

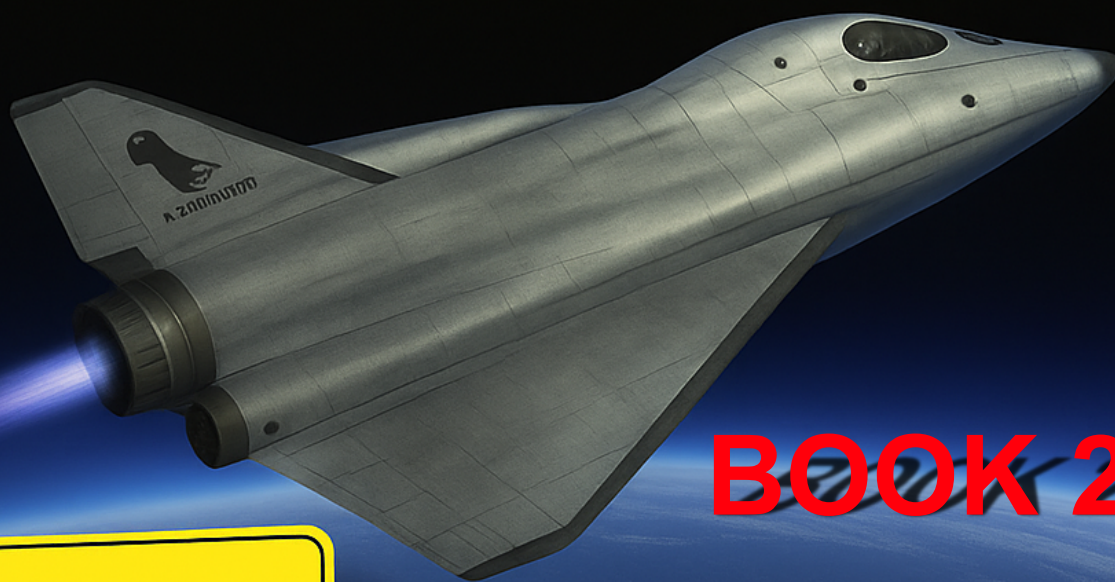


Making everything easier !

From the Earth to the Moon

WITH THE

XR2 RAVENSTAR



BOOK 2



For Orbiter 2024

**Learn to fly in space without
losing your mind!**

Coussini (2025)

Orbiter 2024 keys for this tutorial

Here I will explain the most important keys or buttons 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 -

