

# Alexander Schleicher

## ASK21 & ASK21 Mi





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Please note that due to a bug in Prepar3D V.2 a motorized take-off from the ground is not possible without any wind (the default Constellation shows the same problem!) Lockheed promised us to check this out. For now just add at least one knot of headwind.





## INTRODUCTION

Most people who have not been in a modern glider think that they glide from thermal to thermal in total silence. They can and they do, but they are also capable of the most amazing aerobatics and high speed high G maneuvers. Often the roar of the air flowing over the canopy drowns out the sound of the variometer and the screams of the passenger. They are often flown closer to the ground than most other aircraft, certainly when they are flown using the wind flow rising over mountain slopes. Even if you look at simple performance you see that modern gliders outperform many serious motorized aircraft. Name one general aviation aircraft with a range of 3.009 km, a speed of 306 kmh, and a ceiling of 15,460 meters. And although these are world records for gliders, even the actual performance of standard gliders is amazing.

The Schleicher ASK21 is one of the best known gliders as it is used in many glider schools. It's not a hard glider to fly (that's what makes it a good instruction aircraft) and considered very safe. It's so safe that to practice spins you will need to install a 'spin kit'. The ASK21 has a conventional layout with controls for both seats, a T-tail and a mid-set thick wing.

The FSX version was made with great care by Joachim Schweigler who knows this aircraft very well. Perhaps the most special part of the product is the flight model that is at the absolute limits of what FSX can handle. It is extremely accurate.

## SYSTEM REQUIREMENTS

- Intel Core 2 Duo E6850 CPU (Core 2 Quad advised), 4 GB RAM
- Direct X 9 compatible Graphics Card with minimal 512 MB
- Microsoft FSX (with SP2 or Acceleration), Prepar3D V2 or FSX STEAM edition
- Windows XP, Windows VISTA, Windows 7 (fully updated), Windows 8.1 (64 bit highly recommended)
- Adobe Acrobat® Reader 8 minimal to read and print the manual

This product is compatible with DX10 as much as it possible (note that Microsoft does not document or officially support the DX10 mode)

## CREDITS

Concept:	Joachim Schweigler
Models/Textures:	Joachim Schweigler
XML/ gauges:	Finn Jacobsen, Joachim Schweigler, Peter Lürkens, Ian Lewis
Flight modelling:	Peter Lürkens
Flight modelling testing:	Joachim Schweigler
C4 Competition	Ian Lewis
Project Management:	Mathijs Kok (Aerosoft), Joachim Schweigler
Manual, documentation:	Mathijs Kok (Aerosoft), Joachim Schweigler, Alexander Schleicher Flugzeugbau
Sounds:	Joachim Schweigler, Finn Jacobsen
Installer:	Andreas Mügge (Aerosoft)
Testing:	Several good folks who will all be getting a free copy
Special thanks to:	Ulrich Kremer (Alexander Schleicher Flugzeugbau), Volker Hänel (Luftsportgruppe Köln-Niel e.V.) Franz Pöschl (SDI-Variometer) Harald Jörges (Fliegerschule Wasserkuppe), Michael Tauber

WinchX is licensed for bundling with this product. Thanks to Peter Lürkens (see page 12)





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## CONTACT SUPPORT

Support for this product is offered by Aerosoft. We prefer to have a support forum for the simple reason that it is fast and efficient because customers help customers when we are sleeping.

Aerosoft forums: <http://forum.aerosoft-shop.com>

We feel strongly about support. Buying one of our products gives you the right to waste our time with questions you feel might be silly. They are not.

## SETUP OF THE MANUAL

As with previous projects we divided this manual into separate sections. This section is about the aircraft in FSX and about some of the special features of the project. The other sections are actual real life manuals of the aircraft and the instrumentation. This project is so accurate and realistic that we feel confident giving you the actual manuals. The bonus for you, the customer, is added realism. What can be more realistic than the manual used by the real pilots?

