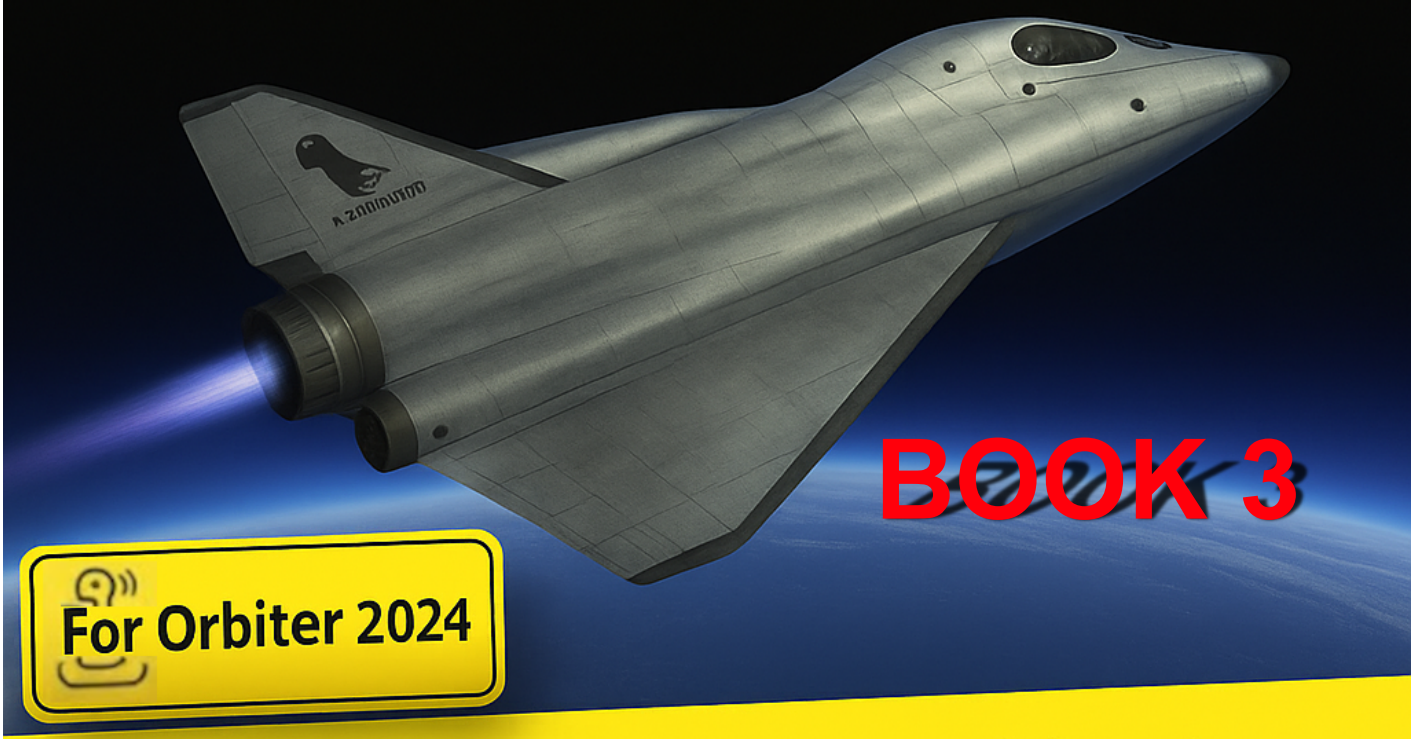
Making everything easier !

From the Earth to the Moon WITH THE XR2 RAVENSTAR



BOOK 3

For Orbiter 2024

Learn to fly in space without losing your mind!

Coussini (2025)

Orbiter 2024 keys for this tutorial

The most important keys to memorize are in red.

KEYS or BUTTONS	UTILISATION
XR2 RAVENSTAR DASHBOARD DISPLAY	
CTRL + up arrow (↑ or ▲)	Go to the dashboard above
CTRL + low arrow (↓ or ▼)	Go to the dashboard below
SIMULATION (VERY IMPORTANT KEYS)	
CTRL + P	Pausing the simulation
T (*)	Accelerate simulation from 0x, 10x... to 100000x
R (*)	Decelerate the simulation from 100000x... to 0x and 0.1x
PROPULSION (NUMERIC KEYPAD)	
“*” on the numeric keypad	Turn off the main thrusters
“+” on the numeric keypad	Ignition of the main thrusters
“6” on the numeric keypad	Ignition of the attitude thrusters (forward)
“9” on the numeric keypad	Ignition of the attitude thrusters (towards the rear)
“5” on the numeric keypad	Stop the ship from rotating
VIEW FROM ORBITER 2024	
F1	Show external view versus internal view
F8	Display the different internal views (**2D**, **3D**, **generic**)
H	Show 3 different HUDs (**SRFCE**, **DOCK**, **ORBIT**)
ATTITUDE BUTTONS	
LIN	Translation
ROT	Rotation (not used in the tutorial)
PRO GRADE or PRO GRD	Prograde
RETRO GRADE or RETR GRD	Retrograde
ORBIT NORMAL + ou NML +	Normal +
ORBIT NORMAL - ou NML -	Normal -

(*) **Do not exceed 10000x** in this tutorial.

Events to leave Earth orbit and land7

EVENTS)	ACTION / TOUCHES
A) TLI	**Trans lunar injection** “Lunar Transfer MFD (TLI)”
B) TLCC	**Mid-course correction** “Lunar Transfer MFD (TLCC)”
C) Summary alignment with the base	Using **Normal +** and “MAP MFD”
D) LOI 1	**Lunar Circularization 1** “Lunar Transfer MFD (LOI)”
E) LOI 2	**Lunar Circularization 2** “Lunar Transfer MFD (LOI)”
F) Complete alignment with the base	**Base Alignment** “Base sync MFD (Dist ± 20.00 m)”
G) Lower the orbit towards lunar base	**Orbit to base** “Base sync MFD (PeA ± 10.00 k)”
H) Moon landing	**Moon landing** with “Pursuit land MFD”
I) You are clear to land	**LAND GEAR** (DOWN)

This is how we will approach our tutorial

I will first offer you a summary, before developing each point in depth. **Orbiter 2024 navigation Top Gun** will be able to skip straight to the **Procedures** while **beginners** will be treated to the **Procedures Explanations** section.

Therefore, I will go through each part of this tutorial (***from point A to point I***).

01 - Start the scenario “**XR2 is going to the moon**” by double-clicking on it.

