



Pilot's guide

PZL-104 Wilga 35A

INTRODUCTION

The PZL-104 was developed by the Development Design Office of the PZL factory (Poland). It was designed to be a sturdy and simple aircraft able to operate from small unpaved runways. The high wing has additional lift surfaces so it is a real STOL (Short Take-Off and Landing) aircraft that can fly at very low speeds and has very gentle stall characteristics.

The pilot and navigator were placed next to each other to make communication easier.

This also makes the Wilga a very good training aircraft. So many years after it was designed many are still in use all over the world to tow gliders or to take parachutist to drop altitude.



In many ways this is a real eastern European aircraft. It lacks many of the niceties that the mostly US aircraft made during the same period and it also has some quirky features like a starting system that uses compressed air. Unlike some aircraft that can be flown with two fingers the Wilga needs two hands. Many of the controls are large and rather cumbersome but that's one of the charms of the Wilga. They might not be very refined but they do work and in fact they work very well and reliable.



When you take your first flight in the Wilga you are in for a shock. The engine is very large and very loud. The Wilga shakes as the engine warms up (that does take a while) and there is a distinct smell of avgas and oil in the cockpit (you can add oil in flight!). You won't see much other than the sky as the large engine and massive propeller cause the tail wheeled aircraft to be tilted backward a lot. With the warmed engine the aircraft is ready to take-off. You need to keep a good eye on the temperatures as it overheats easy as you taxi to the runway. At take-off power it seems like the engine will explode, noise levels are incredible and it seems bits will fly off. It's hard to keep straight at low speeds without tail wheel steering. But after a very small run the aircraft transforms itself from a lumbering beast to a rather nimble aircraft. The flying characteristics are docile and it never seems out to surprise you. As long as you convert enough noise to speed it will fly very stable. Landing is a non-event as long as you keep the speed in mind. Throttle back and the massive drag and weight slows the Wilga down very fast.



CREDITS

Concept:	Stanislav Kolesnikov (Octopus Group)
Models/Textures:	Stanislav Kolesnikov (Octopus Group)
XML/ gauges:	Evgeny Podjachev (Octopus Group),
Flight modeling:	Stanislav Kolesnikov (Octopus Group)
Project Management:	Stanislav Kolesnikov (Octopus Group) Mathijs Kok (Aerosoft)
Manual, documentation:	Kristina Ageeva (Octopus Group) Mathijs Kok (Aerosoft)
Sounds:	Kolesnikov Stanislav (Octopus Group)
Images:	Nick Churchill
Installer:	Andreas Mügge (Aerosoft)
Testing:	Good folks who will all be getting a free copy

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Aerosoft GmbH
Lindberghring 12
D-33142 Büren, Germany
www.aerosoft.com
www.aerosoft-shop.com

SYSTEM REQUIREMENTS

- Windows XP, Vista, 7 (fully updated)
- Microsoft Flight Simulator FSX (with SP2 or Acceleration Pack)
- Dual Core CPU
- 2 GB RAM internal memory
- 512 MB graphic card
- Adobe Acrobat® Reader 8 minimal to read and print the manual ⁽¹⁾

⁽¹⁾ Available for free, download at: <http://www.adobe.com/prodindex/acrobat/readstep.html>

INSTALLING

After downloading the file unzip and start the setup.exe file. At the end of the installer the Aerosoft Launcher tool will be installed. This allows you to register the product and get easy access to the manuals, updates etc. Appendix A has more information on this.

REMOVING THE AIRCRAFT FROM YOUR SYSTEM

Never remove the product manually, always used the control panel applet to do so. Failing to do so could create serious problems.

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.

<http://forum.aerosoft.com/>

If you prefer email support you can reach us at support@aerosoft.com. Do be aware that email support is as fast as forum support.

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.



CONSTRUCTION

The PZL-104 I has a high mounted wing that includes slot flap drooped aileron and fixed wing slats. The fuselage is made up from a semi-monocoque metal frame with partially fabric covered panels. The power plant consists of the radial reciprocating air-cooled engine AI-14RA with two-blade rotor controllable pitch US - 122000. The twin fuel tanks are in the wings. The cockpit is closed, four-passenger, with dual control, has the big glass areas for better visibility and has two removable doors. Equipment differs but most aircraft are equipped with basic navigation and communication radios.

AIRCRAFT DATA

DIMENSIONS

- | | |
|-----------------------------|-------|
| • Length, m | 8,1 |
| • Wingspan, m | 11,12 |
| • Wing area, m ² | 15,5 |
| • Height (with antenna), m | 2,96 |

PERFORMANCE

- | | |
|---------------------------------------|-------------------------------|
| • Maximum speed (low altitude), km/h: | |
| <i>Maximum power</i> | 200 |
| <i>Maximum continuous power</i> | 185 |
| • Service ceiling, m | 4000 |
| • Ferry range (km): | 510(H = 500 m, V = 120 km/h) |
| • Flight duration(h/min): | 4:20(H = 500 m, V = 120 km/h) |
| • Liftoff speed, km/h: | 90 |
| • Takeoff run, m: | 150-160 |
| • Landing speed, km/h: | 100 |
| • Rolling distance, m: | 220 |

ENGINE DATA

Engine type: AI-14RA (nine-cylinder, single-row, air-cooled)

- | | |
|-------------------------|----------------------------------|
| • Takeoff output, h.p.: | 260-2% |
| • Rate power, h.p.: | 220-2% |
| • Engine weight, kg: | 197+2% |
| • Tanks capacity, l: | 180 |
| • Applied fuel: | aviation petrol B-70 or B-91/115 |
| • Oil quantity, l: | max16/ min11 |
| • Applied oil: | MS-20 or MS-22 |