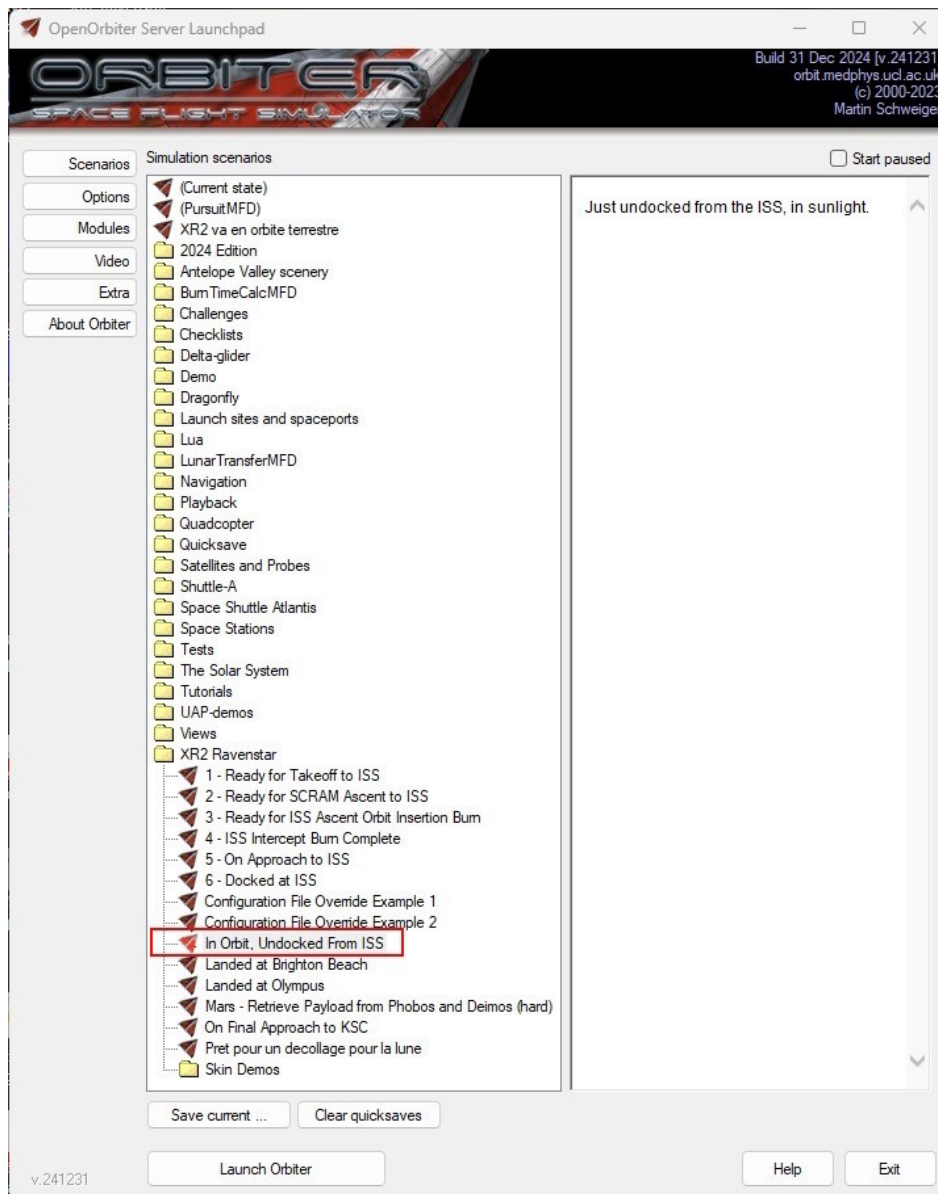
(*) **Do not exceed 10000x** in this tutorial.

Let's prepare ourselves to better understand (open a scenario)

I invite you here, in the Let's prepare... section, to familiarize yourself with some of the buttons or keys explained before.

01 - Open your C:/Orbiter-2024 folder then double-click on Orbiter_ng.exe.

02 - Double-click on “In Orbit, Undocked From ISS” as you see in the following image. It's in the XR2 Ravenstar folder.



Let's prepare ourselves to better understand (views from Orbiter 2024)



Click on the image to enlarge

The first view you see when you start the scenario is the one on the left.

To switch between the **external** and **internal** view of the ship, press **F1**.



Click on the image to enlarge

To switch between different internal views of the ship, press **F8**. From the left we have the **2D view**, then the **3D view** and finally the **generic view**.