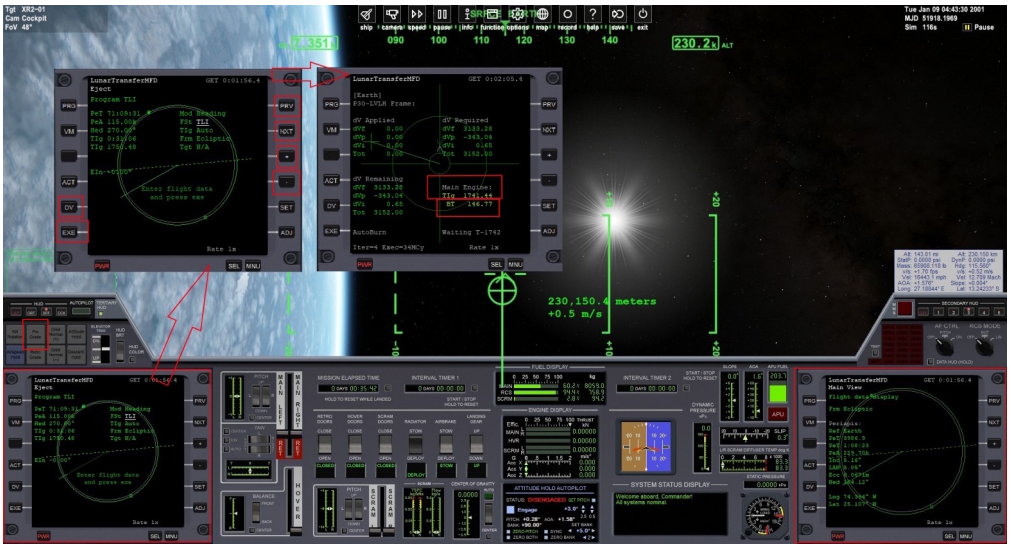
IMPORTANT: “Pause using the CTRL+P keys between each page.”

A) TLI

A.1) Procedures

01 - Open the **LunarTranserMFD** (**Flight monitor** program), on the **right MFD**.
02 - In the **left MFD**, select the **Mod** field and choose the **Heading** value.
03 - Select the **FSt** field and choose the **TLI** value.
04 - Execute an **AutoBurn** and then go into **PROGRADE**.

A.2) Explanations of procedures



Click on the image to enlarge

On the right MFD

01 - Click on the **SEL** button, as many times, in order to see **LunarTranserMFD** in this menu.
02 - Click on the button to the left of the word **LunarTranserMFD** to select it.
03 - Click the **PRG** button to see the **LunarTranserMFD** menu.
04 - Click on the **NXT** button to select the **Flight monitor** field.
05 - Click on the [+] button to display the information.

On the left MFD

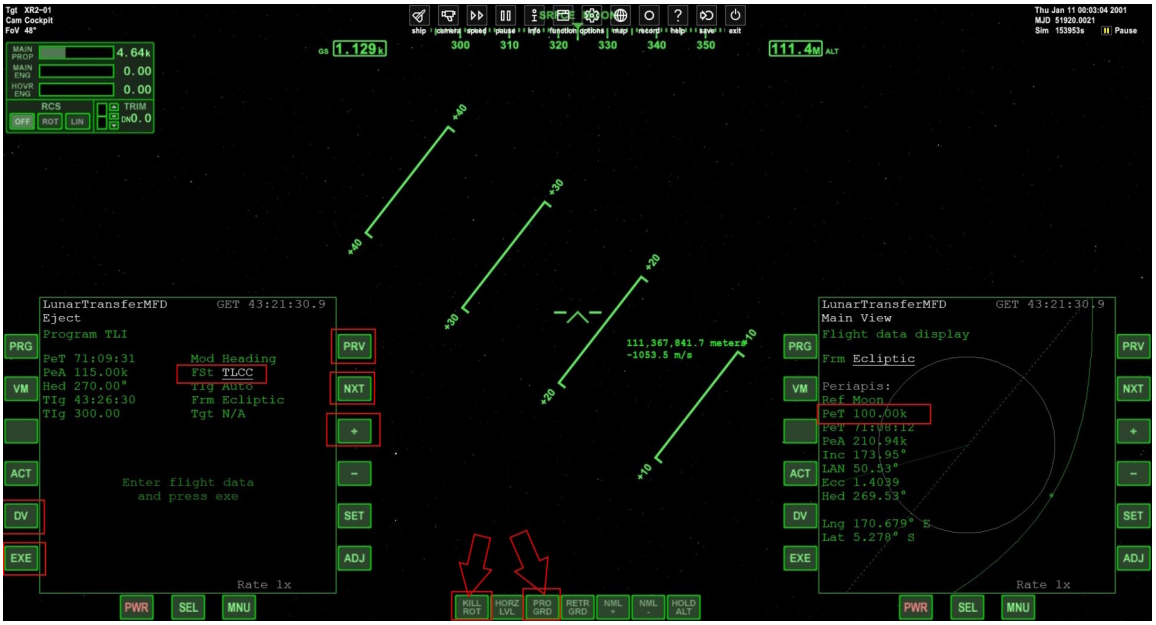
01 - Click on the **NXT** button to select the **Mod** field.
02 - Click on the [+] button to display the **Heading** value.
03 - Click on the **NXT** button to select the **FSt** field.
04 - Click on the [+] button to display the **TLI** value.
05 - Click on the **EXE** button, on the **DV** button then again on the **EXE** button.
06 - The **TIg 1741.44** value represents the number of seconds remaining before ignition.
07 - The value **BT 146.77** represents the combustion duration.
08 - Accelerate then decelerate the simulation, **carefully**, in order to have the **TIg value ±200.00.**
09 - Combustion will begin at **TIg 0.00.**
10 - Once combustion is complete, press the **PRO GRADE** button on the left and top.

B) TLCC

B.1) Procedures

01 - Accelerate then decelerate the simulation in order to have the **PeT value ±100.00k.**
02 - In the **left MFD,** select the **FSt** field and choose the **TLCC** value**.**
03 - Run an **AutoBurn**.

B.2) Explanations of procedures



Click on the image to enlarge

Press F8 to display the **generic screen** as above.

Note the **PeT** variable on the **right MFD.**

01 - At the bottom of the screen, click on **KILL ROT**. The **PRO GRD** button (PRO GRADE) will be disabled.
02 - Accelerate then decelerate the simulation, **carefully**, in order to have a **PeT ±100.00k** then **return the simulation speed to normal.**

On the left MFD

01 - Click the **DV** button to see the settings page.
02 - Click on the **NXT** button to select the **FSt** field.
03 - Click on the [+] button to display the **TLCC** value.
04 - Click on the **EXE** button, on the **DV** button then again on the **EXE** button.
05 - Accelerate then decelerate the simulation, **carefully**, in order to have a **TIg ±200.00.**
06 - Combustion will begin at **TIg 0.00.**
07 - Once combustion is complete, press the **KILL ROT** button at the bottom.

C) Summary alignment with the base

C.1) Procedures

01 - Accelerate then decelerate the simulation in order to have the **PeT value ±20.00k**.
02 - In the **right MFD**, choose the **MAP MFD** with **Brighton Beach** as target.

If your trajectory (in green) is below the Brighton Beach target
01 - Run a burn in **NORMAL +** mode to align the trajectory with the base.

If your trajectory (in green) is at the top of the Brighton Beach target
01 - Run a burn in **NORMAL -** mode to align the trajectory with the base.

