

WinchX!

Winch Launch Simulation for Flight Simulator X

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WinchX! is an add-on for Microsoft® Flight Simulator X for the simulation of a winch launch of a glider aircraft. It allows to use winch launch anywhere on the world with very little prerequisites. Only the input from reality is needed as length of the launch cable, desired airspeed, and force limitation.

WinchX! produces occasionally cable breaks as an additional element of realism and to prevent real glider pilots of becoming careless about launch interruptions.

Disclaimer

Warning! This program is not intended as a training tool for real world pilots. The implemented behaviours may differ significantly from real aircraft. The author excludes any liability for incidents with real aircrafts, which may be attributed to the use of this program.

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Requirements

- Windows® XP, Vista, Vista-64 (no own experience with Windows 64-bit versions)
- .NET 2.0 Runtime, available here:
<http://www.microsoft.com/downloads/details.aspx?FamilyID=0856EACB-4362-4B0D-8EDD-AAB15C5E04F5&displaylang=en>
- Microsoft® Flightsimulator X with **Servicepack 2**
- For a decent parachute animation the minimum frame rate should achieve 20 frames per second

Setting up

Installation

You need to be logged in as an administrator.

The compressed distribution archive contains two directory trees, **“Modules”**, which contains another folder **“WinchX!”**, and **“SimObjects”**, which contains entries for the visual models of the parachute and the winch.

Extract all files into the root directory of Flight Simulator X. Then logon under your preferred user account, go to the root directory of Flight Simulator X, then to Modules\WinchX! and double-click WinchX.exe. WinchX! asks you to register itself in the Add-on Autostart-configuration. Click “Yes”.

If Flight Simulator X is not installed at all, WinchX! will most likely crash.

De-installation:

Delete the WinchX! folder from the folder **“Modules”** in Flight Simulator X. If this is now empty you may remove the folder **“Modules”**, too.

In addition, in the folder **“SimObjects\Misc”** delete the folders **“WinchXParachute”** and **“WinchXWinch”**.

WinchX! saves its settings in the user data area, which can be most easily found by opening Start/Run and typing:

%LocalAppData%

This opens an explorer window with a number of directory entries. Delete the entry named **“WinchX”**, which removes the settings of all versions of WinchX! that has been used so far on this computer.

Winch Launch

First start Flight Simulator. Select “Fair Weather” as the weather theme. Place yourself on an airfield. Open WinchX! program window.

Select a realistic cable length and the desired airspeed during the launch. Select the appropriate weak link force limiter. Work your take-off check-list: coaster, seat belts, canopy, controls, spoilers retracted, flaps (if applicable), altimeter, trim and balance, wind, cable rupture.

Then press “START”, or operate the release knob in the glider cockpit, or press Shift-Y. The winch program window disappears and the launch sequence progresses. If you prefer full screen mode, then first adjust WinchX! in windowed mode, then activate full-screen, then press Shift-Y, or pull the cable release knob, or select “WinchX!/Launch” in the FSX-Ad-don-Menu.

After acceleration pull the stick gently. After establishing safety altitude of approx. 70 m, you pull more firmly to accelerate climb. Use the clouds in front of you as a reference to maintain direction.

Usually the cable is released automatically, when approaching the winch, but even if so, pull the release knob three times to release the cable for sure.

Be aware that a cable rupture may occur at any time. If this happens, first of all push the stick, not to bleed out of airspeed. Then accelerate at least to 10 kn or 20 km/h more than normal speed before any manoeuvring. During this, decide on landing straight ahead, flying an S-curve, making a 360, or enter shortened circuit pattern. Alos in this case operate the release kno three times to drop the rest of the cable and the parachute.

It is highly recommended to follow these procedures by default in the simulation, too, in order to avoid adoption of faulty exercise, in particular for real world pilots.

In the real world it is assumed, that the aerodynamic flow around the wing is severely disturbed after a cable break. The aircraft can go much quicker into stall, e.g. during hard pull out of a dive, or extending the spoilers at low speed or flare. It takes a while until the aircraft recovers its usual aerodynamic performance.

The fidelity of Microsoft Flight Simulator is unknown in this respect. It might be, that the simulation exhibits a much more friendly behaviour than reality.