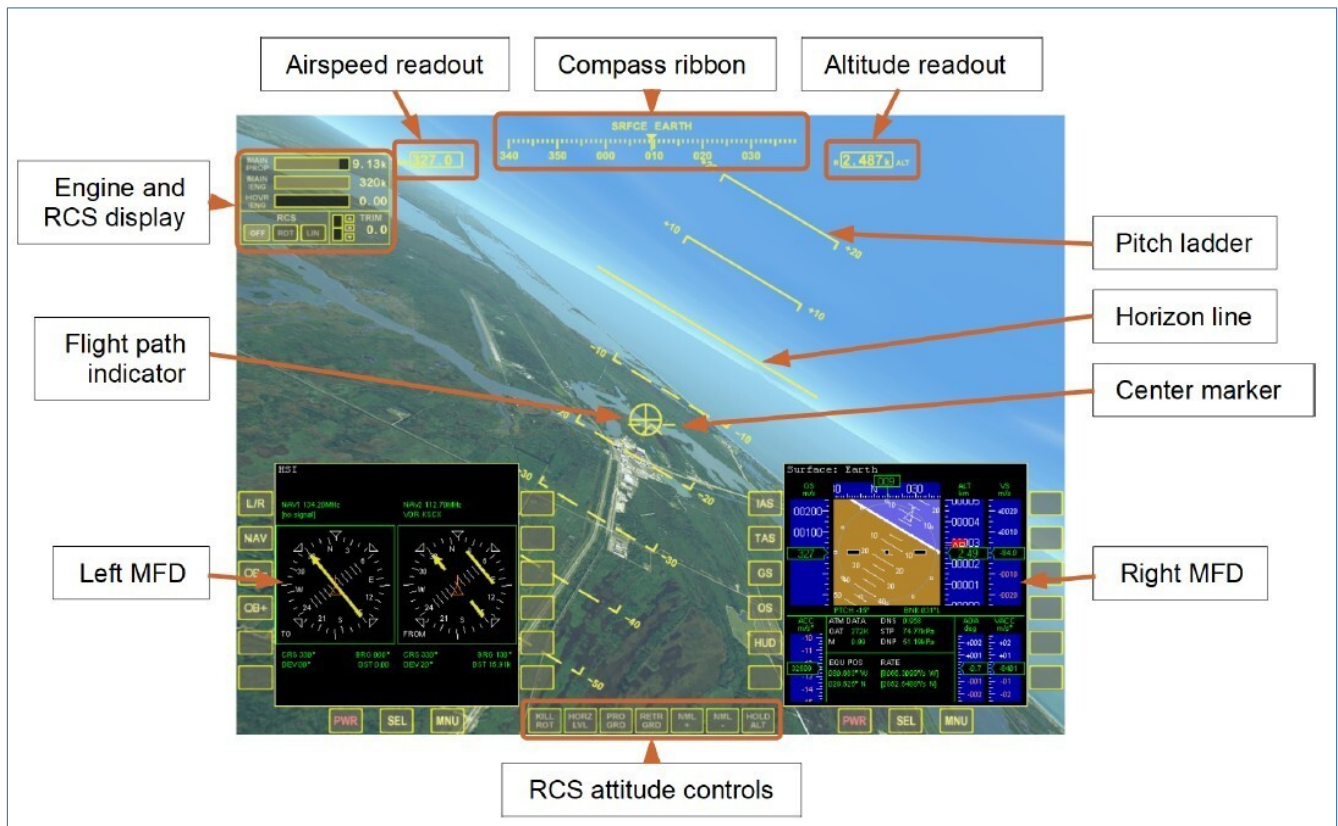
Click on the image to enlarge

To switch between the different Orbiter 2024 **HUDs**, press **H**.

From the top we have the **SRFCE HUD** (surface), then the **DOCK HUD**, and finally the **ORBIT HUD**.

Each of these **HUDs** offers benefits. We will only use the **SRFCE** and **ORBIT HUD**.

Let's prepare ourselves to better understand (basic instruments)