C.2) Explanations of procedures

Click on the image to enlarge

Note the **PeT** variable on the **right MFD.**

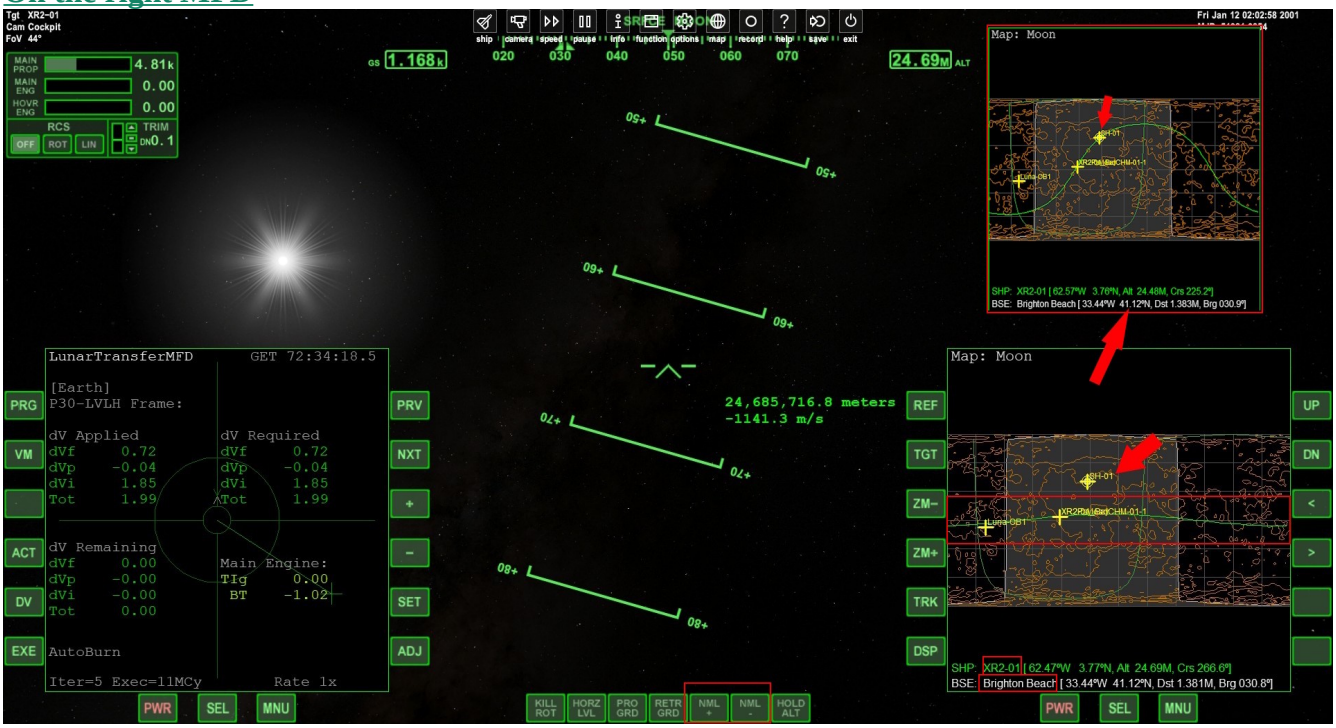
01 - Accelerate then decelerate the simulation, **carefully**, in order to have a **PeT ±20.00k** then **return the simulation speed to normal.**

On the right MFD
01 - Click on the **SEL** button, as many times, in order to see this **Map** menu.
02 - Click on the button to the left of the word **Map** to select it (1).
03 - Click the **DSP** button to display the options.
04 - Click the **MOD** button to change the current option to "**Orbit lines = Orbit plane**" (2).
05 - Click the **OK** button to return to the map.
06 - Click on the **TGT** button.

Don't move your mouse anymore.

07 - Use ↓ or ▼ on your keyboard to choose "**Spaceports**".
08 - Use → or ►on your keyboard to display the choice "**Brighton Beach**", then **ENTER** (**2**).
09 - You will have the map as displayed in point (**4**).

On the right MFD



Click on the image to enlarge

Notice on the **MFD Map (<u>bottom right</u>)** that your **ship** is on a **green line**.
This **green line** (your orbit) is at the **bottom of your target** which is SH-01 (**Brighton Beach**).

If the ship's trajectory (in green) is below the target

01 - Press the **"NML +"** button like at the bottom of the image (means **NORMAL +**).
02 - Wait for "**NML +"** to finish executing (the ship will no longer move).

03 - Using the "+" key on the number pad, perform a burn and **pay attention** until the green line **overlaps the target**.

04 - Once combustion is complete, press the **KILL ROT** button at the bottom.

If the ship's trajectory (in green) is at the top of the target

01 - Press the **"NML -"** button like at the bottom of the image (means **NORMAL -**).
02 - Wait for **"NML -"** to finish executing (the ship will no longer move).

03 - Using the "+" key on the number pad, perform a burn and **pay attention** until the green line **overlaps the target**.

04 - Once combustion is complete, press the **KILL ROT** button at the bottom.

Your result should be similar to the image at the top right.

D) LOI 1

D.1) Procedures

01 - In the **left MFD**, select the **LOI** program.
02 - As the value of the **Pri** field, choose **ApALT**.
The orbit will not yet be circular (as **Apollo 11** achieved).
03 - As the value of the **ApA** field, enter **100.00k**.
04 - Execute an **AutoBurn** and then go into **PROGRADE**.

D.2) Explanations of procedures

Click on the image to enlarge

On the left MFD

01 - Click on the **PRG** button to see the programs page.
02 - Click on the **NXT** button to select the **program LOI** field.
03 - Click on the [+] button to bring up the **LOI** program page.
04 - Click on the **NXT** button to select the **Pri** field.
05 - Click on the [+] button to display the **Pri ApAlt** value.
06 - Click on the **NXT** button to select the **ApA** field.
07 - Click the **SET** button, a window will appear, then enter **"100.00k"** then press the **ENTER** key.

Open a floating Orbit MFD

01 - Move your mouse to the center and top of the screen.
02 - Click on the **function** button.
03 - In the functions window, choose **External MFD** then press **OK.**
04 - Move the new window with the mouse, and place it as in the example in the previous image.
05 - In this window, click on the **PRJ** and **DST** buttons**.**
06 - At the bottom of this window, click the **MNU** button.
07 - In this window, click the button to the left of **Auto reference**.
08 - At the bottom of this window, click the **MNU** button.