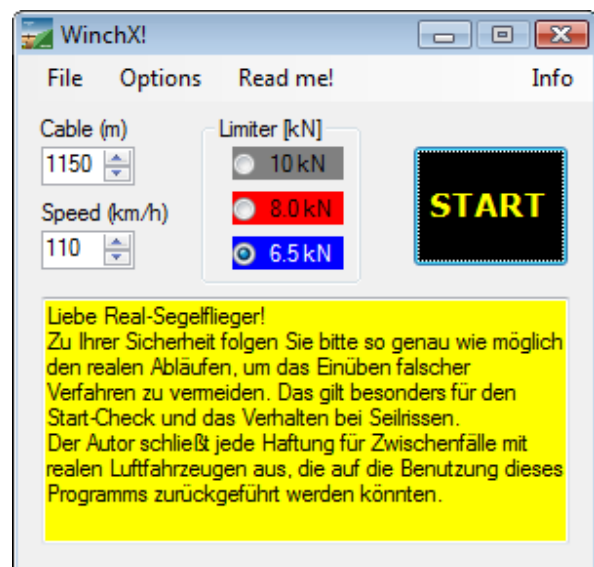


Fig. 1: WinchX! program window

WinchX[!] Functions

Working Principle

During initialisation, WinchX[!] assumes the glider aircraft being on the launch pad of a glider aerodrome. The winch is then assumed in direction of the heading of the aircraft, away by length of the cable. The winch maintains this position until it is reset, a new flight is loaded, or the aircraft is placed somewhere else by selecting an different airport or by using the map. This allows still slewing, for pushing back the aircraft to the launch pad after a circuit pattern, and launching with angles oblique to the cable.

During launch, WinchX[!] calculates the forces of the launch cable on the aircraft body in direction of all aircraft axis's. Thereby the actual aircraft weight is used as inertia parameter. The pitch moment is also included, but currently this is only a very rough estimation. The pitch moment of inertia (pitch MOI) is estimated from aircraft geometry and weight. Yaw and roll moments are neglected, also the sag of the launch cable.

In this way, WinchX[!] is actually a simulation of the winch launch, rather than mimicking the flight path of a typical winch launch. As such the flight dynamics model of the selected glider plane, which is not under control of WinchX[!], has much influence on the individual behaviour.

Winch Performance Envelope

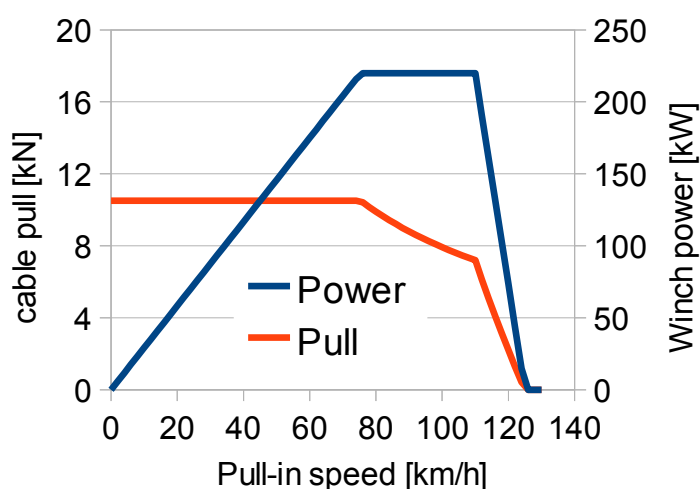


Fig. 2: Winch performance envelope

WinchX[!] simulates a 220 kW (300 HP) glider launch winch with a maximum cable force of 10.5 kN, and a maximum pull-in speed of 125 km/h. Maximum power is obtained between 75 and 110 km/h. The glider speed may be higher still, due to the oblique angle between cable and direction of movement of the glider.

The winch controls the airspeed of the glider automatically, which is more than a real winch driver could do. So one will have a very stable launch, under normal circumstances.

Cable ruptures and force limiter breaks

As in real life it may happen, that during launch the cable fails and a cable rupture happens. In this case, the pull is terminated immediately. The glider pilot has to take care to stabilize the glider at normal speed plus an extra safety margin in the order of 10 kn or 20 km/h by pushing the stick forward. This has top priority, before any other manoeuvre. At the same time the release knob is pulled three times in order to release the rest of the cable and the parachute, just in case.

Then one has to decide on the way to proceed, depending on the current altitude, wind

conditions, length of the runway, and the glider performance. One may either land straight ahead, if current altitude is still low and the end of the runway is still far away enough. Or, if altitude is a bit higher, fly an S-curve, or a 360 to reduce altitude, before trying to land. If altitude is high enough one may enter a shortened circuit pattern.

