

OptiGT - INSTRUCTIONS

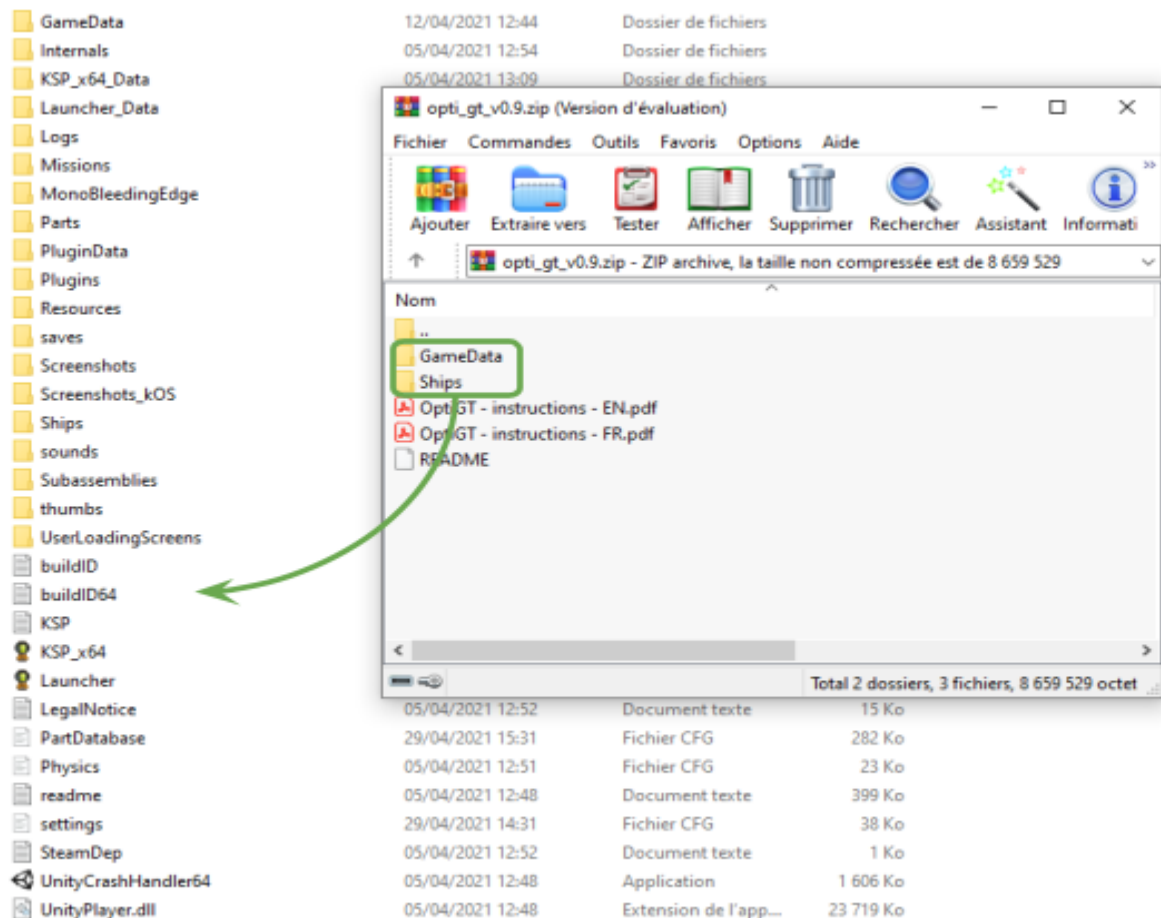
The purpose of this kOS script is to allow you to test the design of your ships to make the most efficient gravity turn possible; in other words, the most fuel efficient. It may seem long, but I promise you: in 5 minutes and without having to come back to it, this document will allow you to use this joyful, happy and voluptuous script properly! And you will have the opportunity to see it, the interface of the script contains the essential information and help to use it ;-)

I- Installation

We assume that you have already installed the latest version of the mod kOS by your own means. For more information, you can visit this page:

https://ksp-kos.github.io/KOS/downloads_links.html#obtain

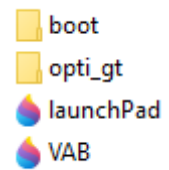
The first thing to do after that is to unpack the `opti_gt_v0.9` archive inside your KSP folder. Not in the `GameData` directly, as you would do for most mods, but in the root of your installation, because our archive contains elements that will go elsewhere than in the `GameData`!