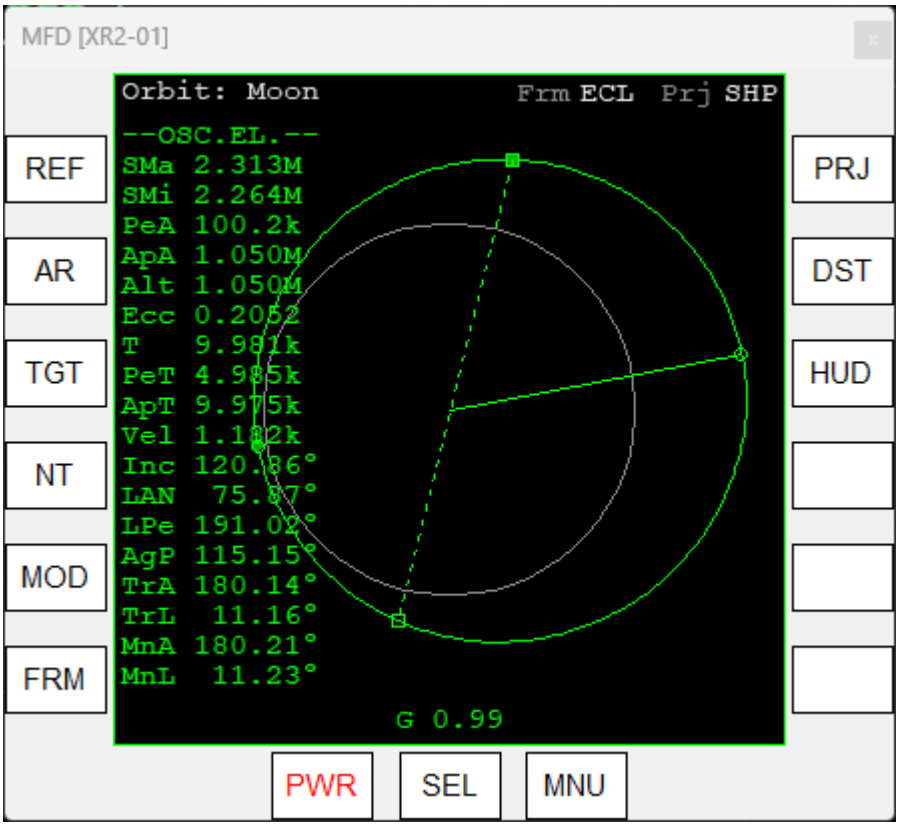
On the left MFD

01 - Click on the **EXE** button, on the **DV** button then again on the **EXE** button.

02 - Accelerate then decelerate the simulation, **carefully**, in order to have a **TIg ±200.00** then **return the simulation speed to normal.**

03 - Combustion will begin at **TIg 0.00.**
04 - Once combustion is complete, press the **KILL ROT** button at the bottom.

This should produce a first lunar orbit, as Apollo 11 achieved.



E) LOI 2

E.1) Procedures

01 - Accelerate then decelerate the simulation in order to have the **PeT value ±900**.
02 - In the **left MFD**, select the **Pri** field and the **"Ecc"** value.
03 - Execute an **AutoBurn** and then go into **PROGRADE**.

E.2) Explanations of procedures

Click on the image to enlarge

Note the **PeT** variable on the **floating MFD**.

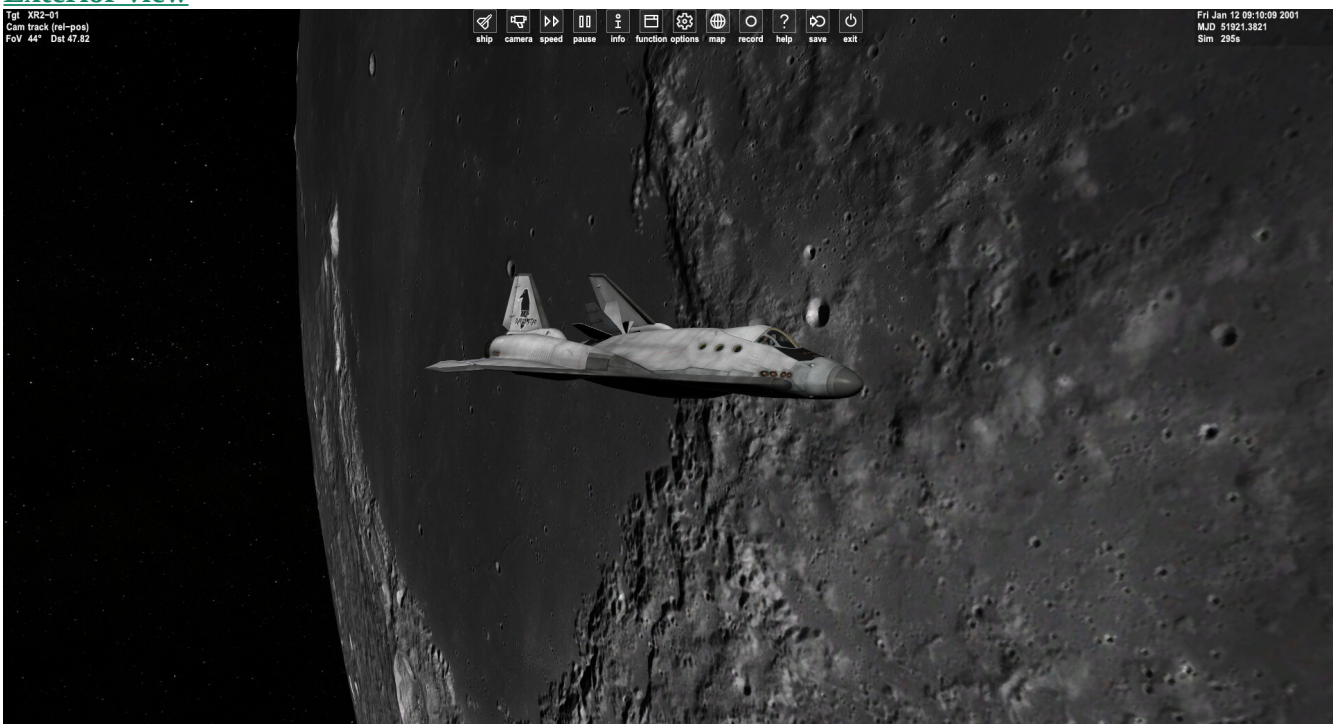
01 - At the bottom of the screen, click on **KILL ROT.**
02 - Accelerate then decelerate the simulation, **carefully**, in order to have a **PeT ±900** then **return the simulation speed to normal.**

On the left MFD

01 - Click the **DV** button to see the settings page.
02 - Click on the **NXT** button to select the **Pri** field.
03 - Click on the [+] button to display the **Pri Ecc** value.
04 - Click on the **EXE** button, on the **DV** button then again on the **EXE** button.
05 - Accelerate then decelerate the simulation, **carefully**, in order to have a **TIg ±200.00** then **return the simulation speed to normal.**

06 - Combustion will begin at **TIg 0.00.**
07 - Once combustion is complete, press the **KILL ROT** button at the bottom.

Exterior view



Click on the image to enlarge

01 - Press the **F1** key.
02 - Using the **right mouse button**, you can change perspective such as the previous image.
03 - Using the **central mouse wheel**, you can **zoom** in on your ship.
04 - If you **zoom out completely**, you will see an entire moon.
05 - Using the **central mouse wheel**, zoom your ship back to normal.
06 - Press the **F1** key to have the **generic view**.