PROPELLER DATA

- | | |
|-------------------------------|-----------------------|
| • Prop type: | US-122000(two-bladed) |
| • Prop direction of rotation: | left |

THRUST RATINGS

Thrust Rating	RPM	Pressure kp/cm ²			Temperature°C		Fuel Consl/h
		Manifold	Fuel	Oil	Engine	Oil	
Take-off Power	2350 ±1%	35 ±10%	0.2<>0.5	4<>6	120<>230	30<>75	80-85
Rate Power	2050 ±1%	30 ±10%	0.2<>0.5	4<>6	120<>230	30<>75	70-75
Cruise Rating I	1860 ±1%	680 ±15%	0.2<>0.5	4<>6	120<>230	30<>75	60-65
Cruise Rating II	1730 ±1%	630 ±15%	0.2<>0.5	4<>6	120<>230	30<>75	55-60
Idle	<500		>0.15	>1.5			

LIMITS

- Max take-off weight, kg 1350
- Max take-off weight, kg 1250
- Max landing weight, kg 265
- Maximum permissible operation speed, km/h 265
- Maximum speed (full power), km/h 200
- Maximum speed (max continuous power), km/h 185
- Maximum flap extended speed, km/h 130
- Maximum over load:
 - positive G* 3.5
 - negative G* -1.5
- Maximum bank angle, degrees 45
- Maximum number of gliders in tow 2
- Maximum weight of gliders in tow kg:
 - two* 1125
 - one* 650
- Maximum wind speed, m/s:
 - front wind* 15
 - beam wind* 3
- Maximum safe without door (parachute operations) 200

Do not operate engine at max rated power for more than 5 minutes!

AIRCRAFT SYSTEMS

OIL SYSTEM

The oil system is used for lubrication, cooling and is used by the propeller control mechanism. It consists of oil tank, oil filter, oil cooler (with a louvers air flow control mechanism controlled by a turn knob in the cockpit), engine driven oil pump and a cockpit indication for the oil pressure and oil temperature. Proper use of the oil cooler is important and oil temperature should be monitored closely. It is important that oil cooling and engine air cooling should be used together and not working against each other.

FUEL SYSTEM

The fuel system provides the engine with fuel and consists of two wing mounted tanks (each with a fuel level indicator), hand operated primer pump, fuel selector switch, small feeder tank and a fuel filter. The primer pump is used to prime the engine with fuel if it has been off for some time. Normally 3 pulls are enough. When the engine runs the primer pump should be locked (turned horizontal). When total fuel load is below 30 liter the fuel selector has to be at L/R to ensure a reliable fuel flow. The Wilga will use around 55 l/h in cruise.

HYDRAULIC SYSTEM

The hydraulic system of the Wilga is very basic and only serves to operate the two (independent) wheel brakes. It's a fully closed system without any pressurization.

PNEUMATIC SYSTEM

The pneumatic system is used to start the engine and consists of two pressure vessels, a main control with manometer, air and condense filters and a small engine driven compressor. The system can be pressurized on the ground with a standard compressor (up to 50 kp/cm²) and will be pressurized in flight by the engine driven compressor.

ELECTRICAL SYSTEM

The electrical system is used to provide instruments, radios and engine ignition system with power. It consists of a 24,5 volt battery, engine driven generator and an electrical bus divided in 12 separate sections, each protected by a fuse.

RADIO

Mounted in the main panel is the R-860 transceiver for the 118.0 - 135.9 MHz frequency range. It's a basic radio set with an expected range of 100 km. Operation is simple, after switching the system on and waiting 2 minutes the frequency can be set with the MHz and KHz controls. The system is connected to the on-board communication system that activated with a separate switch.

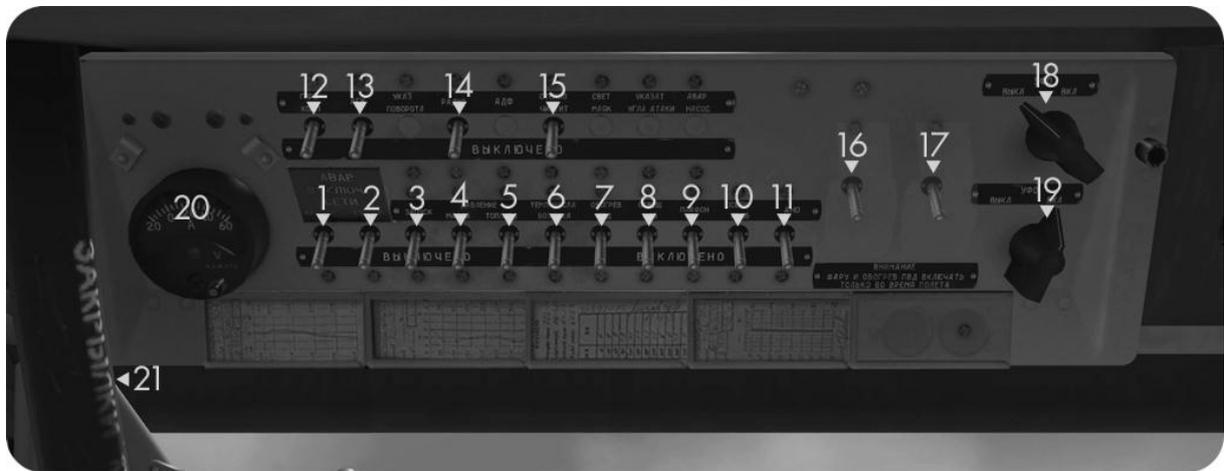
PANELS

MAIN PANEL



- | | |
|---|--|
| 1. Airspeed indicator | 16. "Distance/Narrow" switch |
| 2. Altimeter | 17. Start button |
| 3. Directional gyro | 18. Magneto switch |
| 4. Attitude indicator | 19. Fuel selector and fuel emergency shutoff valve |
| 5. Alternator caution lamp | 20. Mixture lever |
| 6. ADF indicator | 21. Primer |
| 7. Climb indicator | 22. Airborne radio station |
| 8. Clock | 23. Flight intercom |
| 9. Magnetic compass | 24. Air pressure indicator |
| 10. Oil temperature, oil pressure and fuel pressure indicator | 25. Air valve |
| 11. Manifold indicator | 26. Engine cowl flaps grip |
| 12. Mixture temperature indicator | 27. Oil radiator cowl flaps grip |
| 13. Engine temperature indicator | 28. Elevator trim wheel guard |
| 14. Tachometer | 29. Elevator trim indicator |
| 15. ADF (APK-9) | 30. Self-recording device |

