Simulated Soaring Manifesto

A MSFS 2024 native hang gliding experience

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The Hang Gliding Files

The hang gliding files is a project of the NextWave Mobile Apps company. We are building tools, aircraft, models, whatever is necessary to fly hang gliders in the MSFS 2024 flight simulator.

We want this to be as realistic as we possibly can.

But we also must leverage and bend to the environment that we are trying to do that in. This simulator gives us a great simulated Earth with complete geography, photogrammetry, weather and physics engine. It lets us explore this world as an Avatar. That Avatar happens to be an aircraft and all our interactions with this environment are as if we were this avatar. That makes it a flying simulator (as opposed to say a fishing simulator).

But a hang glider (flex wing types especially) does not fly or operate like any other aircraft other than they move the air and use aerodynamic physics to “fly”

What hang gliders must do that no other aircraft does:

- **They can be foot launched**. They have no motor and must provide their own momentum to reach flying speeds.
- **They can be foot landed**. They must land slow enough that the human (the limiting factor here) can use their feet as landing gear without getting hurt.

- **They do not have to use runways.** They can of course, when towing, but generally not. Any hillside, mountain top, cliff, sand dune, etc. can be used. This opens the entire planet for exploration.

What flex-wing hang gliders must do that no other aircraft does:

- **The pilot moves**. In all other aircraft, controls move and make the aircraft perform maneuvers like roll, pitch and yaw and therefore, the control stick is animated, and the pilot's perspective is fixed. That just does not happen when the pilot himself is the control mechanism. The pilot's perspective must move when control inputs are made. This is visually what really happens

And to make that all happen realistically, is the basis of this entire project.

Let me tell you how we do it.

We had to invent a few things…

Natively, the simulator can do none of these things we have identified as being hang glider specific. **Not one**. No problem let's go through some concepts and how we manage them.

Controls

These are the general input controls we need to map to a controller and what they mean to a hang glider aircraft. We will have a complete manual on how to configure and use these controller mapping as this just represents the concepts.

In the air

- **Ailerons**. The is roll control. Mapped as normal. Translates to pilot moving side to side.
- **Rudder**. This is yaw control. Mapped as normal. Translates to pilot pivoting horizontal.
- **Elevator**. This is pitching control. Mapped as normal. Translates to pilot move forward/backwards within the control bar.
- **Gear up**. This translates to the pilot's feet going into the harness.
- **Gear down**. This translates to the pilot feet coming out of the harness.
- **Spoilers up**. This translates to the pilot being in the upright position
- **Spoilers down.** This translates to the pilot being in the prone position. (normal flying).

On the ground (not towing)

- **Ailerons**. Does nothing on the ground
- **Rudder**. Will rotate the glider bearing.
- **Elevator**. Will accelerate the glider (forward/backwards) on the current bearing. This is basically walking and/or running.
- **Gear up**. Will set the glider on the ground. It will not move but can rotate. Effectively the brakes.

- **Gear down**. Will pick the glider off the ground. It can now move.
- **Spoilers up**. It has no effect but once launched it will.

On the ground (wire man mode)

The “wire man mode” is the state of being on the ground, ready to launch, but the wind is too strong to maneuver the glider. Hang gliders have an extremely low wing loading and can be easily overwhelmed by wind. In real-life situations, this is accomplished by using helpers to help control the glider on the ground in windy conditions. These are called “wire men”. When in this condition, the glider is effectively flying but it is being held down to the ground by the helpers until the pilot signals launching. The pilot provides some forward momentum (maybe) and is instantly off the ground. Makes for some spectacular launches.

- **Ailerons**. Reacts as if flying
- **Rudder**. Reacts as if flying
- **Elevator**. Forward will trigger launch.
- **Gear up**. Will exit mode.
- **Gear down**. Will exit mode.
- **Spoilers up**. It has no effect but once launched it will.
- **Spoilers down**. It has no effect but once launched it will.

> *SPECIAL KEYS*

- **WIRE MAN MODE KEY**. Will put you into this mode on launch.

On the ground and in the air (towing)

Towing a hang glider is basically flying but is still a special condition for the glider. You are connected to a tow vehicle (aircraft or winch). You can release from the tow at any time. You can request to be towed at any time if you are on the ground and on a runway (any runway, anywhere).

- **Ailerons**. Normal
- **Rudder**. Wagging the rudder (going left/right) will initiate the tow. Pilot will not rotate.
- **Elevator**. Normal
- **Gear up**. Will exit the tow when you are on the ground, Nothing in the air.
- **Gear down**. Will exit the tow when you are on the ground. Nothing in the air.
- **Spoilers up**. Normal
- **Spoilers down**. Normal.

> *SPECIAL KEYS (standard MSFS 2024 events)*

- **CALL FOR TOW**. Will put you into this mode if you are on the ground, on a runway.

- **RELEASE FROM TOW**. Will disconnect you from the tow line anywhere, any time.

Camera Views

Normally, sim pilots don't mess with the camera view much. You look out the windows, cool. You look at the instrument panel, cool. Sometimes, you might even watch your flight from an external point of view. Great for pictures and stuff.

But for hang gliders, they are not inside or outside. There is no cockpit or instrument panel. There is just the first-person view, and it is dynamically changing its position, all the time.

The pilot in hang glider is looking around at his/her surroundings as part of the act of flying the aircraft. The pilot position changes with control movements (the pilot is the control stick essentially). The pilot position changes on the ground, It changes with in-air pose changes (i.e. spoiler positions). This creates an issue within the sim, because first person movement while flying is not really supported.

Virtual Reality and IR Head Tracking If you use these types of devices, we do not do anything to the first-person camera view. Everything here works normally. Your head movement alone is translated into camera movement by these devices. You do not see roll, yaw or pitch movements directly in your headset.

This could be done in 2 different ways.

1. **Control inputs move your headset camera**

> *This would translate some actions or input from any outside controller (like a game controller, VR controller(s) or joystick that would then modify the viewpoint of the headset camera.*
> *This will likely not be a pleasant experience without a lot of thought put into implementing.*

2. **Headset movement creates the control outputs (simulates control input)**
   This would use the actual movement of the headset relative to some external point (such as the VR controller(s)). The VR camera would never be modified but the pilot using head movement becomes the control inputs to the simulator.
   This creates the spatial issues of keeping relationships between you (your head/headset) and the input devices position relative to you (your headset). Will work fine in a physical simulation environment, but not that good sitting at your desk or on the couch.

We do not do either. For VR glider pilots just leaving the VR view alone will be more than enough immersion to get enough feedback and great views and immersion.

We will probably be enhancing the MSFS 2024 VR experience as we progress through this project!

For Everybody Else

We want to make sure that anyone flying the sim can get a realistic view from within the hang glider, even if not in VR. We do this by creating a moving camera first person mode to simulate the pilot moving within the control frame. When in this mode, you cannot access instruments buttons or look around. When out of this mode (back to fixed cockpit view), you can interact with instruments and use the controller to look around (any direction). Whatever way you are looking remains that way when you switch modes back to first person camera mode. It is very easy to do and makes for a very realistic hang glider pilot view.
The position of the camera also changes based on the pilot position state. If you are on the ground, upright or prone,

yawing left or right, etc.
Again, those pose positions cannot be done in VR easily without causing visual discomfort but add greatly to simple flat panel sim viewing.

You only need to map the following to your controller to switch camera modes:

- **Toggle View Mode.** This event will toggle between view modes. This is the variometer on/off event

First Person View.

- Camera moves with control inputs
- Instruments do not respond to interactions

Instrument View.

- Camera is fixed (looking forward) and does not move with inputs.
- Instruments can be interacted with.
- **Reset View**. This event is a standard MSFS 2024 event that should be mapped.
- **Move Camera**. This is a joystick like control that can be mapped directly in MSFS 2024

Game Controllers

We HIGHLY encourage pilots flying hang gliders to just use a game controller and not try to use standard aircraft controllers such as joysticks, pedals and HOTAS. These will of course work, but this is really just simple flying and trust us when we say, you will like flying these types of craft using the controller.

We are also targeting the console players as well and they only have the game controllers (in general) to use.

We will be shipping controller mappings for both game controllers and joystick controllers with each aircraft.

This is just a short description of how to configure controllers and how and when to use them. Please download the completed controller documentation for detailed information about what you can do with your controllers.