You will find all the manuals in the same directory (FSXMainFolder\Aerosoft\ASK21\) with these names:

- |                      |  |
|----------------------|--|
| • Manual.pdf         | What you are reading now                 |
| • 219FD komplett.pdf | Flight manual for the ASK21 Mi (German)  |
| • 219FE komplett.pdf | Flight manual for the ASK21 Mi (English) |
| • EN_C4-V4.06.pdf    | Manual for C4 Competition (English)      |
| • DE_C4-V4.06.pdf    | Manual for C4 Competition (German)       |
| • EN_WinchXHelp      | Manual for WinchX! (English)             |
| • DE_WinchXHelp      | Manual for WinchX! (German)              |

Please note that the Flight manuals only cover the motorized version but are to a large degree suitable for the pure glider versions. Appendix A will cover the few differences.

The copyrights for all manuals except this section remains with the companies (and individuals) who created the products.





## MODELS

There are two models of the ASK21 included in this project. The standard glider and the ASK21 Mi that has a Diamond IAE 50R-AA engine delivering 37.3 kW. This is enough to allow the ASK21 Mi to take off eliminating the need for a tow aircraft and extending the cross country capabilities. However that does not mean this is a motor glider. The ASK21 Mi is classed as a 'motorized glider'.

## FLIGHT MODEL

One of the highlights of this project is the flight model without a doubt. It is highly researched and tested by several glider pilots with many hours on that type. Where FSX caused problems modules were used to circumvent the limitations. For example the standard additive trim of FSX (you can move the stick fully back and then ADD more deflection with trim) is not realistic and is replaced with a system that actually models the spring loaded trim system of the ASK21. Without this it would simply not be possible to do the full aerobatics program the ASK21 is capable of.

If you know the ASK21 you will find our model extremely close to the real flight experience!

## AEROBATICS

While being designed as a trainer the ASK21 is a very capable aircraft that is used for aerobatics (class A Aerobatic) and cross-country flights. It is approved for these maneuvers:

- inverted flying
- slow rolls
- loops
- spins
- stall turns
- Split 'S'
- Immelmann turn
- steep climbing turn
- Chandelle
- Lazy Eight

The ASK21 Mi is a lot less aerobatic (it is classed as a utility aircraft after all) due to the lower load factors and it is certified for:

- spins
- steep climbing turn
- Lazy Eight
- loop upward.





## INSTRUMENTS

There is a highly realistic and rather complex set of instruments in these cockpits. If you are not used to gliders you might be surprised about the complexity of modern glider cockpits. All the instruments are described in some details.

## VARIOMETERS

Variometers or, in short, varios are vertical speed indicators (VSI) which show change of altitude by measuring the change in air pressure (static pressure) as altitude changes. As the aircraft climbs or descends the pressure outside the aircraft changes. Inside the aircraft there is an isolated, airtight container, something like a thermos. When the aircraft climbs, outer pressure decreases, and the air in the thermos expands to the outside. The thermos is connected to the variometer. In the variometer there is a highly sensitive vane which is deflected by the flow in and out of the thermos. The vane is connected to a needle which indicates climb, when the outer pressure decreases and the air flows out of the thermos and vice versa.

Without further means, this variometer shows any change of altitude as climb or sink, regardless if it results from up- or down streaming air, or just from pulling or pushing the stick by the pilot. Of course, it is confusing for a glider pilot, if climb indication is superimposed by aircraft maneuvers, when he is deliberately trying to find the best part of the thermal. Therefore modern gliders have all compensated variometers that eliminate the variometer reaction on aircraft maneuvers (see next chapters).

There are three variometers in these cockpits - from top-left to bottom right they are the "vario SC" slave vario of the SDI C4, the digital "lcd petal" gauge of the main SDI C4 unit, and the "Winter" mechanical variometer. The modern installation of variometers in gliders is very sophisticated, with a variety of compensations possible to make the reading as meaningful to the pilot as possible. In reading the descriptions below the simple point to remember is that each vario is trying to give an indication of the rate of climb, and when you are thermalling or ridge flying a needle pointing upwards is generally a good thing, while the needle rapidly rotating anti-clockwise around the dial heading towards the negative lower half is a sign that you should speed up and get out of the sinking air you are in.