F) Complete alignment with the base

F.1) Procedures

01 - In the **left MFD**, choose the **BaseSync MFD** with **Brighton Beach** as the target.

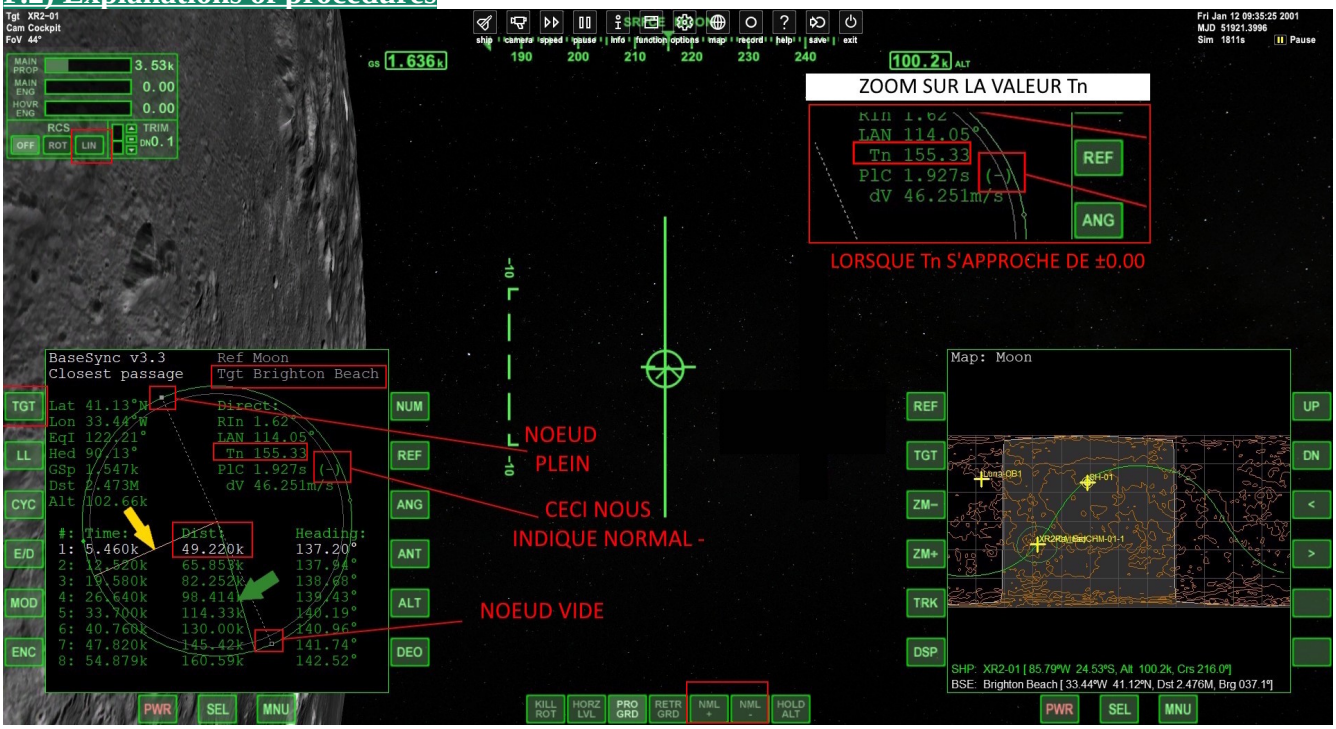
If the green line approaches an EMPTY NODE

01 - Run a burn in **NORMAL -** mode to align the trajectory with the base.

If the green line approaches a FULL NODE

01 - Run a burn in **NORMAL +** mode to align the trajectory with the base.

F.2) Explanations of procedures



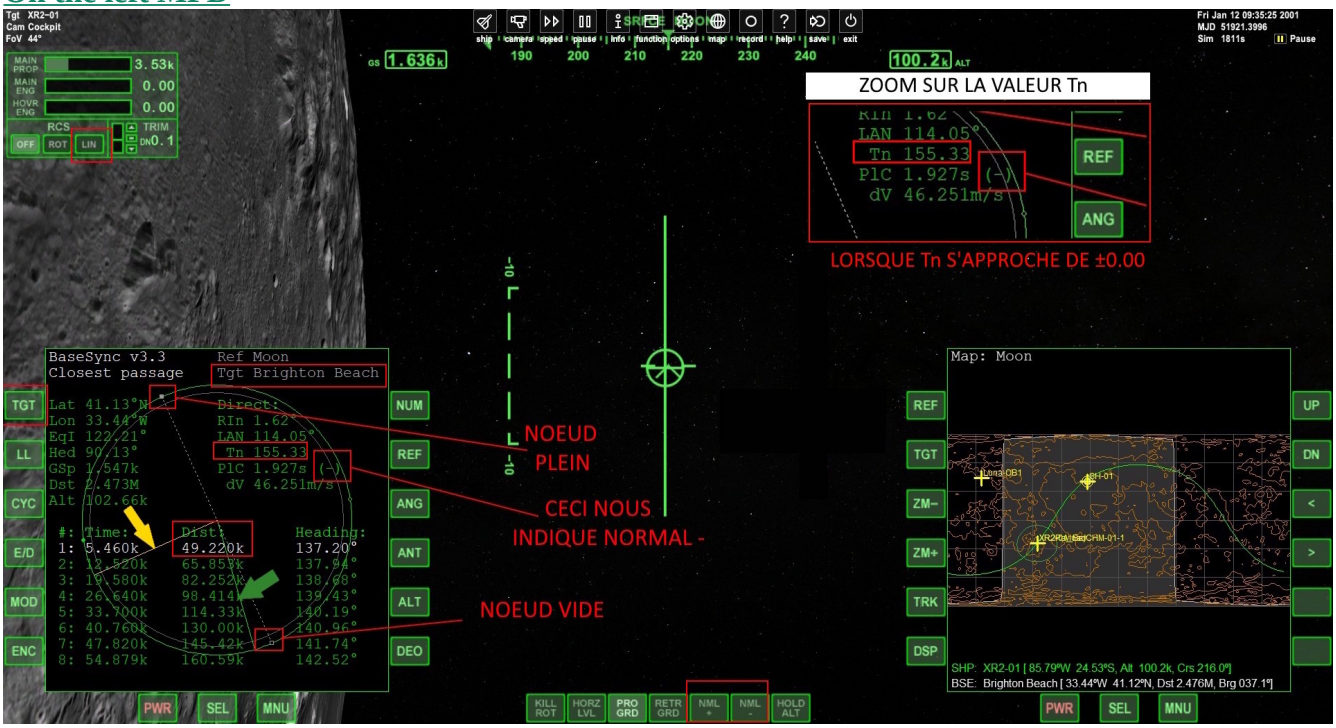
Click on the image to enlarge

On the left MFD

01 - Click on the **SEL** button, as many times, in order to see **BaseSyncMFD** in this menu.
02 - Click on the button to the right of the word **BaseSyncMFD** to select it.
03 - Press the **TGT** button to bring up a window
04 - Enter (**carefully regarding the syntax**) **Brighton Beach** then press **ENTER**.