Click on the image to enlarge

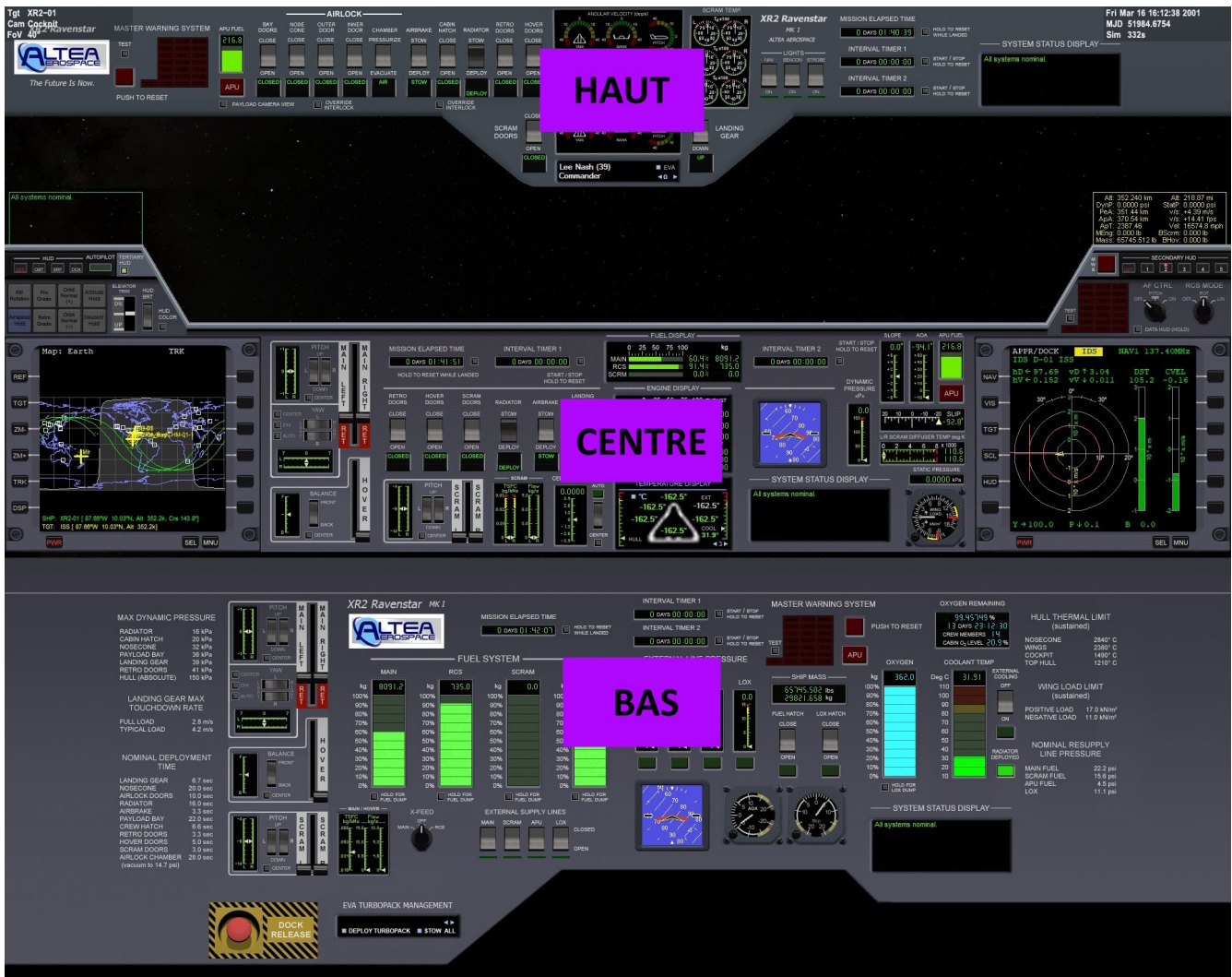
The Orbiter 2024 simulation screen allows us to obtain a wealth of useful information for navigation.

MFD = Multifunction display.

Note that the **2D view** is similar to the **generic view** as shown previously.

However, the attitude buttons, MFDs and fuel quantities are arranged differently in the **2D view**.

Let's prepare ourselves to better understand (2D dashboards)



[Click on the image to enlarge](#)

The **dashboards** of the XR2 Ravenstar are **haut (OVERHEAD)**, **centre (CENTER)** and **bas (BOTTOM)**. To navigate between the different dashboards, use the following keys.

Touches

CTRL + up arrow (↑ or ▲) to go to the table above.

CTRL + down arrow (↓ or ▼) to go to the table below.

Let's prepare ourselves to better understand (explanation of simulation speed)



Click on the image to enlarge

I stacked various display headers taken during a simulation.

The first, at the top, explains that we are on PAUSE. This is a good time to think or consult a tutorial (CTRL+P).

Orbiter 2024 also offers a **simulation acceleration function** to accelerate phases where nothing is really happening or to move to a specific step.

I have circled the **simulation speed** with a **red square**. The **empty red square** represents normal simulation speed (no acceleration). Look at the **Sim** variable to the left of this **empty red square** and you will see that the seconds are ticking normally.

The red square with **0.1X** represents a speed **10 times lower** than normal.

The red square with **10X** represents a speed **10 times faster** than normal.

The red square with **100X** represents a speed **100 times faster** than normal... ETC.

IMPORTANT

- Never go **100,000X** regarding this tutorial.
- It is very practical to accelerate the simulation to obtain a target value.
- **After an acceleration, return the simulation speed to normal.**

Touches

CTRL + P to pause the simulation
T to speed up the simulation
R to decelerate the simulation

Too high simulation speeds can affect the accuracy and stability of the simulation.

Let's prepare ourselves to better understand (play with simulation speed)

01 - In the context menu, at the very top of the screen, click **exit**.

02 - Double-click “**In Orbit, Undocked From ISS**”. It's in the **XR2 Ravenstar** folder.

We will practice with the simulation speed.

03 - Press **F1** to display the **2D view**.



Click on the image to enlarge

The scenario you just loaded indicates that the **XR2 Ravenstar** is leaving the international station after undocking.