In the `GameData` folder, you should see that a `kOS.Utils` folder has been added. You should not delete it. For more information about this mod, we invite you to consult the README file and the following page:

<https://github.com/tony48/kOS.Utils>

If you go to the `Ships` folder, you will see a `Script` folder. The contents of this `Script` folder should look like the image on the right.



If you have used kOS before, it is possible that your `Script` folder contains more stuff. For the proper functioning of our script, it is important that you do not move or change the contents of the folders or files. In particular, the images must remain directly in the root of the `Script` folder. The `boot` folder contains the `opti_gt_boot` file which we will discuss immediately.

II- Inside the VAB

To use a kOS script, you must install a module provided with the mod. When using the script, you can choose the one you want since the script will be executed from the kOS *archive* and will therefore not require any particular memory space in the module.



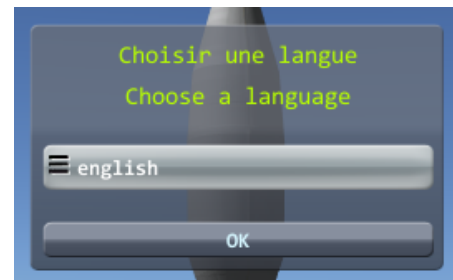
Once the module is installed in your ship, right click on it and select `opti_gt_boot` in the corresponding location.



Once you have made these small modifications, you are ready to launch your ship!

III- Presentation of the different windows

Once the ship is loaded on the launching pad, the script starts automatically (it is the principle of the `opti_gt_boot` file that you have loaded). If it is the first time, you will see this small window which invites you to choose a language.