OVERHEAD PANEL



- | | |
|---|--------------------------------------|
| 1. Battery switch | 12. Directional gyro switch |
| 2. Alternator switch | 13. Attitude indicator switch |
| 3. Ignition switch | 14. Radio switch |
| 4. Oil pressure indicator switch | 15. Wiper blade switch |
| 5. Fuel pressure indicator switch | 16. Excess-voltage protection switch |
| 6. Mixture temperature indicator switch | 17. Alternator protection switch |
| 7. Pitot heat switch | 18. Ultraviolet light switch 1 |
| 8. Cabin light switch | 19. Ultraviolet light switch 2 |
| 9. Dome light switch | 20. Volt / Ampere meter |
| 10. Devices light switch | 21. Lever flaps |
| 11. Nav-lights switch | |



FLIGHT GUIDE

COCKPIT PREPARATION

- Check that stick and rudder move freely
- Check that elevator trim moves freely then set neutral trim
- Set altimeter to airport altitude
- Check (or set) the clock
- Check free movement of throttle and propeller lever
- Check the fuel selector control can move then set to L+R (fuel selector has four position: CLOSED/LEFT/BOTH/RIGHT/CLOSED)
- Check that engine cowl flaps and oil radiator flaps can be fully operated
- Open air valve and check that pressure is 50 Psi or more

NOTE: do not check radio and other electrical equipment extensively until engine runs at 1300 RPM to avoid discharging the battery.

- On overhead panel switch battery, alternator, oil pressure, fuel pressure, oil temperature and air temperature on
- Check battery voltage under load
Switch navigation lights on for at least 10 seconds and push button on volt/ampere meter, voltage must show at least 24 volts.
- Check ADF set correct
- Check transceiver set correct
- On overhead switch gyro horizon on
After 2 minutes unlock the gyro horizon using the arrestor knob on the gauge, check arrestor indication is not shown
- On overhead switch gyro compass on
Set the correct heading and after 2 minutes unlock the gyro compass using the arrestor knob on the gauge, check red indication is not seen

BEFORE ENGINE START

- Check area around aircraft is clear of people and equipment
- Close engine and oil radiator shutters
- Check fuel selector is in position L+R
- Set air valve open (using mouse wheel)
- Mixture lever to full rich (fully in)
- Check starter switch is off
- Prime 3-4 times (use mouse wheel to turn control fully vertical and click to pump, then turn lock). Do not prime more than needed.

ENGINE START

- Crack throttle two centimeters
- Pull stick back

- Magneto switch to 1+2
- Starter switch to on for 2 seconds
- After engine starts:
Establish 900-1000 RPM
Check oil pressure reaches 1,5 Kg/c -> if not stop engine

WARMING UP

- Maintain 900-1000 RPM until oil temperature starts to rise then
- Slowly raise RPM in one minute steps (1200, 1400, 1600, 1800 and finally 2000 RPM) until cylinder head temperature is at least 120 C° and Oil Temperature is at least 30C°
- After engine is warmed up check the propeller controls (fully travel) to ensure it works and is warmed up

To stop the engine:

- Run engine at 1900-200 RPM for 30 seconds to clean the plugs
- Reduce RPM to 600-700
- Magneto switch to off
- Throttle smoothly to full open
- When engine is stopped:
 - Throttle back to idle
 - Fuel selector closed
 - Switches off



TAXI

- Check engine instruments, open radiators when engine runs hot
- Request taxi clearance when needed
- Increase throttle to 1300 RPM to start taxi, check that brakes are functional
- During taxi:
 - Maintain 7-10 km/h, reduced while cornering or when wind is above 2 m/sec
 - Keep stick back
 - Use smooth short braking action to avoid the tail rising
- At the holding point:
 - Brake test with full power (stick back) aircraft must stay in position
 - Check runway for obstacles
 - Check circuit for landing aircraft
 - Set flaps for take-off at 21°
 - Switch pitot heat on
- Request permission to enter runway (when needed)
- Line up and stop, then:
- Check trim is in neutral
- Check compass and gyro compass are in alignment
- Check mixture is full rich (fully forward)
- Open engine and oil radiators
- With brakes on, slowly increase RPM to 1900-2000 to clean plugs

TAKE-OFF

- After take-off permission (when needed is received)
- Check engine instruments
- Increase RPM to 2350 with stick kept back and release brakes
- At 65-80 km/h allow tail to lift
- At 90 km/h smoothly lift off, achieve 20° nose up attitude
- Increase speed to 115 km/h
- At 50 meter AGL
 - Retract flaps
 - Increase speed to 120 km/h and
 - Set maximum continuous power (2050 rpm),
- When needed at 100 meter AGL
 - Reduce power to high cruise setting (1860 rpm)