## TOTAL ENERGY COMPENSATED VARIOMETER

The mechanical 'Winter' variometer in the Aerosoft Discus below and to the right of the SDI C4 has been configured to continuously display your 'Total Energy Compensated Climb Rate'. This is the traditional value that has been relied upon by glider pilots for over fifty years, giving the climb rate of the glider after removing the effects of the pilot pulling or pushing on the joystick. Pulling back on the stick causes the glider to climb, but also to decelerate, and by reading both the static air pressure (altitude) and the pitot pressure (airspeed), the effect of the joystick movement can be compensated for, hence "Total Energy Compensation". If your airspeed is not changing, the Total Energy climb rate will equal your true climb rate.



This reading is far more useful than the simpler true climb rate, as the information that glider pilots really need to stay in air is the change in energy stored in the aircraft, either in kinetic (altitude) or in potential energy (speed). If he is low and fast he can exchange speed for altitude, if he is high and slow he can exchange altitude for speed. Excluding the loss of energy due to drag for simplicity, the total energy stays the same. What the glider pilot needs to know is if he is losing or gaining Total Energy. If he is in a thermal and gaining altitude without pitching up he gains energy (in the form of altitude), if he is in descending air he is losing energy.





The Total Energy Compensated variometer provides that information "It shows the vertical speed while effects of aircraft maneuvers are eliminated. For a mechanical vane vario this is achieved by using special static pick-up nozzles which combine static pressure and pitot pressure". Perhaps best explained with these examples:

- Speed constant, altitude descending -> TEC variometer will read SINK
- Speed constant, altitude climbs-> TEC variometer will read CLIMB
- Speed increase, altitude constant -> TEC variometer will read CLIMB
- Speed decrease, altitude constant -> TEC variometer will read SINK

The SDI C4 also provides an audible indication of the Total Energy climb rate, with a broken beep-beep-beep indicating lift, and a continuous beep indicating sink. You learn quickly to recognize and respond to these sounds, speeding up when you hear sink and slowing down when you hear lift. This behavior (called 'dolphin flying') makes a huge difference to the efficiency of your cross-country flying. Please note that the McCready ring on the variometer in the TEC variometer on our panel cannot be used. The information it can offer is presented far more detailed and reliably by the C4 Competition.



### NETTO VARIOMETER

The electronic 'vario SC' variometer above and to the left of the SDI C4 in the Aerosoft Discus has been configured to continuously display the 'Netto climb rate', operating as a slave dial driven by the SDI C4. It is a modified Total Energy variometer (see above) with one additional compensation where the intrinsic sink rate of the glider is also compensated. Thus, this vario shows basically the ascent and descent of the external air mass. As the intrinsic sink rate is obtained from performance data of the glider, this works well only as long as the performance of the real glider is not reduced, e.g. by flies or water drops on the wings - in this case there is a setting within the main SDI C4 flight computer where you can adjust its value for the glider performance of the glider, to restore the accuracy of the Netto reading (see the SDI C4 manual included in this package).



While the calculation to provide the netto value is complex, the reading of the gauge is the most simple of all: if the needle goes up it means the air outside the glider is rising, and similarly for sink. For ridge flying the gauge comes into its own, continuously indicating the nuances of the vertical air movement as the wind passes over the hilly terrain, allowing you to optimize your flight relative to the landscape.

### ELECTRIC VARIOMETER – FLIGHT COMPUTER

The main 'petal lcd' gauge of the SDI C4 displays the total energy climb reading by default (see above). However, the "VARIO/SOLLF." switch lower down on the panel allows you to switch the gauge into the most advanced mode of all, i.e. "speed-to-fly".