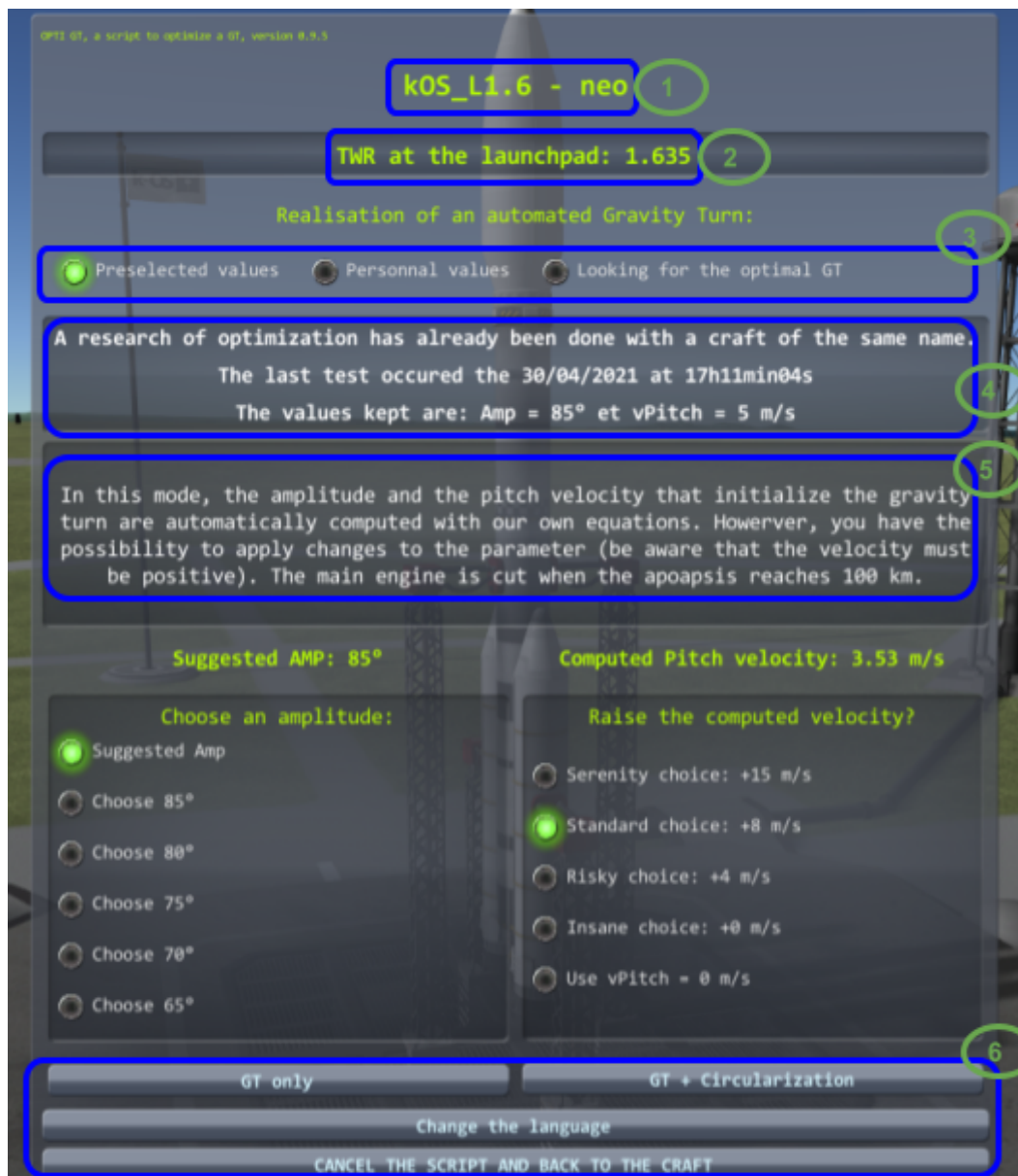


Once you have made your choice, you will see the main window of the script.

WARNING: YOU MUST CHOOSE THE LANGUAGE USED BY THE GAME!

A) Main window

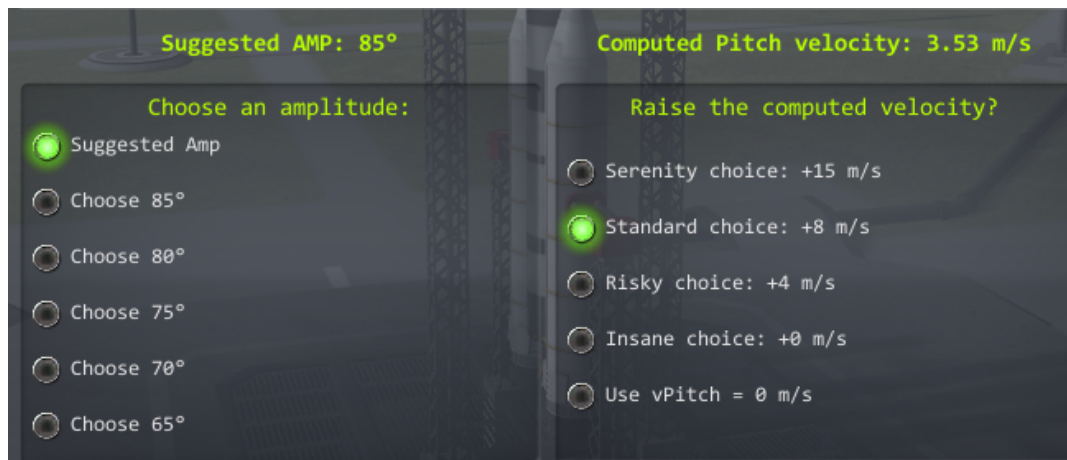
The window in the image below is the most important one because it is the one that will allow you to make your choices. At the beginning of the script, the default mode is the first one: *Preselected values*.