CLIMB

- Standard climbs:
 - 2050 rpm
 - 30 kp/cm² manifold pressure
 - 120 km/h
 - Cylinder head temperature not over 240 °C
 - Oil temperature not over 85 °C
85 °C is allowed for not more than 15 minutes, then reduce to 50-60 °C
 - Oil pressure 4 - 6 kp/cm²
 - Fuel pressure 0.2 - 0.5 kp/cm²
- Monitor engine instruments carefully
- When temperatures are too high open engine and/or oil radiators
- Expect to reach service ceiling (3960 meters) after 48 minutes
- Expect vertical speeds between 4,6 m/s at sea level and start power down to 3.8 m/s above 2000 meters

For an increase in power: increase rpm then increase manifold pressure

For a decrease in power: lower manifold pressure then lower rpm

CRUISE FLIGHT

- As soon as cruise altitude is reached the aircraft will be configured to cruise setting
- Fast cruise:
 - 1860 RPM
 - 665 - 695 MP
 - 160 - 165 km/h
- Slow cruise:
 - 1730 RPM
 - 615 - 645 MP
 - 145 - 150 km/h
- Airspeeds:
 - Minimal = 108 km/h
 - Maximum = 220 km/h
 - Maximum in turbulent air : 140 km/h
- Optimal engine variables:
 - Cylinder head temperature : 140 - 210 °C
 - Oil temperature : 50 - 75 °C
 - Oil pressure = 4 - 6 kp/cm²
 - Fuel pressure = 0,2 - 0,5 kp/cm²
- Every 15 minutes set rpm to 1500 (using propeller controls)

DESCENT

- Maintain 3 - 4 m/s sink rate (with passengers do not exceed 3 m/s)
- Optimal airspeed between 130 and 150 km/h
- Check engine variables

- Cylinder head temperature : 140 °C
- Oil temperature : 30 °C
- Inlet temperature : 10 °C
- When temperatures drop below these values, increase power.

LANDING

GENERAL

- Three point landings are standard
- Landings can be done with flaps at 0°, 21° or 44° depending on airfield and wind

NORMAL LANDING WITH 21° FLAPS

- Circuit is flown at 140 - 150 km/h
- Do not exceed 30° bank
- Final approach is flown at 120 - 130 km/h
- Set propeller pitch to minimal on final approach
- Start flare at 5 meter above ground
- Landing speed at 1300 kg
 - Flaps at 0° : 110 km/h
 - Flaps at 21° : 102 km/h
 - Flaps at 44° : 95 km/h
- Achieve three point landing attitude at 0.25 m above ground
- Expect the aircraft to drop to the ground fast, but this period of horizontal glide is very important.
- Maintain direction with rudder first and wheel brakes later
- Avoid strong braking to avoid the propeller hitting the ground



LANDING WITH 0° FLAPS

- Landing distance is at least 30 m longer
- Final approach is flown at 140 km/h
- Landing speed is 110 km/h

LANDING WITH 44° FLAPS

- Landing with 44° flap is used:
 - On short field landings
 - On soft, sandy or snow covered terrain
 - To avoid obstacles
- Prevent the aircraft pitching up when extending flaps

PARKING AND STOPPING ENGINE

- While taxiing to the parking location monitor the engine temperatures
- Avoid running long duration on low throttle settings that could foul plugs, short burst of higher power settings will clear plugs

To stop the engine:

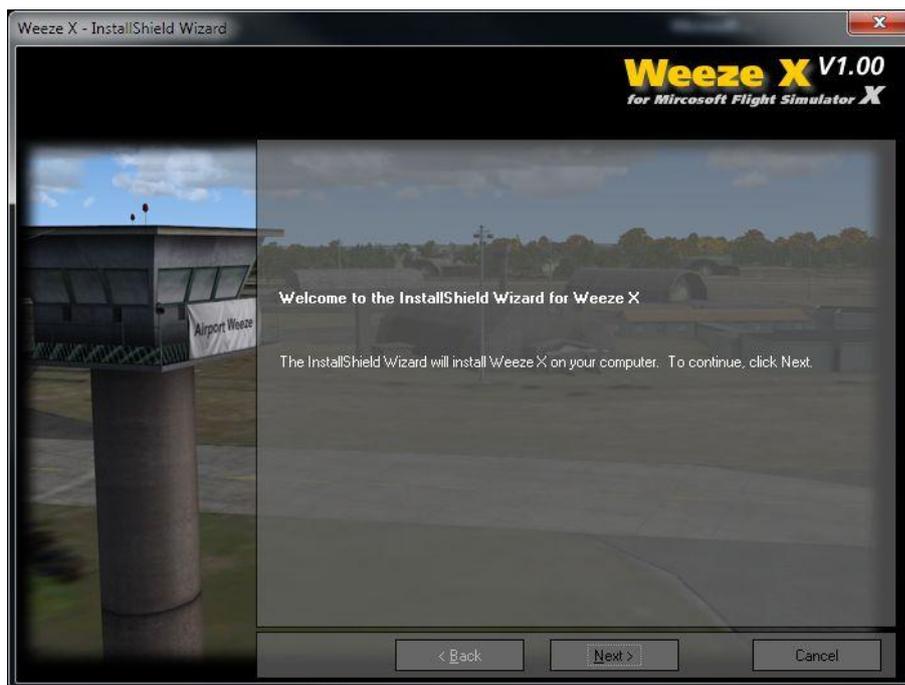
- Run engine at 1900-200 RPM for 30 seconds to clean the plugs
- Reduce RPM to 600-700
- Magneto switch to off
- Throttle smoothly to full open
- When engine is stopped:
 - Throttle back to idle
 - Fuel selector closed
 - Switches off