As mentioned earlier, the pilot learns to speed up when the total energy variometer is indicating sink (to fly quickly out of the sink) and to slow down when lift is indicated (to loiter in the lift to take the most advantage of it). But with a total energy or netto variometer the pilot does not necessarily know how much to speed up or slow down. Indeed you





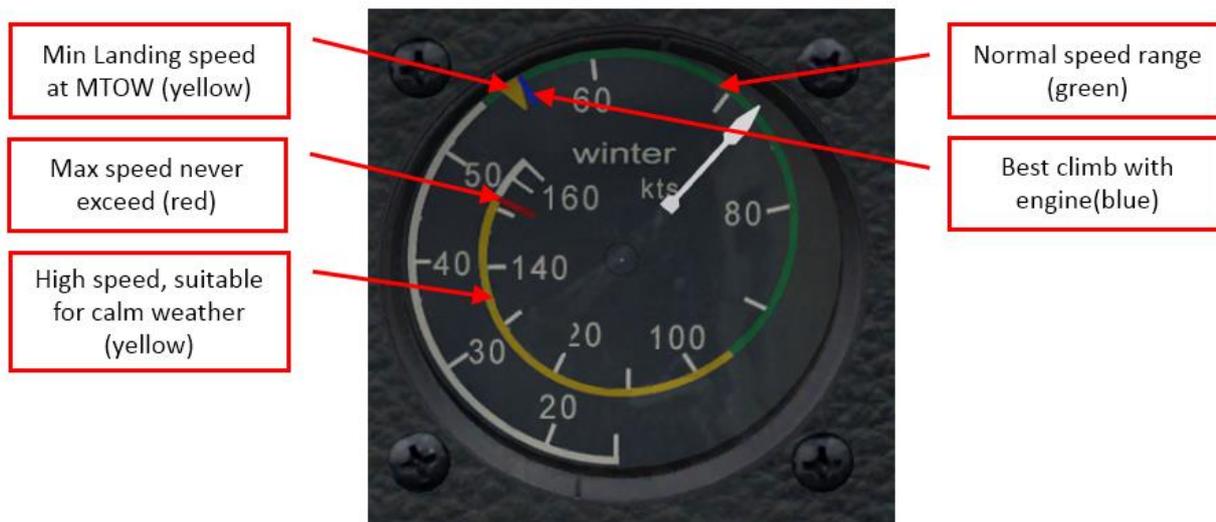
will learn that speeding up causes the sink reading on a TE vario to increase, as the glider is less efficient at higher speeds, making it even more difficult to decide whether to speed up or slow down.

The "speed-to-fly" variometer takes the burden of this complex calculation away from the pilot, and although the needle looks like it is behaving in a similar way to a TE or netto vario it is actually performing the triple compensation calculations so the needle UP simply means SLOW DOWN, and the needle DOWN means SPEED UP. This is consistent with the direction the needle would move if it were indicating underlying lift or sink, but the pilot no longer needs to consider how much to accelerate or decelerate - the needle reads zero when the optimal airspeed is reached.

You will find more information in the complete C4 manual that is included.

### AIRSPPEED INDICATOR

The 510 degree scale on the airspeed indicator allows for a precise reading of the indicated airspeed in km/h or knots depending on your FSX setting.



### ALTIMETER

The altimeter is rather standard and like the Airspeed indicator can be switched between metric and US settings. The gauge will automatically show the correct bitmap. Make sure you set the correct QFE before take-off. As the C4 Competition works independently from this gauge you could set QFE in this gauge and QNH in the C-4.





## C4 COMPETITION

Without a doubt the heart of this product, the C4 competition is a flight computer that is used in glider competition (but also for recreational flights). It is capable of using the loaded flightplan, your GPS-determined position and the performance of the glider to make many calculations. It is far too complex to describe them here and we are happy to have permission of the manufacturer (Franz Pöschl GmbH) to include the actual manual. You will find our representation of the instrument to be accurate and detailed in almost all functions. You will find the C4 Competition powerful but you have to spend half an hour of getting to know it. We assure you this will be time well spent.