Ground Handling

MSFS 2024 expects that you ALWAYS launch from a runway and this is true even for gliders (you need to be towed or winch launched). And for 99.99999% of all pilots, this is perfect, but it does not work for a foot-launchable aircraft (no motor, no tow). We need to be able to navigate the world (in other words, move without any externa engine). This is your feet for a hang glider.

To accommodate this, we wrote our ground handling module code. It is automatically included in every hang glider. It looks for our controller inputs and keeps track of the state of the glider in the air, on the ground or on tow. It tracks the state of the camera view and moves the camera position if indicated. It controls everything that we have discussed so far.

This is a C++ WASM gauge, and it has a visual representation of information shown on the base bar of the glider. There is no interactions available. It just shows you what your eyes can see.

It shows ambient information that the pilot can see or feel just by being in the sim.

- Temperature
- Am I on a runway
- What type of surface am I standing on
- How fast am I moving relative to the ground?
- Am I in a cloud?
- Can I tow from here?

Teleportation

This module is also necessary to teleport your glider to any location on Planet Earth. It reads variables from the simulator and if certain variables are set, they are used to move the glider to a specific position and altitude. From there, It is up to you to get to a launch and get into the air. Anyone can populate these variables, and it will work. You can do it manually, build 3rd party tools to do it, or use our included EFB application, The **Widget.**

This is just a short description of this instrument and how it works. Please download the completed instrument documentation for detailed information about what you can do with this application.

Wind Indicators When you are on the ground or in the air, you need to be able to see (and hear) what the wind is doing relative to your aircraft.

We provide multiple ways that you can see what the wind is doing:

- **Animated Tell Tail.** This is an animated wind direction and speed indicator that is usually located on the glider's front wires. This is visible when on a launch and indicates relative wind strength and direction. This is NOT like a yaw string yarn on a sailplane that indicates slips and coordinated turns. This acts like a windsock when on the ground.
- **Windsocks.** The simulator generally provides windsocks at every airport, which is great when you are at an airport. When flying from hill side or other defined hang glider site launch, we will provide a windsock with each of those.
- **Variometer/Glide Computer.** In real-life situations, it is very hard for an instrument to indicate ambient wind information (not air speed, but environmental wind conditions). But this information is very necessary for gliding distances and for safety. Our instrumentation always includes this information that usually the pilot must determine using environmental clues (that we won't have).

Variable Geometry indicator

Some gliders have a variable geometry mechanism. It modifies the span and nose angle and planform of the wing. IN FLIGHT, and it modifies the performance envelope of the aircraft with each change.

This is a C++ WASM gauge, and it has a visual representation of information shown on the inside of the downtube of the glider. It is just above the VG rope and cleat. The pilot can modify the value of the VG (in percentage) by clicking on the VG ROPE. This replicates how it is done in real life.

Variable Geometry controller mapping.

- The VG (if any) can be mapped directly to the FLAPS UP/DOWN events within the sim

This is just a short description of this instrument and how it works. Please download the completed instrument documentation for detailed information about what you can do with this application.

Wheels/Skids

Some gliders can have wheels or skids. Sometimes they are mandatory. Sometimes they are options. In every case, they increase the speed and impact of landings that are acceptable without incurring damages.

If you do not care about your flight score, you don't need to bother.

Variometer/Flight Computers

We include with every glider and/or variant a working variometer and/or flight computer. This depends on the glider model, but all instruments of every kind are included with the category of glider package. That means that any additional add-on mods or newly added gliders or variants have full access to all instruments provided.

Please review the specifications and documentation for each instrument as they can be varied in how they work and what they can do.

The standard variometer/flight computer is the Flytec 6030. This is based on the real-world version of this very popular hang gliding instrument, but it is not meant to be virtual copy.

The variometer position can be changed

The variometer can be positioned at any time, but you MUST be in the instrument camera view to make changes.

- **Left Downtube**. Clicking on the left strap will position the vario here.
- **Right Downtube**. Clicking on the right strap will position the vario here.
- **Center Basetube.** Clicking on the clamp nut will position the vario here.

The variometer tilt angle can be changed.

The variometer can be positioned at any time, but you MUST be in the instrument camera view to make changes.

- Clicking on the mount stem will toggle the tilt angle.

The variometer can be turned on/off at run time.

You can click on the on/off button (on the side of the vario) to turn the glider on and off as you wish.

The variometer position and tilt will be saved as your preference between flights and even between different gliders (of the same category).

The variometer is also an ICG flight logger

There is no need to use any 3rd party data logger. Our variometer will do that for you. After you land, you are given the option to export your last flight data into a file of ICG format. This can then be used to review your flight data in 3D using many available 3rd party tools.

This is just a short description of this instrument and how it works. Please download the completed instrument documentation for detailed information about what you can do with this application.

Electronic Flight Bag (the EFB)

A new feature for MSFS 2024 is the EFB. It is basically a tablet-style computer that is now part of the simulator itself. This is the preferred location for developers to add additional applications to sim pilots. It provides a clean, non-aircraft specific, non-developer specific interface to add-on utilities and applications.

EFB Applications

As for the writing of this document, we have only 1 EFB application.

The Widget The widget replaces the original MSFS 2020 tool bar widget application. It has the same functionality as the original, but it is implemented in a completely new way. The 2020 widget will not work with 2024 gliders and the 2024 EFB app will not work with 2020 gliders.

You can find the widget inside the EFB (any way you load it, it is up to you) by launching "**Hang Glider Sites**" app you find there.

The only purpose of this application is to help you find places to fly and to get you to those places. The simulator will only naturally find and take you to airports. And that is just fine if you want to tow into the air, but to foot launch or to go to exotic hang gliding sites, you are going to need to have some help.

Finding Sites to fly

We provide a database of world-wide flying sites that you search and use to get to launch! These sites are curated by THGF, but anyone anywhere can just create new ones by using our desktop app to build and deploy new sites.

Getting to the site (teleportation)

Once you have determined where you want to fly, you need to get there. This application allows you to teleport directly to any launch site in the database.

This is just a short description of this EFB application and how it works. Please download the completed application documentation for detailed information about what you can do with this application.

Launching

The MSFS 2024 simulator natively supports 4 ways of getting your aircraft into the air. You can start your engine and fly from a runway, you can be towed into the air using a tow plane (if you are a glider), you can simply slew (cheat) your glider into the sky, or you can choose to start mid-air right from the start.
Only the standard launch mechanisms (engine or tow) will create a flight log.

We support all the above (from a flight tracking perspective as well) but we also let you foot launch.

Foot Launches

To launch an aircraft is not an easy thing. Humans can only run so fast, and aerodynamics requires a minimum flying air speed and that is usually faster than the average human can run.

To overcome this, we must always launch into the wind as that reduces the difference between how fast we must run and how fast the relative air speed is that the glider sees. This is why a visual wind speed/direction indicator is so important.

Next, slope allows us to run faster as we can run faster down a hill with gravity helping. It is virtually impossible to launch on flat ground with no wind in a hang glider.

Sometimes, were we fly is so steep that running is not possible (cliff launches as example) and in these sites and situations we need to have structure called a ramp. Something built that allows us to do some running.

These requirements drive most of the functionality we need to add to the simulator to do realistic hang gliding.

> *SPECIAL KEYS (standard MSFS 2024 events)*

- **GEAR UP**. Standard event mapping. Will stop the glider from moving.
- **GEAR DOWN**. Standard event mapping. Allows glider to be moved.
- **JOYSTICK FORWARD.** Standard event mapping. Accelerate forward.
- **JOYSTICK BACKWARD**. Standard event mapping. Decelerate backward.
- **RUDDER**. Standard event mapping. Will rotate heading.
- **WIRE MAN MODE**. Standard event mapping of (X). Will enter special ground mode.

Towing

Towing a hang glider in the simulator is identical to how sailplanes are towed in the sim. There is no difference between a hang glider tow and a sailplane tow.

The only catch is that hang gliders fly much slower than most powered aircraft and the natively supplied tow planes can tow up hang gliders at unreasonably high speeds. Doable, but not realistic.

We recommend that you use a towplane specifically designed for towing hang gliders. We supply one for free to our Patreon membership. Or you can use any ultralight on the sim.