The first image on the left tells us that we are paused (**CTRL-P**)

As soon as we apply a speed of **10X** (with the **T** key), the international station seems further away.

As soon as you apply a speed of **100X** (with the **T** key), the international station moves quickly.

As soon as we return to a **normal simulation speed** (with the **R** key), the station moves slowly.

Always observe the upper right corner of the screen and the **Sim** variable during the simulation shift maneuver.

04 - In the context menu, at the very top of the screen, click **exit**.

Events to enter Earth orbit

EVENTS)	ACTION / TOUCHES
A) Preparations before the simulation	“XR2 Ravenstar (standby mode)”
B) TLn ± 500	T or R then “XR2 Ravenstar (start mode)”
C) TLn = 300 (takeoff)	GO “Universal autopilot control MFD”
D) Shrill noise	MAIN 100% + ATTITUDE HOLD (ON)
E) ± 15.00 k	8 + ▲ (PITCH 7) “Attitude hold autopilot MFD”
F) ± 24.00 k	(PITCH 7)
G) Mach 3	SCRAM DOORS (OPEN) + SCRAM 100% + MAIN 0%
H) ± 30.00 k	▲ (PITCH 5) “Attitude hold autopilot MFD”
I) ± 40.00 k	▲ (PITCH 4) “Attitude hold autopilot MFD”
J) ± 50.00 k	▲ (PITCH 3) “Attitude hold autopilot MFD”
K) SCRAM temp $\pm 7700^{\circ}\text{K}$	SCRAM DOORS (CLOSE) + MAIN 100%
L) Apa ± 200.00 k	MAIN 0%
M) ± 90.00 k	RADIATOR (DEPLOY) + APU (OFF) + PRO GRADE
N) EOI	Earth circularization “Burn time MFD (Apoapsis)”

To give you an idea of the time it takes to carry out the different events mentioned above, I will show you the simulation times.

Simulation time

- From takeoff to 15 kilometers = **2 minutes and 29 seconds.**
- From takeoff to 50 kilometers = **7 minutes and 29 seconds.**
- From takeoff to 90 kilometers = **12 minutes and 05 seconds.**

“As you see, 12 minutes and we are in space. Everything is happening quickly.”

Here's how we'll approach our tutorial and previous events

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. From then on, I will go through each part of this tutorial (from point **A** to point **N** (**previous table**))

01 - Start the scenario “XR2 is going into Earth orbit” by double-clicking on it. This scenario is just above the **2024 Edition folder** in the “Simulation scenarios”.

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

A) Preparations before the simulation

A.1) Procedures

- 01 - On the “Overhead” dashboard, **CABIN HATCH** will be on **OPEN**.
- 02 - On the “Bottom” dashboard, **EXTERNAL COOLING** will be **ON**.
- 03 - **APU** sur **OFF**.
- 04 - Add a floating **ORBIT MFD**.

A.2) Explanations of procedures



Click on the image to enlarge

- 01 - Show the “Overhead” dashboard of the XR2 Ravenstar.
- 02 - Press the **button framed in red** to open the **CABIN HATCH**.



Click on the image to enlarge

- 03 - Show the “Bottom” dashboard of the XR2 Ravenstar.
- 04 - Press the **button framed in red** to activate **EXTERNAL COOLING**.

When you no longer hear the sound of the CABIN HATCH opening

- 01 - Press the **red APU** button, pointed by the red arrow.



Click on the image to enlarge

- 02 - Display the “center” dashboard of the XR2 Ravenstar.
- 03 - Move your mouse to the center and top of the screen.
- 04 - Click on the **function** button.
- 05 - In the functions window, choose **External MFD** then press **OK**.
- 06 - Move the new window with the mouse, and place it as the previous image.
- 07 - In this window, click on the **PRJ** and **DST** buttons.

B) TLN ± 500

B.1) Procedures

- 01 - Accelerate the simulation up to **TLN ± 500**.
- 02 - On the “**Overhead**” dashboard, APU will be ON.
- 03 - On the “**Overhead**” dashboard, **CABIN HATCH** will be on **CLOSE**.
- 04 - On the “**Bottom**” dashboard, **EXTERNAL COOLING** will be **OFF**.