APPENDIX A: AEROSOFT LAUNCHER

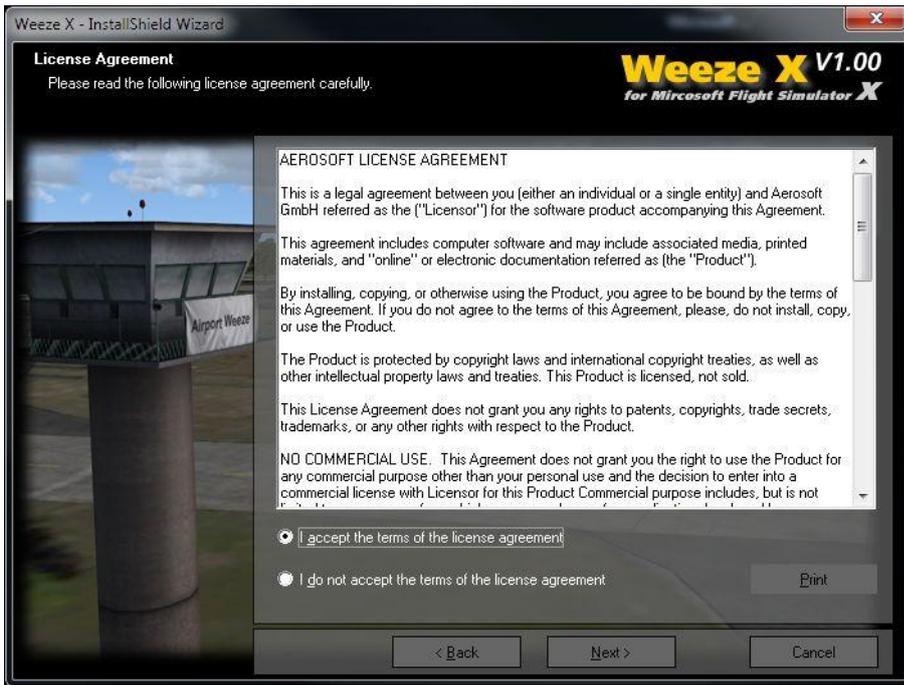
The new installer and launcher system has advantages for Aerosoft (it protects our copyrights better) and for the customers (makes it easier to see what is installed and what updates are available. Using the new system is simple and only adds a few steps to what was used before. There are however four things that you have to keep in mind.

- You need to **be connected to the Internet while the installing and activation takes place** (there is an offline option via email, more on that later).
- You need to be **logged on as Administrator** on your system.
- You need to understand that **the product needs to be activated before it can be used**. Scenery products will just not show until the files are activated and aircraft products will have other limitations.
- You need to know **the installed files are customized** to your order. Multiple files of the product will be marked so if they ever ended up on the Internet we know where they came from.

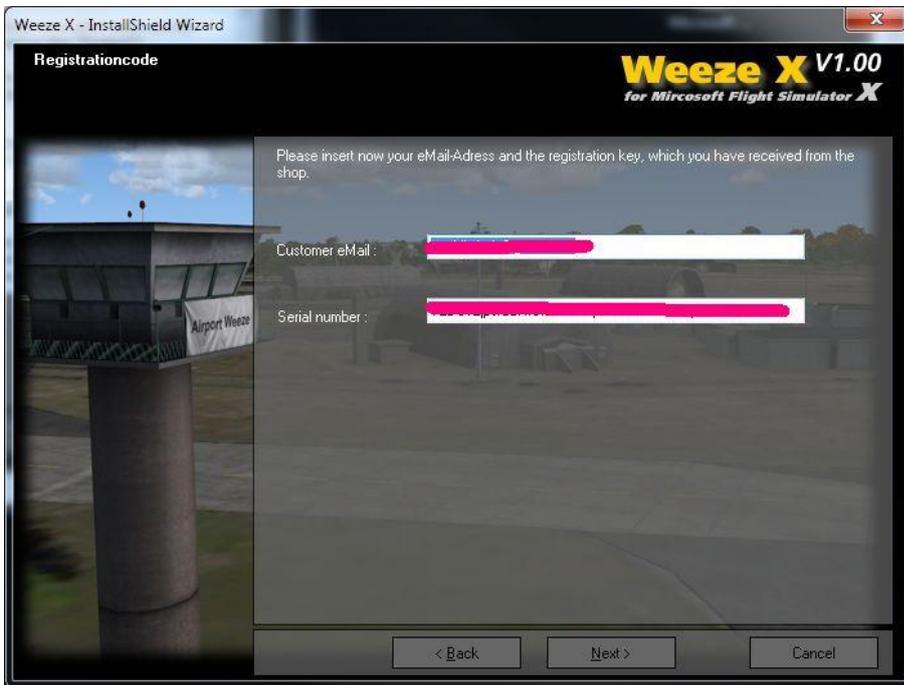
After the SETUP.EXE is started you will see this screen (of course the actual product might differ):



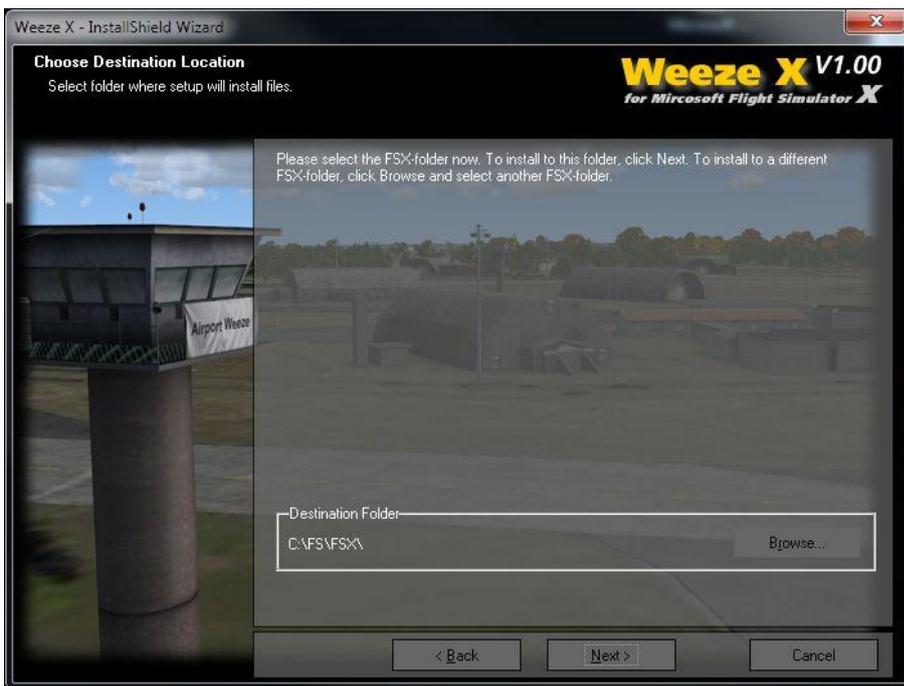
Click [Next] to continue, you expected that right?