Notice the value of **Dist** with its value **49.220k** (as shown).
We are **49 kilometers lateral** to our target **Brighton Beach**.
We will therefore carry out a complete alignment with the base.

On the left MFD



Click on the image to enlarge

Notice the **yellow line pointed by the yellow arrow**. This represents the **target**.
Notice the **green line pointed by the green arrow**. This represents our **ship in orbit**.

Do a short acceleration of the simulation and you will see that the green line is moving.

If the green line approaches an EMPTY NODE (see image)

01 - Press the **NML –** button at the bottom of the screen.
02 - Press the **LIN** button at the top left of the screen (see image).
03 - Watch the **ZOOM ON THE Tn VALUE**. When it is close to **±0.00**, do the next step.
04 - Using the **"+" key on the numeric keypad**, **carefully execute** small pulses until the **Dist** value approaches **±1,000k**.
05 - Using the **"6" key on the numeric keypad**, **carefully execute** small pulses until the **Dist** value approaches **±50**.

If the green line approaches a FULL NODE (see image)

01 - Press the **NML +** button at the bottom of the screen.
02 - Press the **LIN** button at the top left of the screen.
03 - Watch the **ZOOM ON THE Tn VALUE**. When it is close to **±0.00**, do the next step.
04 - Using the **"+" key on the numeric keypad**, **carefully execute** small pulses until the **Dist** value approaches **±1,000k**.
05 - Using the **"6" key on the numeric keypad**, execute small pulses (**be careful**) until the **Dist** value approaches **±50.**

This should produce an approach like the following

Click on the image to enlarge

Notice the value of **Dist** with its value **39.814** (as shown).

We are **39 meters lateral** to our target **Brighton Beach**.

Our alignment is optimal for the rest of the trip.

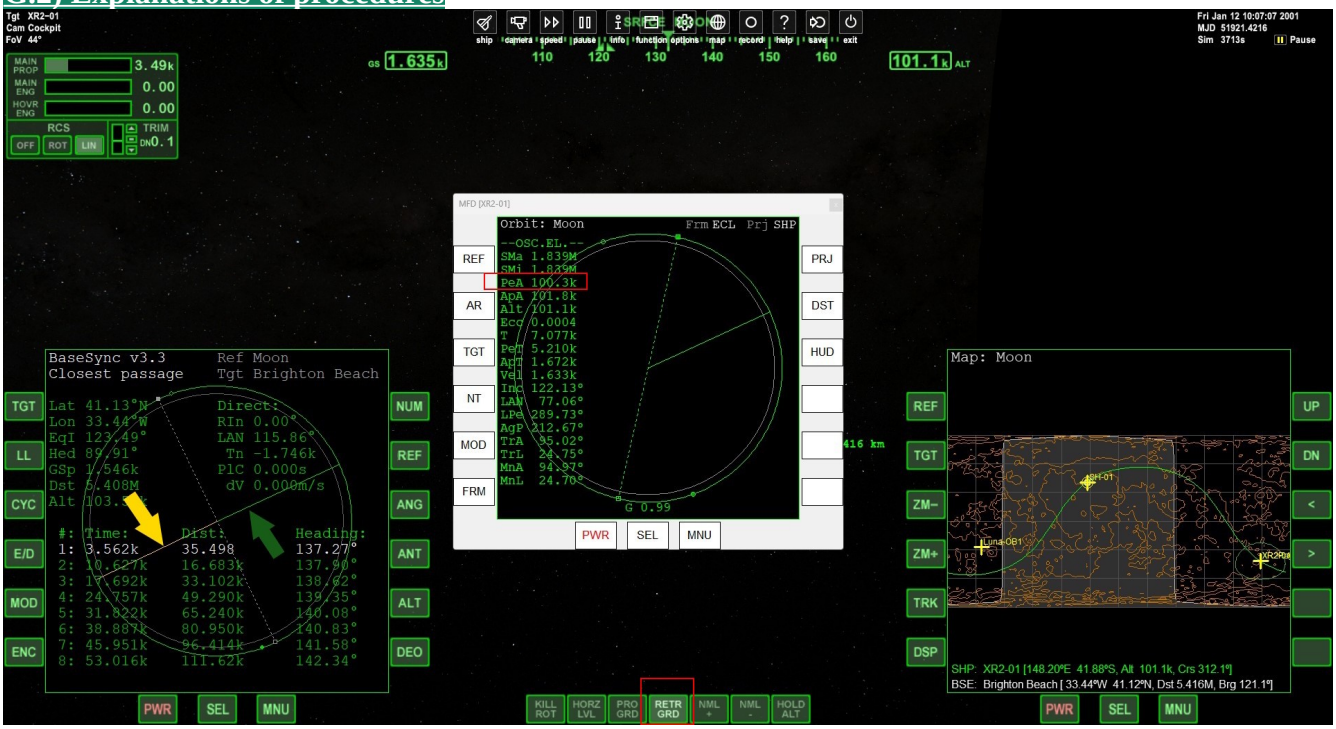
01 - Press the **KILL ROT** button at the bottom.

G) Lower the orbit towards the lunar base

G.1) Procedures

01 - Wait until your ship is opposite the target on **BaseSync MFD**.
02 - Do a **retrograde** burn to lower your orbit by **±10.00k** near your target.

G.2) Explanations of procedures



Click on the image to enlarge

Explanations before proceeding

When the yellow and green lines are **aligned**, then our **ship** will be **opposite our target (Brighton Beach)**. This is the perfect time to perform a **small burn** to lower our orbit by **±10.00k** towards the target.

In Apollo parlance, this is a **DOI** (descent orbit insertion).

On the left MFD

01 - Press the **RETR GRD** button at the bottom of your screen (as above).
02 - Accelerate then decelerate the simulation to 10X, **carefully**, in order to have perpendicular green and yellow lines.

On the floating ORBIT MFD (center of image)