B.2) Explanations of procedures



Click on the image to enlarge

- 01 - Observe the value of the **TLN** field on the left.
- 02 - For this procedure, this value must be within **± 500** (this figure is expressed in seconds).
- 03 - **Accelerate then decelerate** the simulation, **carefully**, to obtain the value **TLN ± 500**.
- 04 - Show the “**Overhead**” dashboard of the XR2 Ravenstar.
- 05 - Press the **red APU** button to activate the APU.
- 06 - Wait until the **red APU** button stops flashing.
- 07 - Press the **CABIN HATCH** button to close it.
- 08 - Show the “**Bottom**” dashboard of the XR2 Ravenstar.
- 09 - Press the **EXTERNAL COOLING** button to close it.
- 10 - Display the “**center**” dashboard of the XR2 Ravenstar.

C) TLN = 300

C.1) Procedures “must be carried out quickly, read before”

TLN is exactly = 300

01 - Press the **GO** button.

02 - Set **AF CTRL** to **ON**.

C.2) Explanations of procedures “must be carried out quickly, read before”



Click on the image to enlarge

TLN = 300.00

01 - When **TLN** reaches **300.00**, press the **GO** button on the right MFD.

02 - Quickly right-click the **AF CTRL** area to turn it **ON**.

03 - Relax, because **Universal autopilot control** works for you.

D) Shrill noise

D.1) Procedures

You hear a very shrill noise

01 - MAIN 100%

02 - Activate ATTITUDE HOLD.

D.2) Explanations of procedures



Click on the image to enlarge

You hear a VERY SHRILL NOISE (around 1,000 kilometers)

01 - Click at the top, in the red MAIN area.

02 - Click on the ATTITUDE HOLD button.

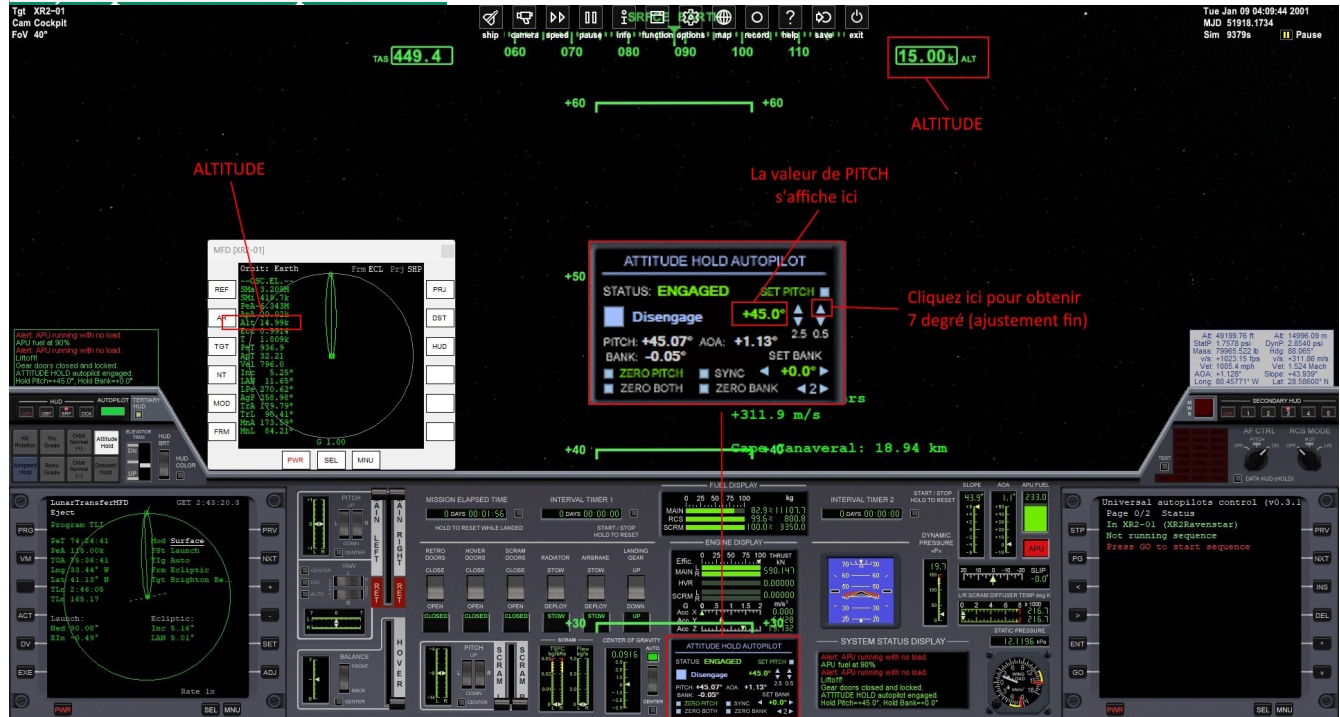
03 - Relax, because ATTITUDE HOLD AUTOPILOT works for you.