## YAW STRING

It's rare that the most important instrument in an aircraft does not cost more than a simple piece of tuft or yarn. But many glider pilots will tell you that the yaw string (also called slip string) is the most important gauge they have and it is in fact considered part of the primary flight reference instruments. It is taped to the canopy and it simply moves in the airstream. If it is centered you are flying the glider as efficiently as possible (without any slip and a yaw angle as small as possible).



Rudder left or  
aileron right to correct

Optimal

Rudder right or  
aileron left to correct

For pilots that are used to flying motorized aircraft it is often hard to stay fully coordinated in a glider, but the yaw string will help a lot.



## TRANSPONDER

The ASK21 Mi is equipped with a Mode S transponder unit making the ASK21 Mi better suitable to operate in controlled airspace. It provides A and C (including altitude) modes. It is toggled on with the OFF / SBY / ON (A mode) / ALT (C mode) switch and you set the digits by pressing the large knob to select the digit and then turning to change the digit.



## COMS RADIO

The standard single channel transceiver on both models is activated with the ON/OFF switch and the frequency is set using the big knob. Use the smaller section for Khz and the larger for Mhz.



## G-METER

The g-Meter shows the g-load on the aircraft and has markings that show the maximum and minimum recorded G. These can be reset with the push button. This instrument is only fitted to the pure glider version.





## STATIC PORT SWITCH

There are two static ports (to measure static pressure) on the AKS 21 Mi. One total energy compensated (TE) mounted on the Vertical stabilizer and the others are little holes in the fuselage (Stat). The Static Port switches the source of the variometers between these ports and is marked with glider and motor operation.

When you use the engine you need to select the static port in the fuselage to get a correct reading of the variometers and prevent failures.



## SPEED TO FLY SWITCH

The variometer has a 'speed to fly function'. It is based on MCReady Theory and tells you at which speed you fly most efficient calculated using the current sink and the expected climb in the next thermal. When you switch it to speed to fly (Vario), the vario shows you if you need to fly faster or slower (also the audible one).



## ENGINE CONTROL GAUGE

The engine control gauge provides feedback on the engine (temperature and RPM) and is used to starts and stop the engine and to extend and retract the propeller. Complete functionality is explained in the flight manuals.





## WINCHX! AND OTHER ADDON PROGRAMS FOR GLIDERS

There was one serious problem when we started with the first glider project. Motorized gliders cannot be towed into the air. FSX simply will not start this process when the glider has an engine. So we had great gliders but no way to launch them. With the release of WinchX<sup>!</sup> this problem was solved. Though highly realistic the product is not overly complex to use. It is also content of the ASK21 package.

We also strongly advise you to check out another of his free utilities for gliders, CumulusX<sup>!</sup>. Peter Lürkens describes this products like this:

*CumulusX<sup>!</sup> is an add-on for Microsoft Flight Simulator X for the creation of a soaring environment. It stands in the tradition of the famous Cross Country Soaring 2004 of Eric Carden. CumulusX<sup>!</sup> creates thermal lift with appropriate clouds either on the fly every time new in the environment of your glider with a wide variety of characteristics, or based on custom-tailored lists of thermals. Both allow joining in online sessions, with the guarantee of equal conditions for all participants. It adapts automatically and continuously to the FSX internal weather conditions even under real-weather-mode.*

*With the help of an additional slope data base (not included), it produces also widely varying ridge-lift conditions in large areas of the world. It also tries to place thermals in mountain areas according to slope conditions and sun irradiation.*

You will find all information and the download link for CumulusX<sup>!</sup> here: <http://www.luerkens.homepage.t-online.de/peter/>