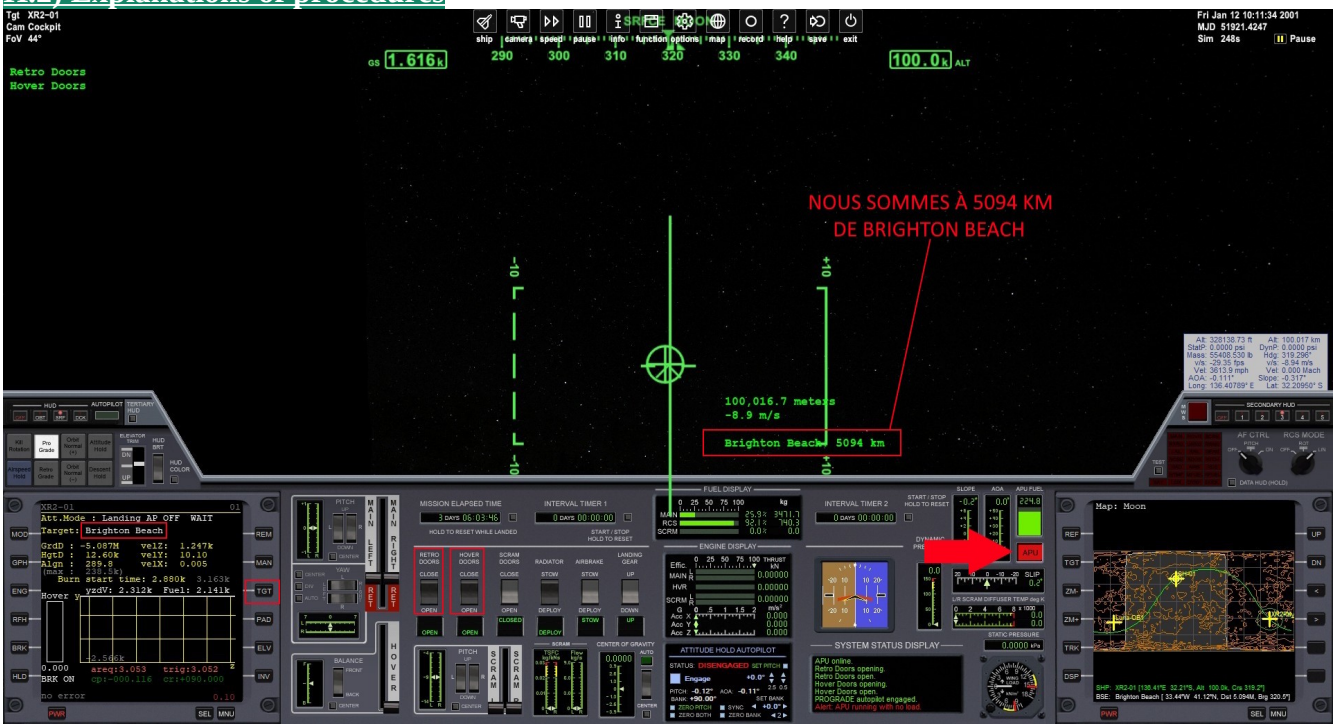
01 - Using **key "6" on the numeric keypad**, **carefully execute** small pulses until the **PeA** value approaches **±10.00k**.
02 - Press the **PRO GRD** button at the bottom of your screen.

H) Moon landing

H.1) Procedures

01 - Follow the Explanations of procedure.

H.2) Explanations of procedures



Click on the image to enlarge

Press F8 to display the **2D view** of the ship as above.

On the left MFD

01 - Click on the **SEL** button, as many times, in order to see **PursuitMFD** in this menu.
02 - Click on the button to the left of the word **PursuitMFD** to select it.
03 - Press the **LAN** button (means landing).

04 - Default **Target** should be **Brighton Beach**.
Otherwise, you must press the **TGT** button to bring up a window, then enter **Brighton Beach** (**be careful about the syntax of the word**), then on the keyboard type **ENTER**.

05 - Press the **red APU** button to activate the APU.
06 - Wait until the **red APU** button stops flashing.
07 - Press the **RETRO DOORS** button to open them.
08 - Press the **HOVER DOORS** button and **wait for the opening noise to stop**.
09 - Press the **red APU** button to deactivate the APU.

We will determine which Landing Pad to use.

Click on the image to enlarge

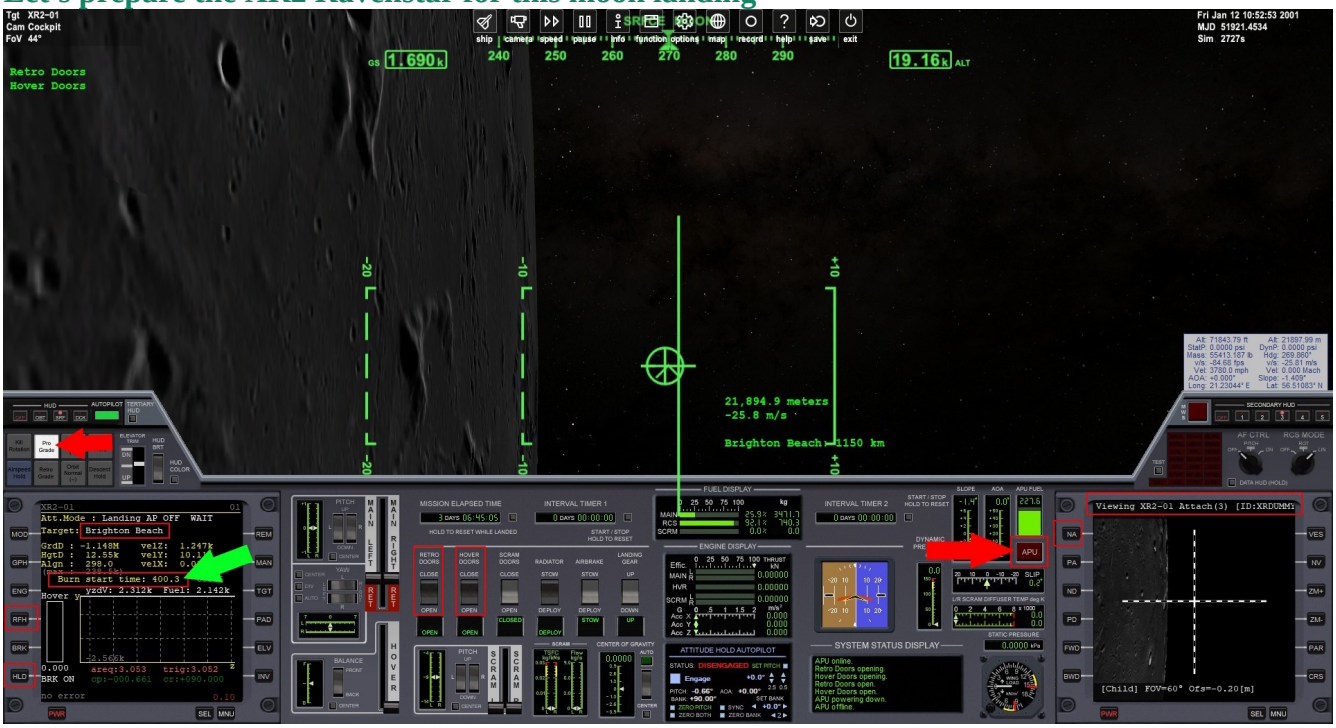
Note that on the **Map MFD** on the right and bottom we see the word **SH-01**, which explains that there is already a ship at the **Brighton Beach** base. Let's look at an information window to find out where this ship is located at the **Brighton Beach** base.

01 - Click at the very top, on the menu bar, on the **info** button.
02 - In this new window, at the very top, click on **Focus vessel** and change to **Base**.
03 - Click on **Alcantara** and change to **Brighton Beach** (use the **mouse wheel** to reach this choice **then click with the left mouse button)**.
04 - Note that landing pads 1 is occupied by the **SH-01** vessel: "Pad 1 ILS 132.20 (**SH-01**)".
05 - Note that **Pad2 is free**
06 - Close the floating window on the **Brighton Beach** base information.