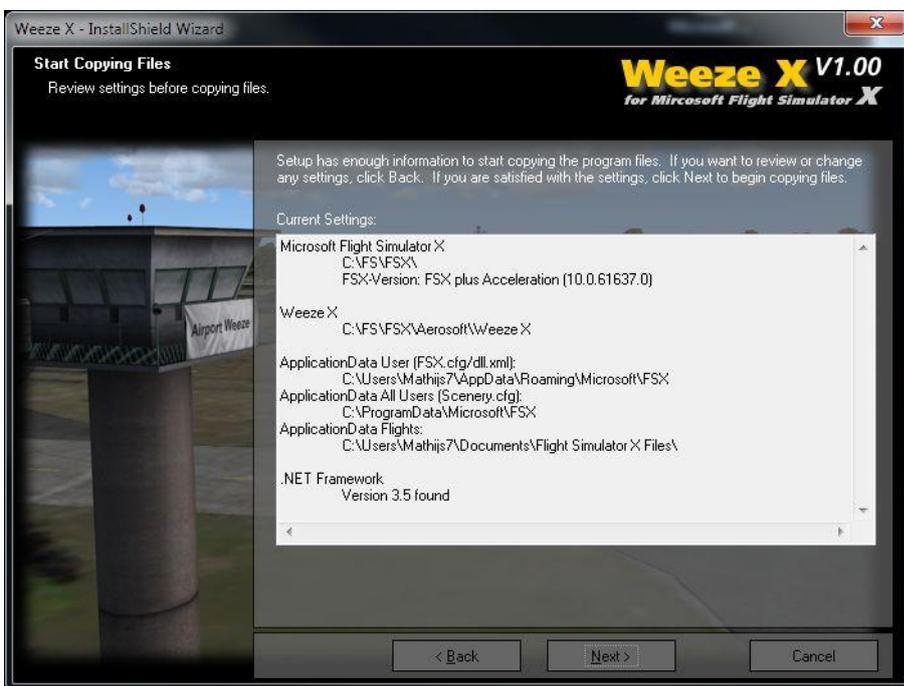
Now you have to accept the license agreement. Easy to click [I accept....] but you might like to read the text at least once, okay?



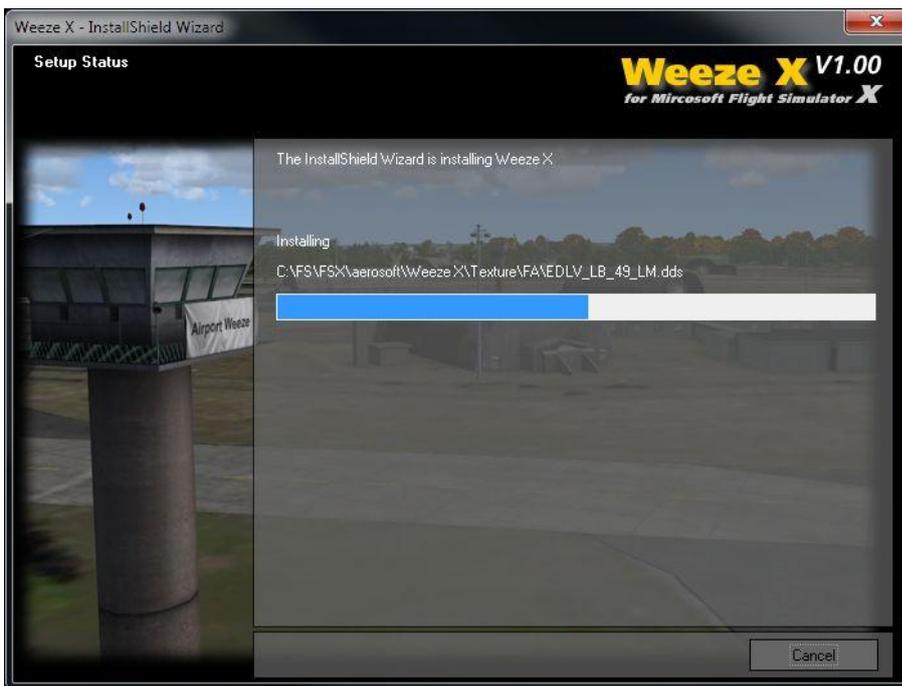
Enter your email address and the serial code we have sent you.