This is just a short description of simulator towing and how it works. Please download the completed towing documentation for detailed information about what you can do with this application.

> *SPECIAL KEYS (standard MSFS 2024 events)*

- **TOW RELEASE**. Will disconnect you from the tow line anywhere, any time.
- **CALL FOR TOW**. Will put you into this mode if you are on the ground, on a runway.
- **RUDDER WAGGLE**. Will signal to the tow pilot to start the tow.

Slew launching

You can of course just skip all the reality stuff and just go flying. You can use the simulator SLEW functions to just put the glider anywhere you like. Once you leave the slew mode, we will just interpret that as a launch event.

Drop in launching

The simulator allows you to just choose any location on earth (not a runway) and it will place your aircraft, flying, at a set elevation (AGL) at that spot. Another way to just start flying, and we support that too.

Weather

Hang gliding and all soaring really, is just a cool way to experience the weather. You are propelled by gravity and the only thing that can keep you from landing is either lift from the wind hitting obstacles and/or lift from rising air caused by heating (convection). That is it in nutshell.
Simulations of weather are very easy if you make them easy. Wind blows in this direction at this speed. You create perfect "weather" for your favorite ridge site. Make thermals happen in specific spots in specific ways based on temperature or cloud type. You create perfect thermals, easily found, always reproduceable, always predictable in location and strength.

Well, that is exactly counter to description of gliding and soaring. It does describe a car race game, if that is what you want. A racetrack built to conditions for my car. But hang gliders are not fast and won't go anywhere quickly, so what is the point?

Using Real Weather

Microsoft Flight Simulator 2024 implements a **global, physics-based real-weather system** built on data provided by **Meteoblue**, a Swiss meteorological company specializing in high-resolution numerical weather prediction. Public information confirms that MSFS 2024 continues the same core architecture used in MSFS 2020, combining **Meteoblue's NEMS forecast model** with **real-world METAR observations** to produce a continuous, three-dimensional atmospheric simulation.

Data Sources and Atmospheric Model

The simulator streams a full 3D atmospheric dataset derived from:

- **Meteoblue NEMS global forecast model**, which provides:
  - **Wind fields** at multiple altitudes
  - **Temperature and pressure** distributions
  - **Humidity, cloud water, and ice content**
  - **Storm systems, fronts, and synoptic-scale dynamics**
  - **Vertical motion, convection, and turbulence**
- **Airport METAR reports**, supplying:
  - Surface wind
  - Visibility
  - Temperature/dewpoint
  - Altimeter/QNH

    - Cloud layers near the ground

These two sources are blended to maintain **global continuity** while ensuring **local accuracy** at airports.

How the Blending Works

The Meteoblue model provides the **full volumetric atmosphere**, while METARs refine conditions near reporting stations. The simulator merges these datasets to avoid abrupt transitions and maintain a physically coherent atmosphere. This allows:

- Large-scale weather systems (fronts, jet streams, storms) to remain intact
- Local airport conditions to match real-world observations
- Smooth transitions between model-driven and METAR-driven regions

Use of AI and Machine Learning

- Meteoblue uses **machine-learning techniques** within its own forecasting pipeline to improve accuracy.
- MSFS consumes the resulting **forecast grids**, not the AI models themselves.

Thus, the simulator uses **AI-enhanced weather data**, but the weather engine itself is **physics-based**, not generative.

Rendering and Simulation

The atmospheric data is visualized using Asobo's **volumetric cloud and atmosphere renderer**, which simulates:

- Multi-layer volumetric clouds
- Light scattering and atmospheric optics
- Precipitation and storm structure
- Thermals, ridge lift, and turbulence
- Realistic transitions over time and space

This system ensures that the weather you see in the simulator reflects the structure and behavior of real-world atmospheric physics.

Real Weather Data Flow in Microsoft Flight Simulator 2024

The MSFS 2024 real-weather pipeline follows a structured, multi-stage flow from real-world atmospheric measurements to the final volumetric weather rendered in the simulator. The diagram below outlines each stage of the process.

Real-World Atmospheric Observations

- **Surface weather stations** (METAR, SYNOP)
- **Upper-air soundings** (weather balloons)
- **Satellite radiance measurements**
- **Radar precipitation scans**

- **Aircraft-based weather reports** (AMDAR, ACARS)

These raw observations feed into Meteoblue's global forecasting system.

Meteoblue NEMS Numerical Weather Prediction (NWP)

Meteoblue ingests global observations into its **NEMS atmospheric model**, which simulates:

- **3D wind fields**
- **Temperature and pressure**
- **Humidity and cloud microphysics**
- **Storm systems and fronts**
- **Vertical motion and turbulence**

The output is a **full-planet, time-evolving atmospheric grid**.

Meteoblue → Microsoft Weather Servers

Meteoblue transmits forecast grids to Microsoft's servers, where they are:

- **Packaged into MSFS-compatible tiles**
- **Time-aligned with METAR updates**
- **Optimized for streaming bandwidth**

This ensures the simulator receives only the data needed for the user's region.

METAR Integration Layer

Microsoft's weather servers ingest **real-time METAR reports** and blend them with the NEMS model:

- METAR defines **surface conditions**
- NEMS defines the **3D atmosphere above and around the airport**

The blending algorithm maintains:

- **Local accuracy** (visibility, wind, QNH)
- **Global continuity** (fronts, storms, jet streams)

MSFS 2024 Client Weather Stream

The simulator downloads weather tiles based on:

- **User location**
- **Altitude and movement**
- **Forecast time step**

Tiles include:

- 3D wind vectors

- Temperature and pressure fields
- Cloud water/ice content
- Precipitation type and intensity
- Turbulence and convection parameters

In-Simulator Atmosphere Engine

MSFS 2024's weather engine converts the streamed data into a live atmosphere:

- **Volumetric cloud rendering**
- **Light scattering and atmospheric optics**
- **Thermals and ridge lift simulation**
- **Storm structure and vertical development**
- **Dynamic transitions over time**

This produces the final weather you see and feel in the simulator.

Comparison: Real Weather vs Preset Weather in MSFS 2024

The simulator has **two distinct weather creation pipelines**:

1. **Real Weather Pipeline** — data-driven, streamed, physically modeled
2. **Preset Weather Pipeline** — user-defined, local, parameter-driven

They both feed into the same volumetric atmosphere engine, but the *inputs*, *logic*, and *updating behavior* are fundamentally different.

High-Level Comparison Table

System	Data Source	Atmosphere Structure	Updates	Strengths	Limitations
Real Weather	Meteoblue NEMS + METAR	Full 3D global model	Continuous streaming	Realistic storms, fronts, jet streams	Dependent on forecast accuracy
Preset Weather	User-defined parameters	Local procedural generation	Static unless changed	Full control, reproducibility	No global systems or real-world structure

Real Weather Pipeline (Data-Driven)

Real Weather uses a **multi-stage, external data pipeline**:

Key characteristic: The simulator is *not inventing* weather — it is *reconstructing* a real atmospheric state from external data.

Preset Weather Pipeline (Local Procedural Generation)

Preset weather bypasses all external data and instead uses **local, user-defined parameters**.

User Inputs

The user (or mission script) defines:

- Cloud layers (type, altitude, density, thickness)
- Wind layers (direction, speed, gusts)
- Visibility
- Temperature
- Pressure
- Precipitation type and intensity
- Storm presets (e.g., “Storm,” “Few Clouds,” “Scattered Clouds”)

Local Procedural Atmosphere Generation

The simulator generates weather *only from these parameters*:

- Clouds are created using procedural volumetric noise
- No global fronts or storm systems
- No real-world structure
- No time evolution unless scripted

Static Until Changed

- Weather does **not** evolve naturally
- No streaming
- No blending
- No forecast progression

Key characteristic: Preset weather is *synthetic* — the simulator is *inventing* the atmosphere based on user-defined constraints.

Flying

To fly a hang glider is quite easy. Joystick left (moves the pilot left), go left. Joystick right (moves the pilot right), go right. Joystick forward (moves the pilot forward) you go faster (down). Joystick back (moves the pilot backwards), you go slower. Use the rudders, the pilot spins on the horizontal axis causing some yaw effects.

That will get you to have control over the aircraft. Go where you want. Don’t hit things. Not much to it, and if that is all you are interested in, then there is nothing more read about.