We will choose a free PAD and register it on the left MFD

01 - Press the **PAD** button to bring up a window, then enter **2** then **ENTER**.

Let's prepare the XR2 Ravenstar for this moon landing



Click on the image to enlarge

On the left MFD

When Burn start time will be ±400.0 (see green arrow)

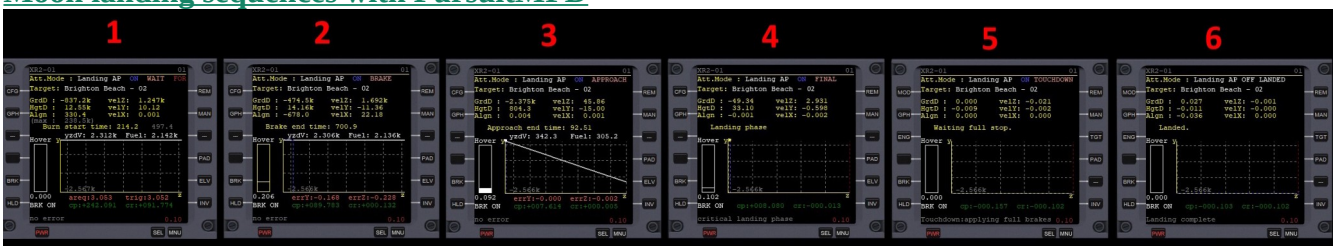
01 - Press the **Pro Grade** button (this will deactivate prograde).
02 - Press the **RFH** button (necessary for the rest).
03 - Press the **HLD** button (you start the moon landing).

On the right MFD

01 - Click on the **SEL** button, as many times, in order to see **Generic Camera** in this menu.
02 - Click on the **left button** of the word **Generic Camera** to select it.
03 - Press the **NA** button (until you see the lunar ground moving).

Do not speed up the simulation so as not to harm the work of PursuitMFD

Moon landing sequences with PursuitMFD



Click on the image to enlarge

01 - Sequence 1 indicates that **PursuitMFD** is in **WAIT** mode.
02 - When **Burn start time** reaches **180.0**, the program will modify the attitude of the ship.
03 - Sequence 2 indicates that **PursuitMFD** is in **BRAKE** mode.

In **sequence 2** you can accelerate the simulation to **10X**, **carefully**, in order to have a **Brake end time = ±300.0** then **return the simulation speed to normal**.

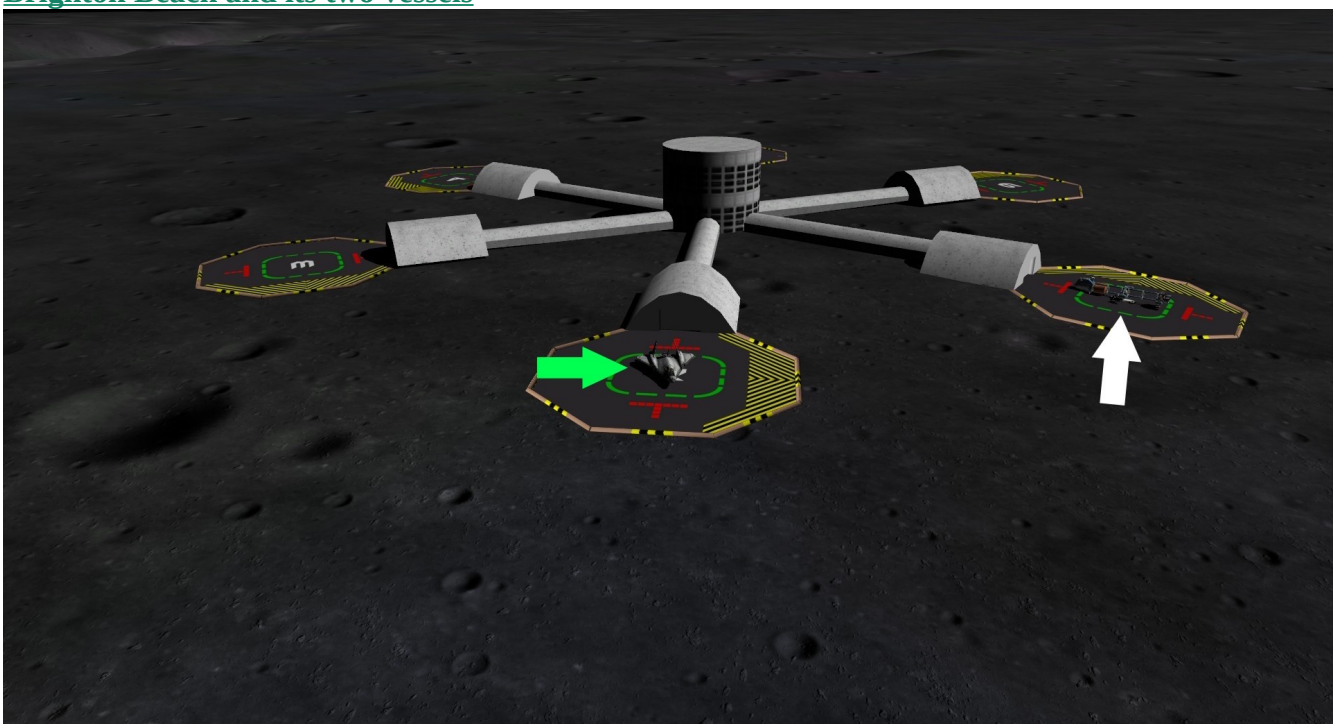
From there, do not speed up the simulation any more so as not to harm the work of PursuitMFD

04 - Sequence 3 indicates that **PursuitMFD** is in **APPROACH** mode.

- **You need to press the APU button** (wait until it stops flashing)
- Click on **LANDING GEAR** (next image).

05 - Sequence 4 indicates that **PursuitMFD** is in **FINAL** mode.
06 - Sequence 5 indicates that **PursuitMFD** is in **TOUCHDOWN** mode.
07 - Sequence 6 indicates that **PursuitMFD** is in **LANDED** mode.

Brighton Beach and its two vessels



Click on the image to enlarge

We discussed on **page 16** that there was already a ship at the **Brighton Beach** base.

This ship is pointed by a **white arrow**. The **XR2-01** is pointed to by a **green arrow**.
The **XR2-01** is our **XR2 Ravenstar**.

Congratulations !
You have succeeded in your mission with flying colors.
You are on the Moon.

Thank you for choosing **Orbiter 2024**.

It is an excellent space simulator that can allow us to visit Mars and many other planets.

Read the official Orbiter 2024 documentation
Orbiter-2024/Doc/Orbiter User Manual.pdf.

Browse the discussion forums for more details
http://orbiter.dansteph.com/?language=french
https://www.orbiter-forum.com/

This tutorial is dedicated to my good friend **Papyref** (**Pierre Refoubelet**).
Coussini 2025 (Louis Cyr)