In order to maintain alertness of real world pilots when using WinchX¹, there is always a 10% chance of a cable rupture which cannot be turned off by user options. It is also highly recommended to follow the real world procedures in this case, rather than switching over to slew mode or resetting the simulation in order to start all over new.

Parachute animation

WinchX¹ creates an animated cable parachute that follows most closely the real world behaviour. When initiating the launch sequence it appears first next to the aircraft. When the winch start pulling, it moves slowly in front of the glider, giving it a light push then getting up-slack. During launch it oscillates by the wind turbulence. After release, the parachute opens and is pulled down to the winch.

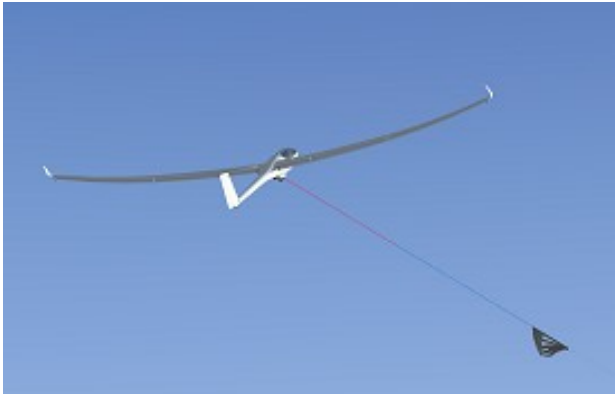


Fig. 3: Lift-off



Fig. 4: Cable release

In case of launch termination in low altitude, the winch driver does not pull in the cable, rather let the parachute drop vertically in order to keep clear of the aircraft. In case of cable rupture the same happens by itself at any altitude. Because the pull of the winch is missing the parachute floats down much slower.

In case of a low release or a limiter break under full pull, the winch driver needs some reaction time to release the throttle, which means that in the first moments, the parachute speeds away from the glider and unfolds before it slows down and collapses again. Take care not to hit the unfolded parachute, it will crash you.

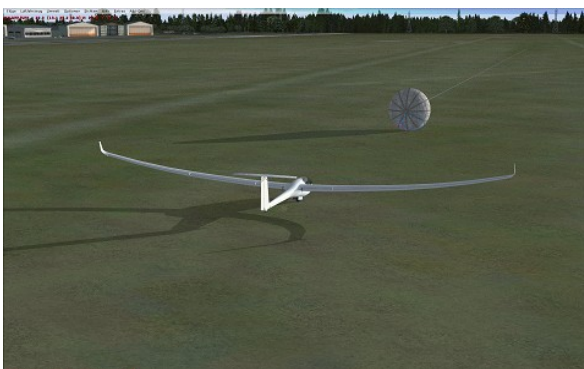


Fig. 5: Early break of force limiter



Fig. 6: Pull-in to winch

Known Issues

Q: Why is there a red piece of the initial part of the cable bouncing around in my cockpit?

A: This appears to be a limitation of the Flight Simulator X graphics engine, which seems not capable of handling occlusion of extremely nearby objects correctly.

Q: Why is the cable and the parachute sometime pointing to different points at the aircraft, rather than sticking to the hook and is jumping forth and back?

A: The parachute animation is not an element of the aircraft visual model and controlled separately. There is a limitation in Flight Simulator X how precise the movement of objects can be synchronized with each other. This leads occasionally to the effect that the visual frames of the aircraft position and of the parachute are differing by one frame. WinchX[!] Takes internally care of that, but if there is not sufficient CPU performance, or the CPU is distracted by background tasks, this lag can be more. If this is too distracting, the parachute animation can be switched off. The advantage is that any aircraft can be supplied with a parachute animation.

Q: I have Flight Simulator X, I installed also DotNet 2.0, but I cannot start WinchX[!]. All I get is a confusing error message that WinchX[!] has encountered some unexpected error and does not function properly any more. What can I do?

A: WinchX[!] requires Flight Simulator X Servicepack 2. Frequently it is communicated that flight Simulator X Acceleration Pack is including Servicepack 2. Functionally this is correct, unfortunately the library versions differ. Still you can use Acceleration pack in conjunction with WinchX[!]. In order to do this you have to uninstall Acceleration pack temporarily, install Servicepack 2, and then re-install Acceleration Pack. During re-install you are asked to uninstall Servicepack 2 again, accept that. The required library versions will remain on the system anyway.