If you want to simulate actual flying (with a purpose and/or goal), then there are some additional concepts to go over. Even for experienced simulator pilots.

Understanding the launch sequence

If you are trying to simulate real-world flying, then you must know how you leave the ground in the first place.

The standard GA simulator launch sequence

- Start the engine
- Add power
- Get to a runway
- Full power
- fly.

With varying degrees of complexity and steps to follow such as checklists, etc. Up to you, the pilot as to what level of realism you want to follow.

For hang gliders (outside of all alternative launch types including towing), there is a different sequence of events to get into the air.

The standard foot launch sequence

- CHOOSE REAL WEATHER option. We never do not use real weather unless there is no other option other than not flying.
- Get into the simulator (you must choose a well-known airport, where does not matter).
    - *If you have installed any custom hang glider sites (airports) you can search for them natively and go straight to them here.*
- This will put on the airport, towing behind some aircraft. (unless you choose not to).
    - **You can just start towing here.**
- Open the EFB application – Find Hang Glider Sites
    - Find your site (by name)
    - Have the app randomly choose one for you!
    - **TELEPORT TO THAT SITE.**
- You will now be on that mountain side, beach, ski area, or whatever.
- SET THE TIME OF DAY (*if necessary*)
    - Real weather is available for the last 24 hour period, so just pick your time of day.
- Determine the WIND DIRECTION/SPEED
    - This is important because you can only successfully launch INTO the wind.

    - If the speed/direction are **NOT** compatible with the launch site, you need to go to a different site. **This is a particularly important part of hang gliding. We are exploring WEATHER and what we can accomplish in that weather. THIS IS THE CHALLENGE.**

- Use ground handling (your ability to move the glider on the ground), to maneuver the glider into a proper position. That would mean. On a slope, into the wind as much as possible.
- Use the ground handling to
    - Settle the glider on launch (set down)
    - Pick up the glider on launch (glider reacts to wind conditions)
    - Accelerate forward. In other words: RUN. If you can get your air speed above min-control air speed for your glider, you will take off. If not, you will crash.

This takes some technique and has a learning curve. All very doable once you understand what is happening.

Understanding the landing sequence

Launching is optional, landings are mandatory.

The standard GA simulator launch sequence

- Set up an approach to an airport. Usually marked and identified in the simulator
- Point down the runway on final, hopefully into the wind, but not necessary.
- Manage speed and altitude to the ground using controls, power, flaps, gear
- Land. You must do a lot of bad things to crash, but still a hard skill to master.

With varying degrees of complexity and steps to follow such as checklists, gear, flaps etc. Up to you, the pilot as to what level of realism you want to follow.

For hang gliders, the issue is getting back onto the ground using your FEET and that means going slow enough at the point of contact that a human could do it. This is not mechanical, it is physical.

The standard foot landing sequence

- **Pick somewhere to land**. Could be anywhere, any field, road, clearing. Up to you. If you are flying at a pre-made flying site, the landing area will be marked with a visual indicator of where it is located.
- **Determine wind direction**. IT IS VERY IMPORTANT that you land into the wind as directly as possible.
- **Make an approach**. Use the information you have about wind direction and come up with an approach to a field. You can use patterns like box patterns or s-turns. Whatever you like. Now set rules.
- **Control glide slope**. There is VERY LITTLE you can do to change glide slope, but one thing you can do is change the pilot position from prone to upright to add drag. This will be done automatically for you if you don’t.
- **Get your gear out**. You need to put your feet down before impacting the ground. They are your gear.
- **Flair**. All aircraft flair on landing. You are attempting to stall the aircraft just as you impact the ground so that you stop flying and start rolling. But a foot landing requires that you not only stop flying but that you cease forward movement altogether, quickly. A hang glider does this because it can change is pitch angle almost instantly from 0 to

90 degrees at slow speeds. At 90 degrees, the glider simply stops and falls. Hopefully, you do this only when near to the ground. The amount of flair required is determined by your ground speed. You will notice a very increased pitch sensitivity for the glider at this point in the flight.

Understanding Flight Characteristics

Only Hang Gliders, fly like Hang Gliders. They are controlled not by surfaces that change the center of pressure (lift) on a wing but by changing the center of gravity of the entire craft. That is the pilot (2/3 of the weight) moving around makes the glider tilt in the direction of that weigh shift. Like balancing a plate on a stick. This is inherently unstable, yet hang gliders are probably the most stable type of aircraft ever invented. The flexible wing automatically centers itself in roll and yaw as shape changes counter roll or yaw actions. Pitch is automatically centered using luff lines, fixed tip, sprogs and other devices that correct pitch down to pitch up. Stall creates a pitch down moment. There is no trim on a Hang glider. Is flies in “trim” by default.

The simulator does not simulate this. 3 axis controlled aircraft go where they are pointed. Pitch down, the aircraft will go down that path until it hits something, or some trim setting is set to counter it.

Landing flair in aircraft is a formality. If you don’t do it you will probably bounce your landing, but you will land ok (probably). In a hang glider, it is mandatory to reduce your ground speed on landing to walking speed or less. This is doable because a hang glider pilot can push his/her wing into a 90 degree pitch up (flair) if necessary. Full stop.

We had to programmatically put this physics behavior into our models.

Understanding damage and crashes

You WILL crash your hang glider if you try and foot launch and/or land and have not yet mastered those skills. This is not automatic, no brainer, and you may or may not care, but it will happen.

A hang glider crashes by hitting something (like the ground, building, tree, whatever) while in flight. That seems simple. You can also crash or get damaged by touching the ground while landing sideways or too fast forward or too fast vertically.

If any of that occurs, we simply show it to you on the variometer screen.

Nothing about launching or landing requires you to have any instrumentation, no visual cues, sounds, settings, checklists, engine settings, throttles, flaps or any other thing.

The only thing to concentrate on is:

CONTROL OF YOUR AIRSPEED LIMITED BY YOUR ABILITY TO MOVE YOUR FEET.

Soaring

Soaring is simply your ability to stay up when gravity wants you back on the ground, and gravity will always win.

You need only 1 instrument to help you in this quest: **The variometer.**

The variometer measures if you are rising or falling in the air using changes in air pressure. You are either winning (going up) or losing (going down). That’s it.

We add quite a few more things to the variometer besides that, but that is its primary purpose.

In real-life situations, soaring takes a while to master and there is only 1 reason for this. Fear of dying. You must advance slowly as any mistake can be fatal. In the simulator, it is never dangerous so moving through the learning to soar phase is very quick in a simulator.

There are only 2 ways to stay up:

Ridge Lift

The rising of an air mass to go over something (anything).

You can just assume that anything that rises out of the ground and has wind blowing perpendicular to it, will create ridge lift. This happens at all scales: Large and small.

At the smallest scales it has no impact on your ability to stay up. It just is not strong enough and at large scales you rise until the ridge lift stops or you fly out of the lift area.

Hang glider have an extremely low wing loading and because of that, can be affected by and can use very low scales of ridge lift. In other words, we can stay up in very light winds on very small hills.

All you need to know is: Wind direction (must be perpendicular to your hill) and Wind speed (must create enough energy to overcome your wing's sink rate).

Thermal Lift

The rising of an air mass because it is hotter than the air around it (convection). Like a bubble in a boiling pot of water. A hot spot on the surface heats the air above it, causing that air to rise (as a bubble). The thermal you want to catch is that bubble.

There are lots of factors that determine when, where, strength, etc of these bubbles! But you just need to know that they exist to get started.

- Weather is the key here to forming thermals:
    - It must be hot enough to warm the air on the surface. The temperature required for thermals is not fixed, it is determined by any portion of the air being hotter than the air around it. If all the air is hot, thermals do not form, no matter how hot it is. It is hard to form thermals in the desert until it gets very hot. If all the air is cold but there is one hot spot, a thermal will form. You can get thermals in the snow on a winter's day. It is not just about temperature, but about heating and temperature differences.
    - It must not be too windy as this dissipates heat and bubbles do not form.
    - It must not be too cloudy as the shade reduces surface heating.
- Time of day
    - Thermals are the strongest during the middle of the day as the sun is directly heading the surface.
    - The surface must heat for some period before creating a thermal and the air must reach a specific temperature (called trigger temp) to start convection.
- Surface types

    - Not all surfaces will create hot spots for thermals. Darker spots heat faster than lighter spots. Brown is better than green. Water is the worst. Snow can create thermals.