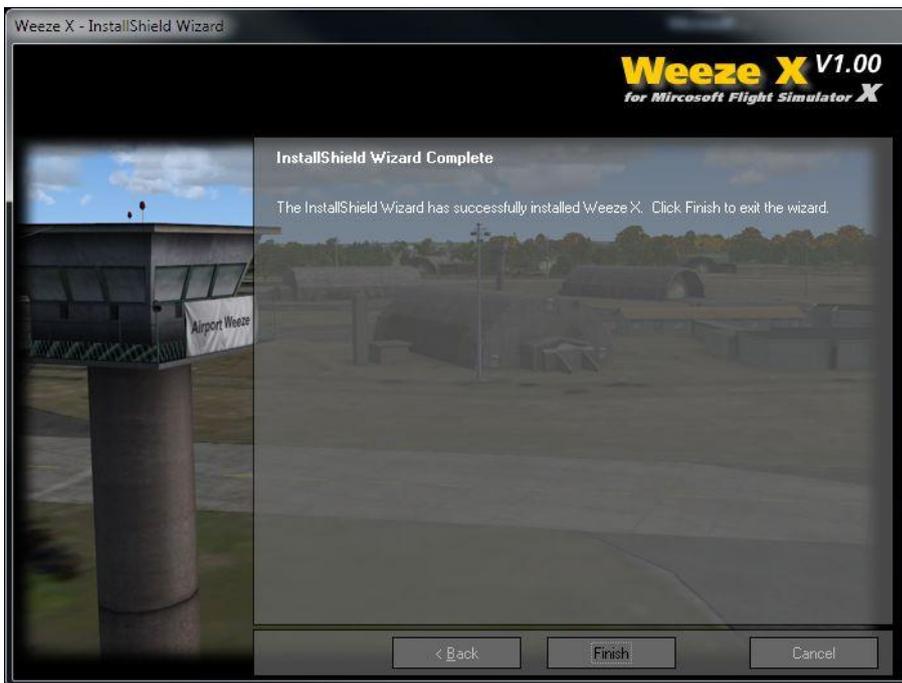
A few screens that tell you what will happen. Click [Next] unless you see an obvious issue.



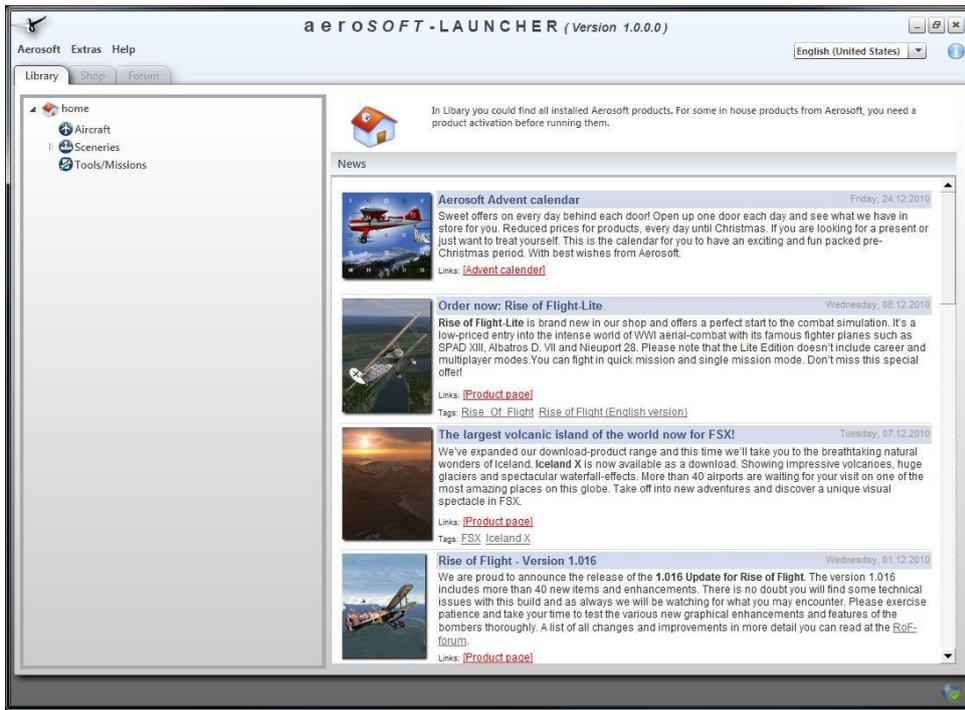
One more...



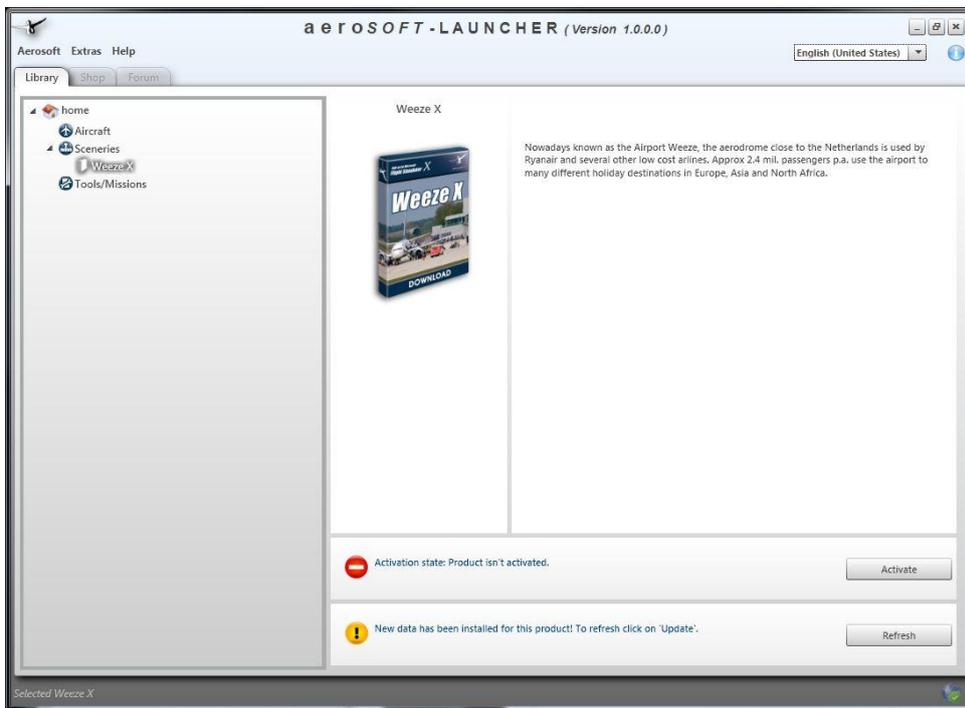
The files are now installed. Will take a few seconds.