- 1 - The name of the vessel is automatically displayed.
- 2- The TWR (Thrust to Weight Ratio) at takeoff is automatically calculated.
- 3- The script offers three main modes and are described in the following paragraphs.
- 4- This display only appears if you have already done a search for the optimal GT with a vessel of the same name.
- 5- This window introduces the currently selected mode.
- 6- The last big button is quite clear and allows you to close the window to abandon the script. The button “Change the language” is self-explained. The first small button on the left allows you to perform a simple gravity turn until the ship reaches space. The second button interrupts the script only after having circularized the orbit.

B) “Preselected values” mode

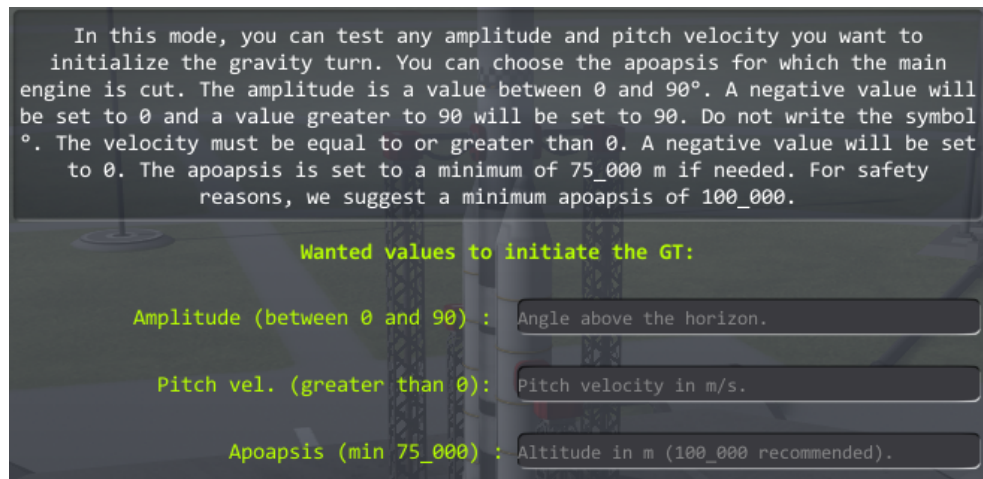
This mode is the default mode. Depending on your TWR, the script tells you the best amplitude (AMP) to use and calculates a velocity (vPitch) according to that. This means that the gravity turn will start when this velocity is reached and the ship will then rotate so that the angle formed with respect to the horizontal is equal to the proposed amplitude. This maneuver is called the *PitchOver*. Then, the ship will follow the navball's prograde marker until it arrives in space or until the orbit is circularized (depending on the button you clicked). If you wish, you can change the starting amplitude by choosing one of the options provided. When changing the amplitude, note that the vPitch is updated.



The speed calculation is based on our equations determined after hundreds of tests. It also takes into account the amount of solid propellant and the amount of liquid propellant that you carry in your vessel. However, this remains an estimate. If necessary, we invite you to increase the calculated value. You can choose to keep this estimate but, depending on the design of your vessel, the flight could end in failure. If you are not looking for the optimal at all costs and want to maximize your chances of reaching orbit, select the appropriate choice. If the final speed, after modification, is still negative, you will not be able to run the script. If your TWR is so high that all modified velocities are negative, then you can use the vPitch = 0 button.

C) "Personal values" mode

This mode is quite simple to use: you enter the values you want to test yourself. You don't have to follow our suggestions. As in the first mode, you can choose to launch a flight only during the gravity turn (until space is reached), or until the orbit is circularized. Note that the buttons remain inaccessible until you have completed all three input fields. This is the mode that allows you to enter the values retained after a search for the optimal GT (see the next mode)!



In this mode, you can test any amplitude and pitch velocity you want to initialize the gravity turn. You can choose the apoapsis for which the main engine is cut. The amplitude is a value between 0 and 90°. A negative value will be set to 0 and a value greater to 90 will be set to 90. Do not write the symbol °. The velocity must be equal to or greater than 0. A negative value will be set to 0. The apoapsis is set to a minimum of 75_000 m if needed. For safety reasons, we suggest a minimum apoapsis of 100_000.