- Persistence
    - If you find a thermal, it is quite likely that the thermal will be at that same spot all day long for your given weather conditions. You can't see them, so recognizing thermal trigger spots visually that are working is a trick to learn.
- Drift
    - Thermals will drift downwind from their point of origin. You can follow them as they drift. The other trick is that if you do lose a thermal, fly directly upwind from where you are. You are flying back to the trigger spot and will likely find another bubble.
- Clouds
    - The rising bubble of a thermal will turn into a cloud once the air mass temperature in the thermal goes below the dew point temperature. But this does not mean all clouds indicate a thermal or that all thermals are connected to a cloud. Far from it, they can be good indicators of lift of all kinds. Many soaring simulators create a 1 to 1 condition of thermals to clouds and then many pilots learn this connection and expect it. Some real-life pilots do too, but not the good ones. There is a whole science of cloud flying so don't be disappointed if a cloud does not seem to have a thermal below it.
- Mountains.
    - Thermals will tend to line up on ridge lines and mountain tops. This is because mountains form their own weather. They have surfaces that can be directly perpendicular to the sun at different times of the day, thus forming heating surfaces. Many of these surfaces are bare rock and they heat quickly. The wind will also blow thermal into mountains and ranges where they then stop drifting. This is why mountains are so dominant in flying hang gliders.
- They are spread out.
    - They do not exist everywhere or in any set pattern or distance from one another. It is completely dictated by all these factors and the geography of where you are.

Hang gliders can fly in very light thermals and these exist almost all the time, almost in any weather condition, that is spring-summer or fall and the sun is out. Pretty much everything after that are just variations in strength and other factors. The default state of Earth's daytime weather is that there are THERMALS.

Once you can fly, it is almost impossible not to soar. There is usually some form of lift forming somewhere near or around you, virtually anywhere you are. Even flat ground, but probably not over water

You are then free to explore the planet and do some sightseeing (360 degree view) for basically as long as you wish to do it.

Soaring can be very meditative. Not doing much other than controlling the glider, trying to stay up and plan your next move while just enjoying the scenery or listening to music.

Or you can try the next step.

Goal or Task flying

You may want to challenge yourself to accomplish a set task or flight goal. Soaring with a purpose. This provides you with more than just soaring as you need to navigate and overcome obstacles that in free flying you might never consider crossing.

This can be in a formal or informal format. You can just say “I am going to try and go to X from here” and that in and of itself, sets up a personal challenge. You can do it with friends and that makes it interesting.

We provide you with a tool with the flight computer built into the basic variometer that lets you load predefined tasks into the computer and lets you track and navigate courses.

There are many way to make courses, load, courses, declare goals, navigate courses and score tasks. We support all of that, if that is what you would like to do.

This is just a short description of this instrument and how it works. Please download the completed instrument documentation for detailed information about what you can do with this application.

XCSoar Tasks, Goals, Tracking

We support a standard real world instrument task file format based on the open source model for XCSoar type flight computers. You can download any XCSoar compatible task file into the variometer and it will track that course and turn points for you.

XCSoar Tasks

We support all the task types described by this open source model: This is quite different from what the sailplane instruments currently in the simulator use for flight computer tasks management. The simulator only natively supports using flight plans (like for an airline or commercial craft). It requires you to start at an airport and end at an airport and know nothing about soaring or soaring tasks at all. We have abandoned that line of development and have gone with something that can be useful.

Start and End points define the course.

Start point can be defined to have rules, like a start time, score on exit, score on entry, etc.

Turn points can be lines or cylinder types of any size.

Finish point can be defined to have rules such as minimum crossing heights, etc.

We also support other scoring mechanisms like AAT tasks that have their own special rules but add flexibility to be useful in more varied situations.

This is just a short description of this instrument and how it works. Please download the completed instrument documentation for detailed information about what you can do with this application.

Declared Goals

We have added another feature inside the simulator where you can just declare a goal (a place or location) from launch and we will create a task file for you, automatically. This will let you and your friends just find a site, evaluate the current weather, and set a goal for that session.

IGC Flight Logging

Sometimes after a good flight or after flying a task, you may want to review what happened during the flight. How high did I get? Where? I did I get to that turn point?

You do not need to have an external 3rd party data logger to do this anymore. We will log your flight and export it to an IGC compatible log file for you after any flight.

Flying Sites

Flying sites can be anywhere at all on Planet Earth. Simple as that. All sites are not equal or are they all soarable. But most are. You can land anywhere that does not have obstacles and where you can land on relatively flat ground or uphill, into the wind.
The IF you can launch and IF it is soarable for the ambient weather/wind is really up to you.
It is only required that you put the glider on a launch spot, point the glider into the wind and run. How long you can stay up once off the ground, is very site, weather and wind dependent.

That's the point. Hang Gliding is a completely different form of aviation.

Where you can fly from

The following are just general types of typical flying sites used by hang gliders.

Flat ground

This is usually done using a tow plane or a winch. You can do this in the sim from anywhere that the sim thinks is a runway. **See custom sites below to see how anywhere can be made to be a runway*.
You just need to start using a tow plane (of any kind) when you spawn into the game and after that, you can call for a tow plane at any time. Even after you teleport to other sites or airports.

Very small hills and dunes.

You would be surprised how small a hill or dune that can be soared is. It just takes enough wind! Try it sometime. You won't be going anywhere, but it is a skill to learn.

Ridges

Ridge soaring is the easiest form of gliding there is. Find any ridge running perpendicular to the wind. The taller, the better. Steep is good too. Launch, you will soar if the wind is strong enough.

Cliffs

Cliffs are just ridges that are very steep. Usually very soarable with suitable wind conditions, but almost ALWAYS requires a ramp to launch from (see custom airports below) and almost always launched using the wire man assist mode.

Mountain Tops.

This is what most people associate with hang gliding! Flying off into the blue from some mountain top. And they would be right. Best places to fly are in the mountains but also requires the most skills to soar.

Airports

Any airport you can find in the simulator, you can fly from there using a tow.

Custom Airports/Sites

We support building, selling, and sharing new flying sites. (see our PC Tools documentation). These sites can be added to the site database (see our EFP Application documentation). That can be installed as stand-alone packages into the sim and can therefore be searched and spawned on directly using native MSFS 2024 airport searches, etc.

To do this: Every custom site we build is an airport. Even if it does not look like one, the sim thinks it is one. Each launch area is a runway. Each setup area is a parking area.

We then add to those elements: Windsocks, tell-tail wind indicators, POI markers for all launch and landing areas. And that is just a basic, exported new site. User can also add custom features like static gliders, gliders flying around, buildings, terrain, trees, ramps, people, whatever they like. See our custom site building documentation for more information.

Flying A Task

There really is not much effort to add a task to your flying experience. You just need to find any existing real-life tasks and add them to your variometer or make up some yourself. As we use the industry standard file format of XCSoar, you can find many online, you can download those used on competition tasks, you can use online tools to build them, or you can use our PC app to build them (see our PC APP documentation for more information)

To fly at a task, you simply choose it as the active task in the variometer. The variometer can see all the task files you store there.

A task usually consists of a start point and a finish point (minimum requirement) and most of the time some other turn points are added. These form a course that must be followed. Each turn point is either a line or cylinder that you must cross before moving on to the next turn point.

We provide our own scoring system for a task just so that you can compare your flight to others, but it has no effect on flying the task, or exporting your flight results using our IGC tracking log.

We support 3 types of tasks:

Racing tasks (RT)

A **Racing Task (RT)** is a fixed-course task where:

- All turn points are **mandatory**
- Each turn point has a **fixed observation zone** (usually cylinders or FAI sectors)

- Pilots must round each turn point in order
- The goal is to complete the entire course **as fast as possible**
- Scoring is based on **speed** over the defined course distance
- There is **no time window**, **no area choice**, and **no flexibility** in how deep you fly into a turn point zone

In other words:

RT = classic fixed-route speed task.

Assigned Area Tasks (AAT)

It's a task format used in gliding competitions where each turn point is not a single fixed point but a **large area (usually a cylinder)** that the pilot may enter anywhere. The pilot chooses how deep to fly into each area to optimize speed, distance, and time. It's a brilliant mix of strategy and weather reading, which is why you've been building all that achieved-distance and max-distance logic into your system.