E) ± 15.00 k (altitude)

E.1) Procedures

01 - Decrease the **PITCH** to 7.0

E.2) Explanations of procedures



Click on the image to enlarge

We are at ± 15.00 k on the altimeter

Explanations before proceeding

- * The **PITCH** value is displayed in the **ATTITUDE HOLD AUTOPILOT**.
- * For a **5 degree** adjustment, use the **8 key** on the numeric keypad.
- * For a **0.5 degree** adjustment, use the **mouse** over the **blue triangles** on the right as shown.

01 - Slowly click the **8 key** on the numeric keypad until the **PITCH** is at 7.5.

02 - Use the **mouse** on the **blue triangle** on the right to obtain the **PITCH** value at 7.0.

03 - Relax, because **ATTITUDE HOLD AUTOPILOT** always works for you.

F) ±24.00 k (altitude)

F.1) Procedures

01 - The **PITCH** should already be at **7.0**.

F.2) Explanations of procedures

We are at ±24.00k on the altimeter

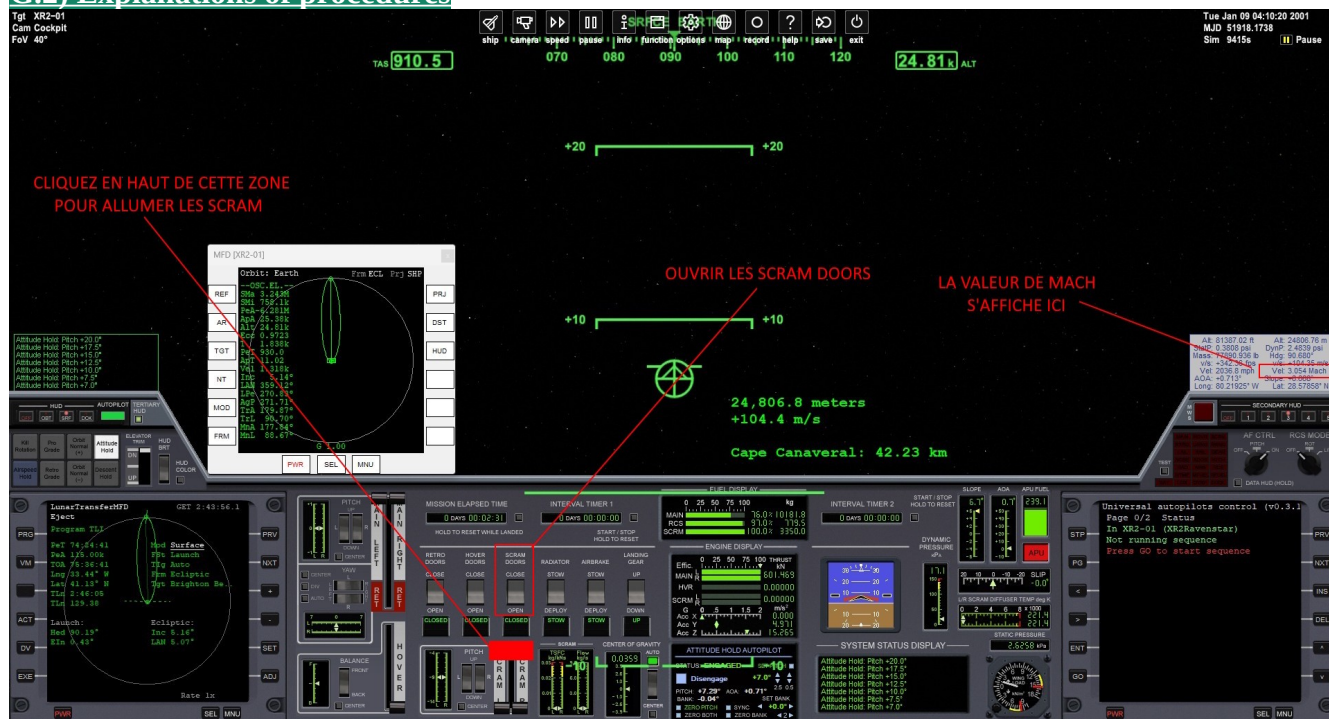
01 - The **PITCH** should already be at **7.0**.