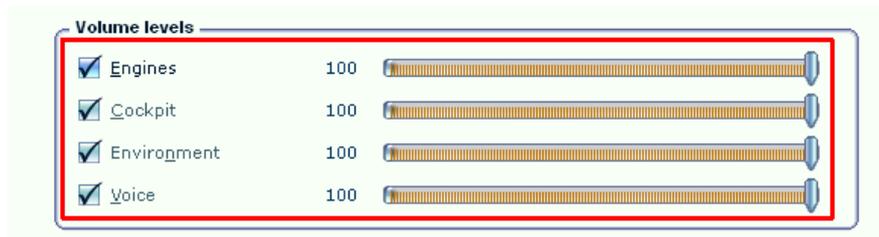


## FSX SETTINGS

This product needs a few tweaks to the FSX settings to allow you full control over the glider.

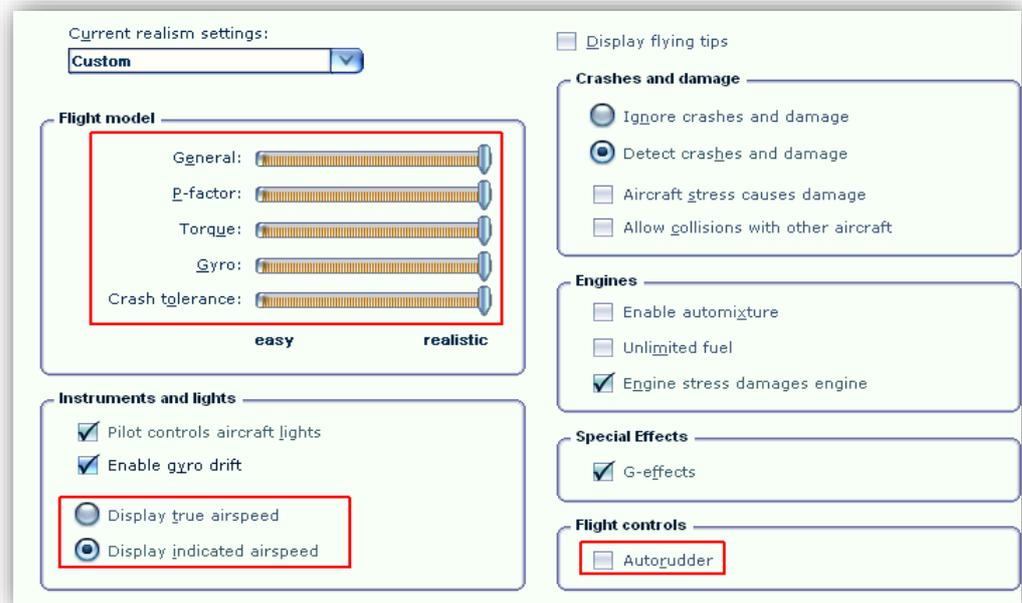
### SOUND

We advise you to move all sound sliders to the maximum setting.



### REALISM

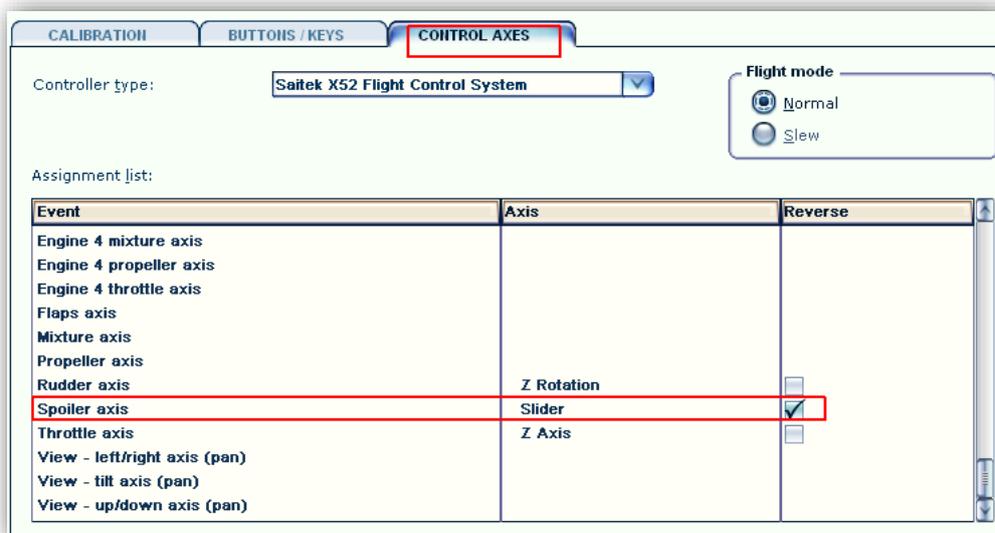
We strongly advise the flight model settings to be set to fully realistic to get the best flight model. Of course flying the glider without any form of rudder (and autorudder activated) is not very realistic. A smooth moving, softer stick will be most realistic and most easy to use. Should you not happen to have a rudder pedal the model comes with a specially designed autorudder that is far better than the standard FSX one.