Declared Goals

A Declared goal task is simply a starting point (launch) and any declared point as the destination (goal). The point with these tasks is to simply make the goal. Fastest time wins or if no pilot makes goal, then the closest distance to the goal wins.

These types of tasks do not have to be built as separate XCSoar task files but can just be declared at run-time in the sim at any time. Even after launching. That gives you a flexible option for choosing something to do that matches the current conditions for any site or situation.

Flying Site Missions

We would like to make MISSIONS the de facto standard for delivering MSFS 2024 packages that can be used to facilitate group flights. The can include everything necessary for every pilot to be installed into the simulator natively and permanently (if they want), making setup for group flying available even to Xbox or console players.

All pilots need to fly similar gliders (see categories in this documentation about architecture), the same site, same weather and time, the same task, same scoring to get cohesive group experience.

Free-flight–based missions

Missions can be constructed in many ways, but a free-fight type mission is what we need to construct a fun, re-useable add-on to the simulator.

MSFS 2024 will allow these types of missions to include:

- A normal flight
- With triggers, markers, or objectives
- Without forcing a custom weather preset or locked aircraft state

- Navigation challenges

Missions that override weather/time

If we attempt to construct a mission with any of the following criteria:

- Live weather off
- A fixed time of day
- A custom atmospheric preset

…multiplayer is automatically disabled and is not useful.

Real Weather depends on:

We would prefer to always use real weather settings, but these simulator requirements are personal:

- Live server data
- Player's online status
- Player's privacy settings
- Multiplayer consistency rules

Missions cannot enforce them, so it becomes the group's decision to decide time and the only weather choice is real weather. But this must be set by each pilot in the group.
This is ideal for soaring:

- Pilots can choose the same real-weather day
- Or pick a historical time (within 24 hours)
- Or use a preset if they want deterministic conditions (**not included in the mission**)

If the mission behaves like **free flight with objectives**, it works in group flights. If it behaves like a **game mode**, it does not.

Using Tasks in group flights

> ✓*Multiple pilots can fly the same task together*
>
> ✓*Each pilot's scoring runs independently*
>
> ✓*Can add multiplayer-aware features later (e.g., shared task state)*

Anyone can build a mission package. This becomes an installable package for the simulator. This package will include

What do we get in a free flight mission?

Players in a group flight are not forced to use the same aircraft, but if they load the mission package, they will have the aircraft available and pre-selected. All this means that all players in the group must choose a

Manufacturer/Make/Model/Livery from the same glider category.
(**see Glider Category Packages in this document).* Because everyone is flying in the same category package, all the players glider choices will be visible to all the other players. Even if a pilot is flying a custom add-on glider to a category, they can be seen (but as the default glider in the category). Each variant comes with its own flight model and characteristics...

Mission installation packages can include:

- A custom airport
- Custom scenery
- Custom objects
- Custom glider sites
- Launch points
- Towplane spawn points
- Winch launch definitions
- Ground routes
- Parking spots
- XCSoar.tsk task file for the mission.

Mission definitions can include:

- Step-by-step guidance
- Voice prompts
- On-screen markers
- Objective triggers
- “Continue when ready” steps
- Custom scoring logic
- Success/failure conditions

Mission “Task Briefing”

- Explaining the task
- Shows the start cylinder
- Guides the pilot to the first turn point
- Explains AAT behavior (if AAT or other type)
- Shows scoring
- Ends with a debrief

Mission Custom Flying site

If the mission needs it, it can include a custom flying site within the package. That will become a new airport automatically for your sim if you keep the mission installed. This includes all custom scenery, points of interest, specific objects and details. All included.

Mission Flying Task(s)

Will contain at least 1 or more flying task (XCSoar type). But the mission is to fly only one task. These task remain after flying the mission and can be used any time during just free flying from this new site.

Mission Scoring

Any mission has its own scoring and interactive features that make it easier to learn new sites, skills and task. But we score the task internally to the variometer as well, so you can still get and share tasks scores using the tasks and sites while free flying.

This just shows that missions can be a great way to introduce new sites and task for group adventures and that they can be re-used for different times of the year and different weather conditions, repeatedly. Or you can just fly freely from your existing sites and skip the mission parts.

Native MSFS 2024 aircraft

Microsoft Flight Simulator 2024 native aircraft are not the same as the previous versions of this simulator. It is important to note that these differences are important to understand so that we can understand why we are doing things the way we are doing them.

You can just fly an MSFS 2020 aircraft in MSFS 2024, it is possible as they provide backwards compatibility, but these aircraft cannot take advantage of most of what is available to aircraft built to run natively in the new sim.

Major Changes Made

As a developer, it has been a steep learning curve to discover what is new/different in this simulator and how to leverage those new/different implementations on aircraft model development. To make a Native MSFS 2024 aircraft.
I will go through all the changes that we have found and how they impacted our development and architecture strategies for building infrastructure in this environment.

Career mode

The feature is central to the concepts of the UI in the new simulator and the primary way that Asobo is trying to attract new pilots to the sim while at the same time, keeping pure flight simmers happy. They added the career mode, and this career mode dictates a great deal of the reasons why many of the following changes have been made.
The purpose of the career mode is to give people something to do (other than just fly around or learn to fly). The is the gamification of the sim to make it more engaging to more people. Specifically, people with lower entry point hardware. Or said other way, console gamers.

LOD rendering engine

This lead directly to a modification in the way the sim generates LOD (level of detail) rendering engine for displaying aircraft models. This algorithm is greatly improved in MSFS 2024 and allows developers to get very detailed, very large 3D models and textures. Although counter-intuitive to the goal of working with consoles or other lower end hardware, this is precisely what it does. The render engine renders each PART of a model using different LOD rendering logic for each piece of the model. Lower resolution rendering is automatically done at the device level letting the developers build models from very low resolution to very high resolution in the same model.
This dictates a complete rewrite of the 3D models used to produce this result.

Introduction of the EFB

MSFS 2024 introduced the new EFB (Electronic Flight Bag) that is available for any aircraft at any time. This is basically a rendered "tablet" computer that runs apps. It can be stand alone or literally built into the aircraft model itself. This replaces the old paradigm where developers could add additional application using the floating toolbar. Now all applications should be built to run on the tablet. This promotes a standard interface and location for pilots to find tools. These tools are usually specific to CAREER MODE flying.

This dictates a complete rewrite of any add-on "applications" that developers provide with their aircraft.

Avatar mode

This is one of the coolest features of MSFS 2024. The ability to get in/out of the airplane and walk around the real world as an avatar.
Here is the truth of the simulator. You were always an avatar. Your avatar in 2020 just was an airplane. Now you can transform from airplane(simobject) to person (simobject) just with different physics and movement logic.
From a development perspective, your supporting code must recognize this state so that it does not do flying type things when you can't fly.

This dictates a complete rewrite of any physics manipulation or flight dynamics that developers provide with their aircraft.

Pre-flight checks

The intended benefit of the Avatar mode is that you can get out of the aircraft and do a pre-flight check. But you are not restricted to that! You could walk the entire planet if that was your intention. We support pre-flight checks on our Native 2024 aircraft because it is part of being native to this sim, but doing a pre-flight check is not necessary. This ability is allowed because the career mode requires it as part of that simulation.

We will include controller setups that let you get into and out of the glider easily when on the ground. This lets you get out, walk over to then launch site and check out conditions or just hang out with the other pilots.

Wear and tear on aircraft

The reason created for pre-flights is that the aircraft now incur wear and tear on common moving parts. Aircraft also get dirty when used. We support this as well.

Completely different model creation process.

The entire 3D modeling process has been reframed and modified. How models are animated, how they are connected, how they are exported, how the models build LOD levels, everything.

While 2020 model will “run” in 2024, they are severely crippled when compared to a native 2024 built model.

This also changed the way textures are created and applied. How that impacts livery development and modifications. Textures are now applied directly to named elements within a model. Some textures can just be a single base color, and any possible color value can then be applied to the color by the livery. This is how we built our 2020 models, so this was greatly appreciated. Stickers, logos and other items can be defined and configured within the livery system now, so the models had to change to support this.

The way the models are exported for use in the sim has completely changed as well. A model exported for 2024 will not run in 2020, but a 2020 export will run in 2024 with zero features and probably a strange look to it. It will look duller and less detailed.