Wanted values to initiate the GT:

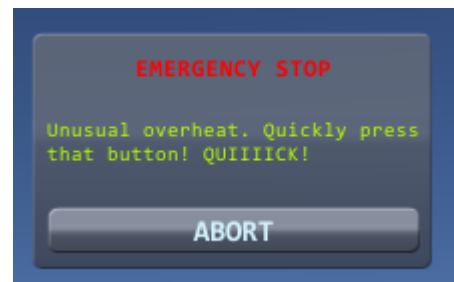
Amplitude (between 0 and 90) : Angle above the horizon.

Pitch vel. (greater than 0): Pitch velocity in m/s.

Apoapsis (min 75_000) : Altitude in m (100_000 recommended).

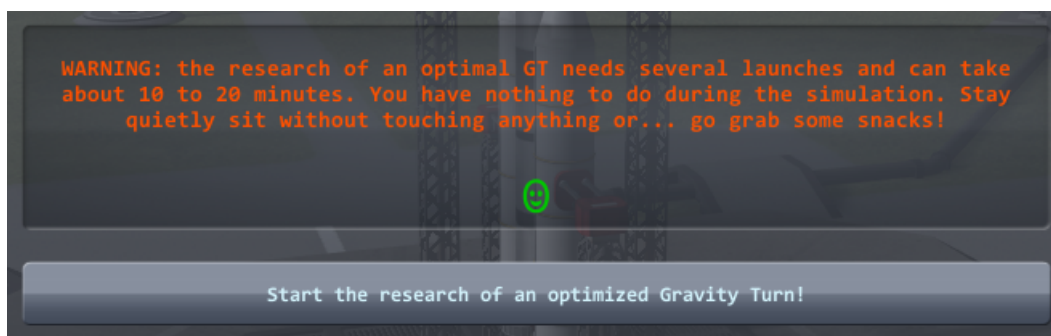
D) During a flight

No matter which mode you choose, you will see a flight cancellation window. For the moment, our script doesn't manage the overheating of the components very well and a possible explosion. If the craft explodes, the script can obviously no longer run. The easiest thing to do is to cancel the flight before it's too late.



E) "Looking for the optimal GT" mode

The abort window shown above also appears in this mode. This mode is the main mode of our script. If your ship seems too original for our calculated values, or you don't know what to choose, this mode is for you. It will perform a series of tests to determine the optimal speed for a successful gravity turn. Be patient! Several flights will be performed successively and it can easily take between 10 and 20 minutes.

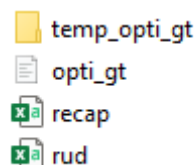


FOR USERS OF THE MOD KRASH: our simulation and successive flight restarts are not compatible with KRASH and this can lead to strange behavior. It is therefore preferable not to use our script in simulation mode.

A small window will tell you that a simulation is in progress. Don't worry, if you have to interrupt your game for any reason, by restarting your ship, the script will ask you if you want to continue the simulation or if you want to restart the script. Similarly, if you start another simulation with another ship, the script will ask you if you definitely want to cancel the current simulation with another ship.



During a simulation, you will see new folders and files appear in your `opti_gt` folder. **Do not manipulate them during the simulation.**



The `temp_opti_gt` folder will be automatically deleted at the end of the simulation. Moreover, it is also this folder that allows you to resume a simulation if it has stopped prematurely. The `rud.csv` file is a file that summarizes the failure conditions if you have clicked on the emergency stop button. This file is not essential, but it may allow you to evaluate some of the data yourself later.

At the end of the simulation, your ship will be loaded on the launching pad and you will see the following window. The file `recap.csv` summarizes this information.



If you wish, you can add a comment in the input field. This comment will be added to the recap.csv file. To quit the script, click on the button of your choice. If you come back to the launching pad, the ship will be loaded again and the script will be launched from the beginning. You can then make new choices.

All you have to do is have fun.

If you have any questions or suggestions, find us on the French discord of the Kerbal Space Challenge (KSC) and ask to speak with @Dakitess ou @PhilippeDS. We can answer in English ;-)

Link of the discord : <https://discord.gg/Hh5YM8pi>

Link of the website : <https://kerbalspacechallenge.fr/>