## SPOILERS

In an aircraft that has no engine and is designed to glide as efficiently as possible it can be amazingly hard to land as the aircraft will tend to glide a long way in the ground effect. Thus the use of the spoiler is very important and you will need smooth



control over it. If your control hardware has an additional slider (like for example the Saitek X52) we strongly advise you to assign that to the spoilers so you can control the spoilers in small steps. When your hardware does not have any additional slider, we advise you to use the throttle axis for this. We can offer help on the forums if you need to know how this can be done on your stick.

## TAKE-OFF WITH THE MOTORIZED VERSIONS

The ASK21 Mi has little wheels under the wingtips (and steerable nose wheel) but taking off still requires a bit of practice. Here are some steps that will get you airborne. Do not feel bad if your first take-offs are not perfect.

- With the left wing on ground:
- Apply full right aileron, full pulled elevator, and a bit right rudder.
- Apply full throttle, and keep the direction with the rudder, stick still full right and pulled.
- Once the wing starts to level, control it with aileron, still keep the direction with the rudder and hold the stick full back.
- As soon as the nose goes up slowly release back pressure and wait for lift off. Should happen at around 80kph. Still keep a bit back pressure to climb with around 100 (blue line).



**APPENDIX A**

The manuals we provided are for the ASK21 Mi and there are some minor differences between that version and the pure glider version.