The entire directory structure and packaging process of creating something to go into the sim is also completely changed and any and all tools used in 2020 to build packages or manage packages will no longer work on a native 2024 product build.

This also dictates a complete rebuild from the ground up, every single 3D model

New API sets and impact on code development

All the programming interfaces that a developer can use to interact with the sim have been modified. Every single interface, except one: SimConnect. That remains largely unchanged.

That means that every Animation had to be rewritten.

That means that every C++ WASM gauge had to be rewritten.

That means that every JavaScript/TypeScript gauge and application had to be rewritten

Modular Sim-Objects

By far and away the biggest change was the introduction of modular simobjects. And probably the hardest to explain.

In MSFS 2020, there was only ever 1 simobject (a thing in the sim) that represented an entire aircraft. Every bit of the model, all the textures and materials, all the animations, everything, was all part of the 1 model simobject. Nothing used in one simobject could be shared with another simobject. They were immutable. If you created code for one aircraft, the source of that code would be duplicated into any new simobject you may wish to create.

Each aircraft was simply one thing. And all you could modify it was what was in that 1 thing. You could directly modify the flight model, the animations, the livery (just manipulating images) because there was just the one thing, and all of the source code to create that thing (from the sim’s point of view) existed within the package that lived on your hard drive.

In MSFS 2024, none of that is true anymore.

An airplane (or anything) can be made up by an infinite combination of simobjects merged. Each piece and part of a model is its own simobject. Like perhaps the rudder model is its own simobject and it can be combined with tail structure simobject which is combined with a fuselage simobject, and on and on. Each individual element can be combined at run-time to create highly configurable aircraft combinations. Each component has its own level of detail control. That allows you to make items very detailed for close ups and maybe disappear in short distances. Then there is the whole mechanism of how to construct the package of simobjects so that the pilot can pick the variations and color schemes for a particular aircraft he/she would like to fly.

This flexibility allows a single aircraft type to be configurable for different CAREERS, like smoke jumpers, rescue, or whatever. You need to have different variations (and models, animations, etc.) to be selectable to be suitable for different career options.

A package model consists of the following basic parts:

Components

In here are sim objects that can be used as parts for a whole glider. Things like control bars, king posts, wires, wheels, etc. Things that any model glider might use.

This includes textures, models, configurations and animations.

Presets

Presets (or better known visually as VARIANTS), define specific combinations of components and their own models and animations.

An example of this would be a WILLS WING U2 – 160. That would be the VARIANT you might see in the hanger for the category of glider.

This includes textures, models, configurations and animations.

Liveries

These are configurations of color schemes, labels, materials and textures that have been built for a specific set of components and variants.
You will only see liveries for the variant type you have selected. However, liveries can be generic in nature as well and could apply to any variant or even re-used among many aircraft categories.

Liveries can also add their own model additions to the variant, creating an even larger array of possible combinations.

This includes textures, models, configurations and animations.

Common

This is where everything for the basic aircraft goes. This is the equivalent of what complete aircraft had in MSFS 2020. The sim aggregates a complete aircraft now starting with this model, then the selected variant (preset), then the livery and all of them can call and use models, etc. from components.

New Hanger selection systems

The modular simobject paradigm then led to a modified method of choosing aircraft from the hanger. There are more steps now!

You start with an aircraft:

Searching for an aircraft in the hanger is like it has always been. Start with category (say gliders), and you are presented with an array of aircraft in that category.

How we use the selection process

To prepare to fly a hang glider you should follow this procedure when choosing an aircraft from your hanger.

- Start by selecting the GLIDER category in the search. This will limit the selection to include only gliders.

- What you see in the list of gliders for hang glider will be by: **CATEGORIES** of hang gliders, like king post, topless, ridged, etc. You don't choose a make and model like all other aircraft; you choose the category of the type of glider you want to fly.
- Once you choose a category, you will automatically get the default aircraft of that type and the default livery for that type.

You could fly right there. However.

Choose to configure

You should select the configure button in the hanger once you have decided on a category. This configuration will allow you to setup everything about your glider, including: MANUFACTURER – MAKE – MODEL – SIZE and LIVERY.

- Variants (presets) (**NEW**).
  The variant tab will show you variations (models, types, etc) for the basic aircraft. You can choose one here or leave at the default.
- Liveries (**UPDATED**).
  Livery choices will be presented based on the current VARIANT.
- Launch Method (**UPDATED**).
  This is where you pick your tow options. You should always start with a tow option, but you can choose autonomous.
- Fuel (**DON'T CARE**)
- Identification (**UPDATED**).
  Your TAIL NUMBER will be displayed on the glider (if provided) as a user definable sticker.
  You Call-Sign is your name for your AVATAR.

Architectural Strategy

This leads us to discussion about how THGF is architecturally set up to manipulate the MSFS 2024 simulator into simulating hang gliding.

Prerequisites

- All code must be built to leverage and use only NATIVE MSFS 2024 elements
- Realism is paramount in all things. This includes models, textures, materials, animations, physics, flight models, and restraints introduced by foot launching.
- Ability to have virtually unlimited gliders based on manufacturer, model, sizes, colors.
- Ability to have community or 3rd party developers be able to easily add value to the ecosystems.
- That all parts and participation in this ecosystem can be done via consoles like the XBOX.

Components Required

- Glider models that have unique flight characteristics but share common elements.
- Physics models that allow properly simulated ground movement, launches and flight modes.
- Modified pilot POV camera style. The only aircraft in the world where the pilot moves is relative to the aircraft.
- Variometer/Flight Computer as the sole instrumentation.
- Application to find and move to actual flying sites (not airports)
- Ability to tow from airports using native sim towing.
- Tow system(s) that fits the aerodynamic requirements of a hang glider.
- Missions to make multi-player sessions easier to manage.
- Missions to train new pilots on key aspects of learning to fly hang gliders
- Interaction between pilots to have on-going goals and rewards for flying to stimulate interest

Deliverables

- Native tow vehicle. Modified native aircraft to tow hang gliders
- EFB application. Site database and teleporter. This will also track site records, task records, and other information on the THGF Website.
- Variable Geometry Gauge. Instrument that controls/shows state of Variable Geometry.
- HUD Gauge. Instrument that shows current ambient information that does not require an instrument to know (you can see it or feel it).
- Flytec Variometer. Instrument that acts as a variometer and flight computer capable of loading, tracking, scoring tasks as well as creating a track log in IGC compatible file output.
- Physics Engine. Add functionality to the simulator to accommodate:
    - Ground Handling. The ability to control the glider on the ground
    - Tow sequence. The ability to call for tows, release from tow and perform a tow.
    - Flight sequences. Pilot body position changes. Leg in/out changes. Launch recognition of all types, landing recognition, crash or damage recognition. Pitch stability.
    - Landing sequences. Recognition of landing on wheels. Add ability to flair near the ground to facilitate realistic foot landings.
- Scoring systems. Gamification adds new elements to flying
- Custom sites as airports
- Site sim object library package. Adds windsocks, tell tails, ramps, etc for use on sites.
- Missions
    - Training Missions
        - Ground handling – Foot Launch
        - Tow handling – Tow Launch

    - Multiplayer Missions
        - RT Task type
        - AAT Task type
        - Declared Goal type
- Aircraft. Models that can be our hang gliding avatars.
- Aircraft ADD-ON mod package example
- Livery ADD-ON mod package example
- Mission ADD-ON mod package example

How MODS allow future upgrades and compatibility

Because native 2024 models can implement modular sim object architecture, we and use this feature to define how we can offer modifications to existing sim objects (missions, airports, models, variants or liveries) using ADD_ON mods that are packages designed to merge with or overwrite parts of the main object.

In MSFS 2020, you could modify “parts” of any aircraft by simply modifying the package elements inside the community folder. You can probably still do this with 3rd party aircraft that you have direct access to, but I would not recommend it. In MSFS 2024, we modify everything using new ADD-ON packages that automatically merge with whatever it is you are trying to modify at run-time. You can have unlimited? Mods that all add 1 root object.

Asobo aircraft

These are the aircraft that are included in the simulator when you buy it. Most of these cannot be modified with standard add-on like a livery as they are encrypted, some are not. Even the encrypted aircraft can be modified in some ways. Like making them a tow plane or modifying some flight model configurations.