Q: At the beginning of the launch I cannot see the winch, and after launch the winch and the dropped parachute are only visible if I am really nearby. Can the visibility be improved for both of them.

This is a matter of screen resolution and suppression of small objects in Flight Simulator X. Objects which are smaller than one pixel are not shown at all. With a screen resolution of 1024x768 and a cable length of 1200 m, the size of the winch on the screen is only around 1 pixel at a zoom level of 1.00. Some people have increased the pixel limit even further for performance reasons, which leads to suppressing of the display of the winch and the dropped parachute even earlier. After all, the dirty look of the parachute makes it hard to discover anyway, once on ground.

Acknowledgements

The author acknowledges the great work that has been done by a large number of persons in the FS community. In particular I would like to mention the entire SOAR community and the people at the Aerosoft Beta forum for spending their time during testing and producing helpful suggestions for improvements, especially Bert de Bruin, Joachim Schweigler and Dirk Böhm for proof-reading of the manual.

The French voice recordings of the launch commands are made available by courtesy of Norbert Behety.

Remarks

WinchX¹ was produced with Visual Studio® 2005 Express Edition VB.NET

For those who are interested in virtual soaring, a very active community is found at [SOAR](#), an internet location, dedicated to the development and proliferation of soaring in flight simulation.

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Appendix

AutoStart with “EXE.xml” file

Find FSX' start-up file for Add-on executables “EXE.xml”. Open the Start/Run (Winkey-R) and type %AppData%\Microsoft\FSX. Open the file EXE.XML in notepad and insert the bold black lines from below. Take care not to break any existing block of <Launch.Addon> ... /<Launch.Addon> clauses, but add before or right after. If you have installed WinchX! at the proposed location in the Modules folder, you can use the example from below directly. Otherwise you have to edit the underlined part, that it points to the actual location of WinchX.exe.

The next time you start Flight Simulator X, you will be asked to start WinchX!, and if you trust the source. If you click “Yes” on both, from then on WinchX! will start fully automatically together with Flight Simulator X.

```
<?xml version="1.0" encoding="Windows-1252"?>

<SimBase.Document Type="Launch" version="1,0">
  <Descr>Launch</Descr>
  <Filename>EXE.xml</Filename>
  <Disabled>False</Disabled>
  <Launch.ManualLoad>False</Launch.ManualLoad>
  .
  .
  .
  <Launch.Addon>
    <Disabled>False</Disabled>
    <ManualLoad>False</ManualLoad>
    <Name>WinchX!</Name>
    <Path>Modules\WinchX!\WinchX.exe</Path>
    <CommandLine></CommandLine>
    <NewConsole>True</NewConsole>
  </Launch.Addon>
  .
  .
  .
</SimBase.Document>
```


Replacing the Visual Model of the Winch

By default, WinchX¹ uses a stock vehicle from Microsoft Flight Simulator X as a substitute for a real launch winch model. It is however possible to use any other simulated object for displaying a winch. It is assumed, that this is available in the SimObjects directory tree. It is also assumed, that during launch winch and glider do have the same initial orientation.

First, the default model of the winch has to be deactivated first. Starting from Flight Simulator X installation directory, navigate to „**SimObjects\Misc\WinchXWinch**“ and open the file „**sim.cfg**“ with a text editor and identify the following entry:

```
title=WinchX
```

Modify this into:

```
title=WinchXdefunct
```

Now go to the directory containing the new winch model and open the file „**sim.cfg**“. Modify the line containing „title=...“ into:

```
title=WinchX
```

Now the new winch model is used for visualization.

Modification of the Voice Files

The voice files for the launch commands can be replaced by own voice commands as well. Some files must not be made longer than the original ones. All voice command files begin with the letter “V”, followed by a single letter “E”, “G”, and “F” for English, German, and French. The other audio files produce sounds, which are strictly synchronized with the launch sequence and cannot be changed easily.

The voice files in the English version are:

VECableOn.wav	:	Request for cable on, no limitation
VEOpenClose.wav	:	Command of the helper during cable-on, no limitation
VESlack.wav	:	Command of the telephonist to take up-slack, duration limited
VELive.wav	:	Cable-live report from the telephonist, duration limited
VEAllOut.wav	:	All-out report from the telephonist, no limitation

Version History

Version #	Release Date	Description
1.0	26.07.2009	Release