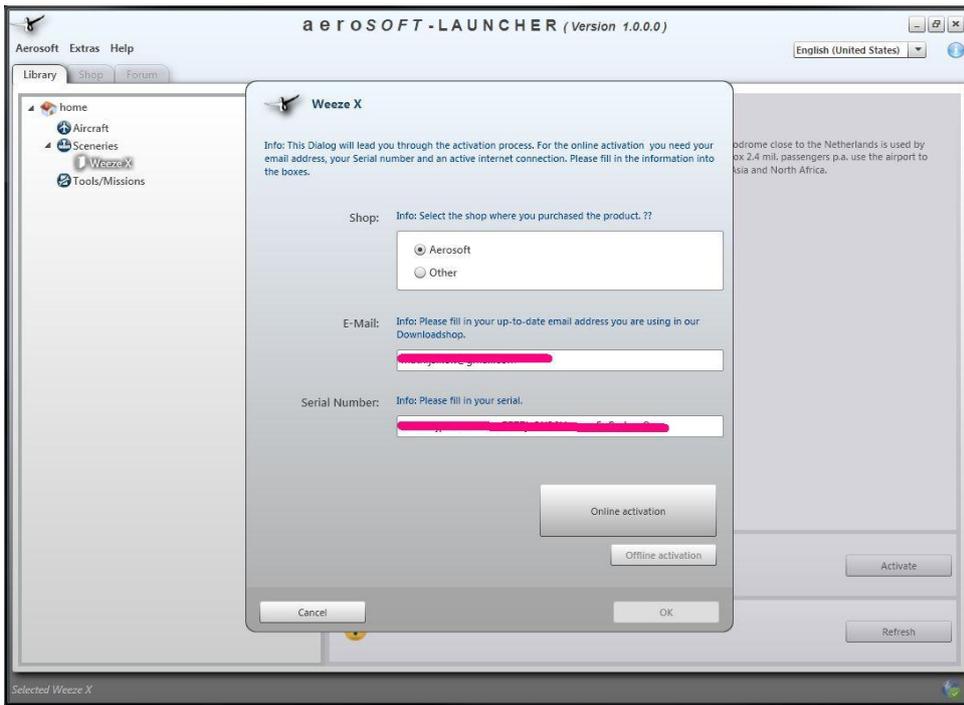
And you're done. Click [Finish] to close the installation part of getting the software in FSX. Now Aerosoft Launcher will start and you will see this.



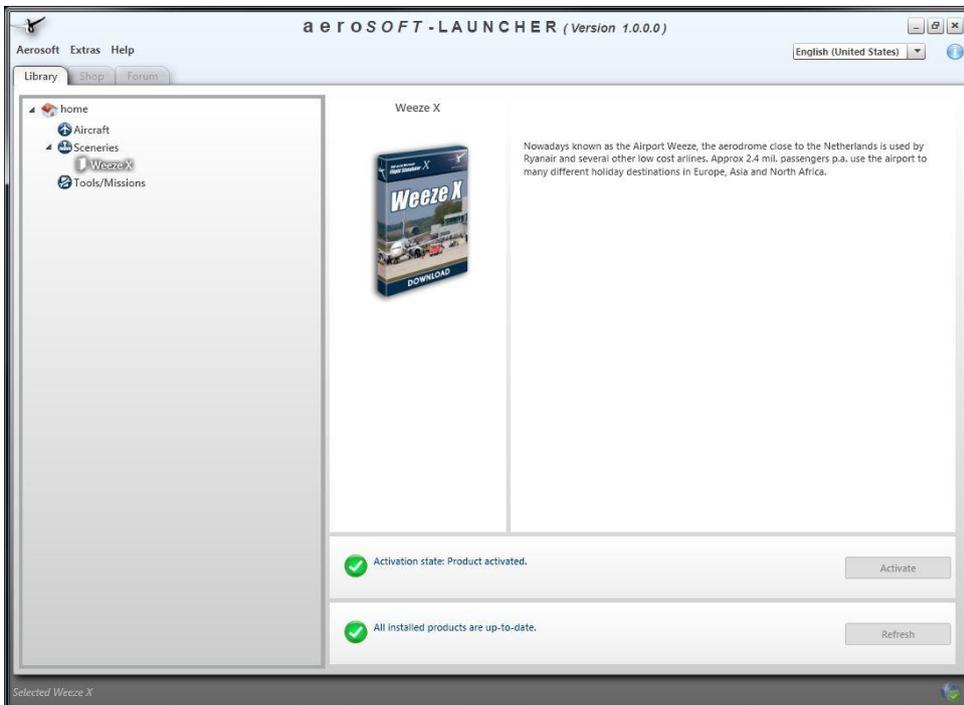
Click on the [Sceneries] to open that section of the product tree.



And there is the product we have just installed. By clicking on the [Activate] button the launcher will activate the software.



Select the download shop you used, enter the email address used when buying and the serial code and click [Online activation]. You will see the program contact the server and do its work. Note that only appropriate information is sent. Product code, email address etc.



Eh voila, the product shows in green and you can now start FS to start enjoying the product.