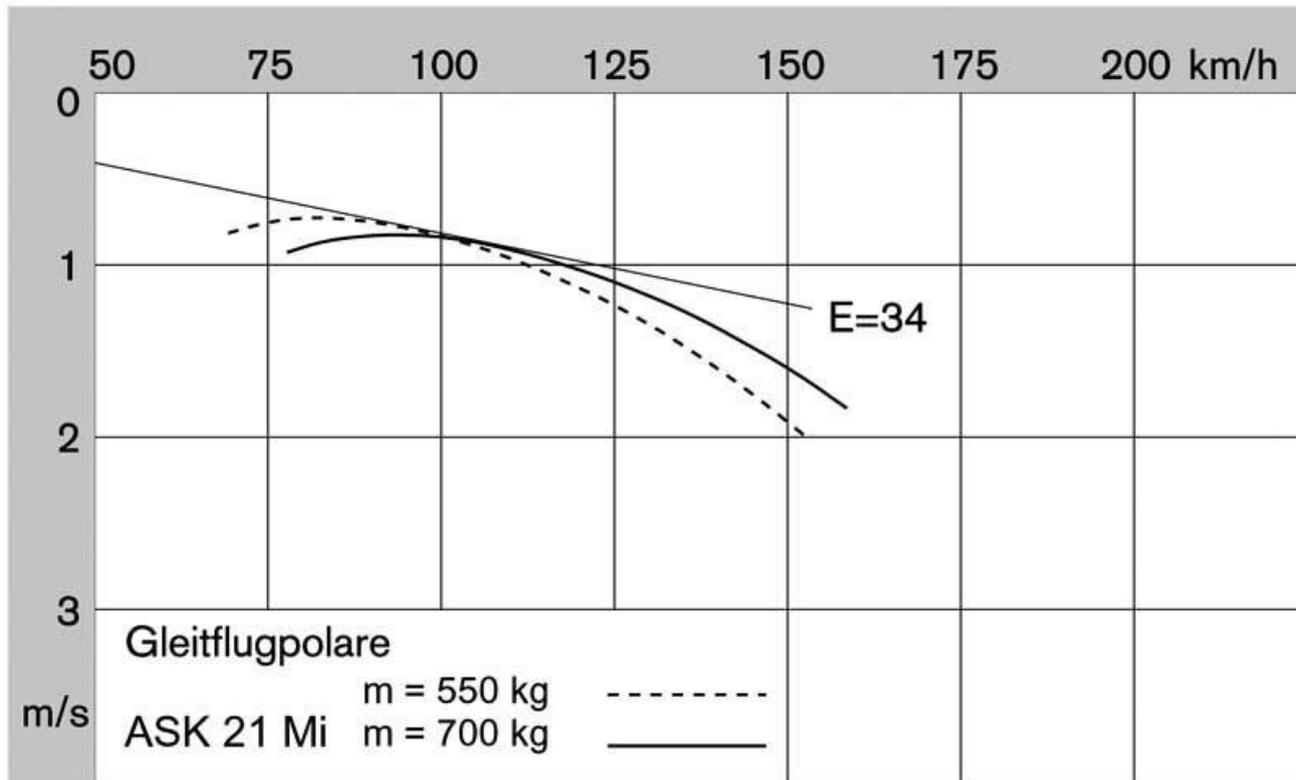
**TECHNICAL DATA**

	<b>ASK21</b>	<b>ASK21 Mi</b>
Wing Span	17 m	17 m
Wing surface	17,95 m <sup>2</sup>	17,95 m <sup>2</sup>
Aspect ratio	16,1	16,1
Length	8,35 m	8,35 m
Cockpit seat height	0,90 m	0.90 m
Cockpit width	0,68 m	0.68 m
Height (at tail)	1,55 m	1,55 m
Highest g-Load (180 km/h)	+6,5 -4,0	+5,3 -2.65
Highest g-load (280 km/h)	+5,3 -3,0	+4 -1,5
Empty Weight (minimal equipment)	ca. 360 kg	ca 495 kg
Maximal start weight	600 kg	700 kg Note higher weight can be seen as water ballast that cannot be removed.
Wing load (85 kg load)	24,5 kg/m <sup>2</sup>	32.6 kg/m <sup>2</sup>
Wing load (max load)	31,0 kg/m <sup>2</sup>	39.5 kg/m <sup>2</sup>
Maximum load cockpit front	max. 110 kg	max. 105 kg
Maximum load cockpit aft	max. 110 kg	max. 105 kg
Maximum speed	280 km/h	280 km/h
Minimal speed (single seated)	62 km/h	72 km/h
Minimal speed (duo seated)	65 km/h	80 km/h
Manoeuvre speed	180 km/h	180 km/h
Spoiler extension	up to 250 km/h	up to 250 km/h
Lowest sink rate	0.65 m/s	0.65 m/s
Lift/Drag (single seated)	34	34
Lift/Drag (duo seated)	34	34



PERFORMANCE

ASK21 Mi POLAR (borrowed from: [http://www.alexander-schleicher.de/produkte/ask21mi/ask21mi\\_polare.htm](http://www.alexander-schleicher.de/produkte/ask21mi/ask21mi_polare.htm))



ASK2 POLAR (borrowed from: [http://www.alexander-schleicher.de/produkte/ask21/ask21\\_polare.htm](http://www.alexander-schleicher.de/produkte/ask21/ask21_polare.htm))

