripe are very well visible here.

Demo Flight

The demo flight „MDM-1 Fox“ (hit F9 in REFLEX) shows the biggest model version flown on the Mill Hill. This flight is not really well flown but should show the model’s impressive aerobatic performance.

Re- and Un-install

If you want to install other variants of the REFLEX Fox (balance/trim, size, weight), you should have kept the installer in the original place, that is where you had run it for the first installation of the model.

In MS Windows 7, go to the Windows program menu (“Start” button at the left bottom of the display screen). It's probably named “Programs” or “All Programs”, and there is the sub-menu “REFLEX”. There you'll find “models” and “MDM-1 Fox - re-select”. This will re-run the installer program in which you may select a new installation.

In MS Windows 10 you have to render them accessible in the task bar:
- Right-click on a blank area of the task bar.
- Select Toolbars, New Toolbar…
- Navigate to this folder:
  C:\ProgramData\Microsoft\Windows\Start Menu\Programs
- Click on the folder REFLEX and then click „Select Folder“.

On the right-hand side in the taskbar appears REFLEX», and clicking on that double-arrow » will show the sub-menu Models.

If you want to remove the REFLEX Fox from your PC, go to the same menu “Start / All Programs / REFLEX / models”. There, “MDM-1 Fox - uninstall” will do the trick.

Suitable Sceneries

The Fox is an aerobatic glider and needs proper altitude (maybe 1000 ft) for an aerobatic schedule. That is possible in REFLEX, but the model is too far away and hardly visible. So the Fox requires slope sceneries to enjoy it.

The Mill Hill (Shoreham) REFLEX scenery is perfect for the Fox. Set launch speed to 11 m/s, 13 m/s for the heavy versions. The 3 Beaufort wind set as a scenery default may be well increased to 4 or even 5 for really swinging aerobatics. (Use the down or up key after setting a parameter and only then hit or click "OK".)

There's plenty of altitude below the pilot's position to do a decent pattern sequence or a spin or a vertical snap roll (remember the rearward c/g position). Even some dynamic soaring is possible due to the big differences in wind speed at different places. Of course, the scenery is no leeward slope and you won't break a speed record.

But you might use 3D glasses to have stereoscopic vision of obstacles!

If the model gets too low (or at all), you may land it on one of the meadows below the pilot's position. The REFLEX folks kindly set model shadow casting for these areas to make that possible. The airport in the left background isn't suitable for landing but isn't within reach, anyway. (A well-known airport, with a view of the Mill Hill: http://www.shorehamairport.co.uk/)

The Wasserkuppe Fliegerdenkmal REFLEX scenery is, with the 4 Beaufort default wind setting, perfectly suited as well, but even 5 Beaufort would do no harm. Here you may even land on the mowed runway, if only you can judge the downwash behind it (on approach).

The scenery Rotes Kliff (Kampen Sylt) (Germany), like all REFLEX stock sceneries, is perfect in every respect. It's the "red cliff", a famous location, one of the biggest coastal cliffs in Germany near Kampen on the island Sylt, perfectly aligned perpendicular to the prevalent westerly wind. You are looking into a nice sunset just in front of you over the sea. You hear the wind and the swoosh of breakers on the beach below. The Fox likes considerably more than the default 3.5 Beaufort wind, though.

The model is landed on the huge sands below the cliff, flare and touch-down are done watching its shadow on the ground (or watching the telemetry display). You may fly the model over water to get it lower for landing, but the shadow is hardly noticeable there and the model will sink and disappear when hitting the water.

The new "Salzkammergut" (Austria) mountain slope scenery is well suitable with the default 4 Beaufort wind. But there is no really proper place to land the model and one has to fly daring approaches and will appreciate the tight turns and slower speed of the lightweight Fox versions.

Always remember to use the down or up key and only then hit or click "OK". By the way, you may restore any default value by hitting Alt-0 (zero) when the parameter field is selected. Remember as well to select an "Aircraft initial position" where the model is far enough from the pilot's position to avoid a "collision" or the simulation won't start. Never mind if that is the "Parking area" as long as it works.

Even better Sceneries

Other slope soaring sceneries by independent authors are almost made for fast slope razors and aerobats and therefore especially suited for the Fox.

The Gerlitzen Gipfelstation (Austria) scenery is downloadable from RC-Sim. Horst Lenkeit and Dan (RC-Sim name) perfectly rendered one of the nicest mountain flying sites in Austria. It's the summit of mount Gerlitzen near Villach in Austria, 6250 ft above sea level. Flying is very nice there if the wind is set to 3.5 Beaufort or more; landing on the meadow on the left side.

The scenery is just great, but it seems the digital camera failed finding a suitable white balance. At least the colors look quite cold. You might easily correct that yourself. I did that (see picture) and adjusted scenery light and shadow accordingly.

Horst Lenkeit had installed a quite small and simple wind field for slope up-wash. I replaced it by a big and elaborate one which I think is more realistic. If you want to try my version of this scenery you may write me an e-mail.

The Hoernle (Teck) (Germany) scenery, downloadable from RC-Sim or www.Szenerien.de, has been made by an independent author (Markus Vogt) as well. There is very good upwash even at 4 Beaufort and also a good (though confined) landing area behind the pilot's position. So maybe it's the best available scenery for the Fox.

Unfortunately, the author refuses to offer it as an installer program and instead prefers a ZIP file which has to be unzipped and installed after download. He explicitly approved passing-on the unmodified scenery, though. So the Fox installer program may download it from www.Szenerien.de and install it as well - just as a service. If that fails or other deficiencies emerge, please state your grievance to the author: Markus Vogt

Also in this case I found the white balance a bit too blue-ish, but I used less than +10 red and –10 blue to warm it up.

Even more good slope soaring sceneries have been developed in the last few years, at least assisted by Paul Dürr and all of them offered for download at his website. You have to search a bit there, also under "User sceneries" and "Ports", but it is worth it! By the way, the Fox installer program can install the best of them.

Enjoy!

Burkhard Erdlenbruch

mailto:Burkhard@Erdlenbruch.de
http://time.hs-augsburg.de/~erd/Modellflug/textReflex.html

More REFLEX models and the latest versions are on my page
http://time.hs-augsburg.de/~erd/Modellflug/textDownloads.shtml