Airports

Existing airports can be modified (not replaced) by just creating a package that is merged with the existing one already installed. We will be delivering custom flying sites as airports. This allows us freedom to put all kinds of things in that airport. We can also add modification to that airport (or anybody else can too). Like adding a new runway (launch) or windsock or ramp, or whatever.

Missions

Missions can be of 2 types: Free flight and training. We will be providing both (see missions in this document). Only free flight type missions can be modified by another package.

3rd party aircraft

Any NATIVELY built aircraft for MSFS 2024 can be modified by an add-on package. This is how new variants and liveries are created and applied.

Glider Category Packages – NOT AIRCRAFT

This is the most major difference we are introducing. It is unlike any other aircraft in this simulator (or any simulator we think).

The base simulator always assumes that you are going to choose to fly a specific make-model of some aircraft. Like a Boeing 747 for example. From there, you could choose a variant (wide body) and/or livery (United Airlines paint scheme) and then go flying.

We are not going to do that.

We are going to build categories of aircraft and within those categories allow the pilot to pick a variant; Like a make and model (Wills Wing U2 160) and/or livery (blue tubing, blue sail) and then go flying.

The category itself will contain all the basic shared common components of a hang glider. Tubing, wires, control frames, pilot and pilot animations, variometers and other instruments, physics engine, EFB applications, everything you need to start flying. But it won't have a complete aircraft. It will be missing the wing (at a minimum). The root aircraft only contains all the logical connection points for all add-on elements and where they belong. Variants within the category (or added on later via a mod) simply plug themselves into this structure are run-time. Each variant has its own configurations and flight model yet shares virtually all components with other variants within the category.

Category Types

We will be providing the base category packages for the following types. In each category, we will provide at least 1 fully functional variant (manufacturer, make, model, size) of that category type. When flying a mission or with other pilots in multi-player mode, this means that no matter what the other pilot will see a glider of at least the standard variant for the class being flown. If both pilots have the same add-ons variants, then they both will see that too. This structure then solves 2 problems: How to get some realistic multiplayer representation and at the same time allow unlimited additional glider types and liveries that are all compatible and have the same functionality and behavior.

All variants within a category are defined by:

- MANUFACTURER
- MODEL
- SiZE

Single Surface (flex wing)

These are gliders that have exposed cross bars. Typically, lower performance but very easy to fly. These have a flexible wing and are controlled via weight shift.

Examples:

Wills Wing Falcon 4

ICARO Piuma

King Post (flex wing)

These are glider with enclosed cross bars but still have a king post as part of the structure. Higher performance is to be expected and can have VG systems. These have a flexible wing and are controlled via weight shift.

Examples:

Wills Wing U2 160

Wills Wing U2 147

UP Comet 165

Sensor 510 E

Topless (flex wing)

These are glider have completely enclosed structures and cantilever structure. Highest performance of flex wing type. These have a flexible wing and are controlled via weight shift.

Examples:

Wills Wing T2C

Moyes Lightspeed

Aeros Combat C4

Spoiler Controlled (rigid)

These gliders have exceptional performance but require more skill to fly. They are controlled by weight shift only for pitch. Roll is controlled using independent moveable spoilers either on the top surface or the use of tip rudders.

Examples:

Fledge 2B

Flight Designs Tempest

ATOS

3 axis controlled.

Standard aircraft control and configuration. They have tail surfaces, ailerons, etc. The only expectation is that they can be foot launchable.

Examples:

Swift

Brightstar Millenium

Archeopteryx

You can see how all the variant within each category shares common traits and relative performance envelopes. However, each variant (can) defines it own flight model configuration that defines it flight characteristics.

Variants

Any new aircraft is simply an ADD-ON package that defines a new variant within a root category.

A variant can include:

- New models like sail planform, logos, etc.
- New tubing (variation from the category norm).

Liveries

Any new livery is simply an ADD-ON package that defines a new livery configuration within a root category. Liveries can be defined as specific to a variant, to a component or universal to all variants.

A livery can include:

- New models like sail planform, logos, etc.
- Textures/materials that overwrite the root textures (like downtube material)
- Color configurations the redefine color values for root textures (main sail cloth color = RED)

A pilot will only be able to see liveries capable of being used in his/her selected variant.

Liveries that do not have specific requirements can be applied to any variant or in fact, any category.

Multiplayer options

One of the best things about hang gliding is flying with other pilots. MSFS 2024 (and 2020) provides mechanisms that allow this to happen! But for gliding flights there are special considerations.

Requirements for a multiplayer gliding flight:

- **Shared weather is the most important**. The entire concept of gliding is the exploration of weather and then exploiting that. If you are not sharing weather, you are not flying together an any sense.
- **Synchronized Simulator Time**. Time determines sun angles and heat changes and while it is not necessary that all pilot clocks are exactly synchronized **(* except when using preset weather**), they need to be close.
- **Shared tasks**. Everybody needs to know what the flight is about (a task) and have the supporting files ready and loaded prior to flight. This requires a lot of pre-flight configuration that must be done by each pilot.
- **Common glider type(s)**. It is usually done using an agreed upon performance category of glider to make things work out (speed/distance). This also assures that all pilots see the other pilots in the correct glider.
- **Common starting point**. Everybody needs to know where on the Planet to go to and how to get there.

How we propose to do multi-player flying.

Here is how we propose that pilots get together and plan a flight. There are many scenarios that we must accommodate.

Weather.

Always use real weather. Always. It is always flyable somewhere and sometimes you may have to change plans instantaneously to accommodate weather conditions. This is as simple as choosing a new site, but that can cause other issues (see below). But always start joint flights with real weather.

Time Zones

It is very likely that you will be flying with other pilots from other countries and other time zones. Real weather accommodates this because it has a 24 hr history. Everybody gets the same weather, at the same time, with the same dynamic changes.

Simulator Time

All that really matters is that all pilots have roughly the same timetable (regardless of their local time).
for example:

The flight is scheduled for 1:00 AM GMT. In Brisbane Australia, that would be 11 AM AET (10 hour offset), We are going to be flying in Denver Colorado at 2:00 PM (simulator time).
If I show up late, say 11:30 Brisbane time, I simply set my sim time to 2:30 PM and I am ready to go and I will be completely synchronized with all other pilots flying, regardless of when they started. I do not have to synchronize pilots. I only need to match my local time to the sim time.

Task Flying (or what are you going to do?)

You only have 3 choices of what kind of flying you can do with your friends when you get together to fly:

Free flying I personally like this option. Just fly around with your friends and go where the wind takes you.

Fly a previously agree on task

Load an XCSOAR type task file into the flight computer (everyone does this) and see how everybody does try to make the circuit. This is a lot of fun to do too but requires pre-flight setup to get the files in place to use and many times your task chosen will not fit the actual weather.

Create a declared goal on launch.

With this option, you all just agree on either a declared goal or out and back distance on launch. You can do this in the vario, and it will create a task for you right there, letting you use the flight computer to help you get there.

How we can make that easier

One way to do this is to create a site specific mission package. This is an easy way to install a custom site, custom tasks and some rules all while getting the additional benefits of having the simulator help you in organizing everything.

The steps to use a mission for multi-player flying

Download and install a mission.

If you have not already downloaded a mission for a particular site, you would need to download that mission and install it. If you have already downloaded a mission for a particular site but want to fly a different task for that mission site, you could download an ADD-ON for that mission site. Either way, the mission has included in it the task(s) complete custom

site and help in getting it all started. You can come back in the future to this site and fly the mission repeatedly because the challenging part is completing the mission in REAL WEATEHER.

Run the mission.

Just starting the mission will put you right on launch. No hassles getting there. You just need to set real-weather and the sim time. Done. The task file(s) will be automatically available to your flight computer. Nothing to do but go fly.

Additional Applications

We make additional applications that assist you in creating new sites, new site packages, mission packages. See our website for more information

Community Participation

We hope to encourage community participation by creating this system that anyone can build sites, gliders, missions add-ons that expand what we put out there to wherever the community wants to go with it.

Future

The future? The future ain't here yet! Well, it is. We can't wait to see what is next.

How to help

Join our Patreon and help us continue on this journey.

Join our Patreon and help us continue this journey.

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Search our website: The Hang Gliding Files

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