G) Mach 3

G.1) Procedures

- 01 - Open the SCRAM DOORS.
- 02 - Scram to 100%.
- 03 - MAIN at 0%.

G.2) Explanations of procedures



[Click on the image to enlarge](#)

You hear the word "MACH 3"

- 01 - Press the SCRAM DOORS button.

When you no longer hear the opening sound of SCRAM DOORS

- 02 - Click at the top of the red SCRAM area.
- 03 - Click the "*" key on the numeric keypad to turn off the main thrusters (MAIN).

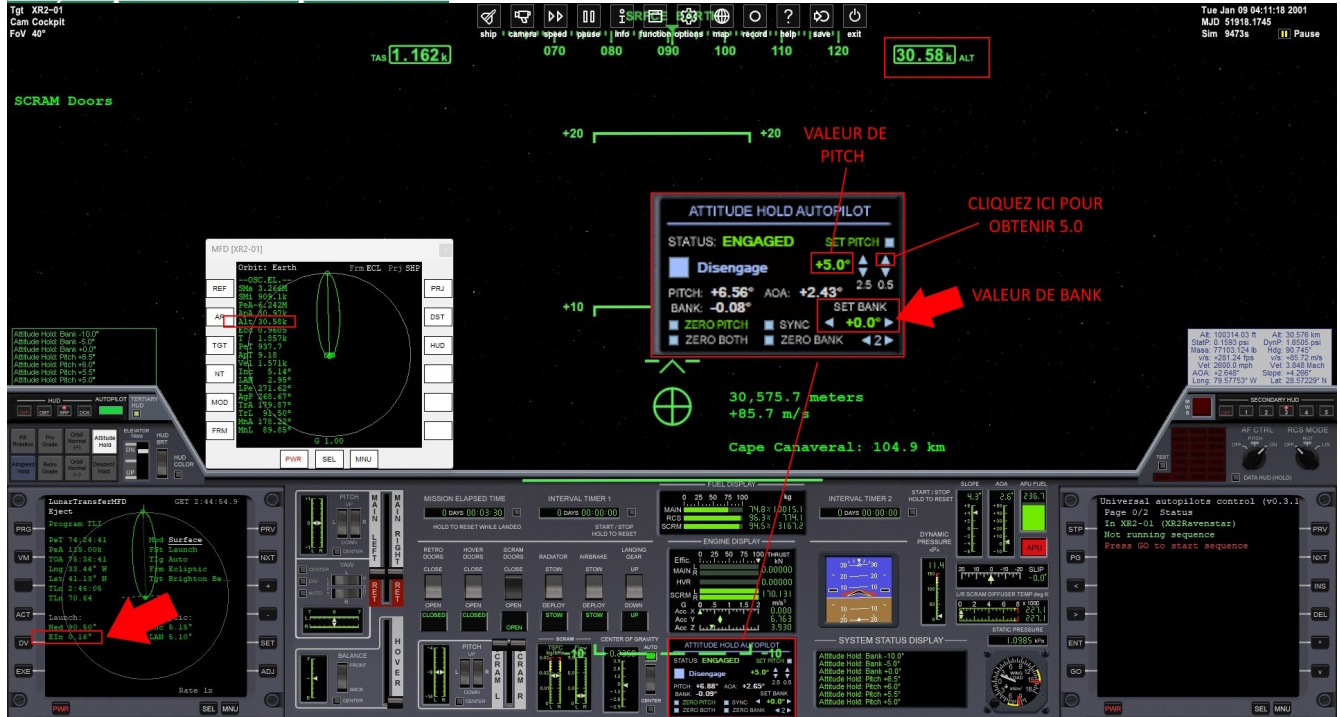
H) ±30.00 k (altitude)

H.1) Procedures

01 - Decrease the **PITCH** to 5.0.

02 - Decrease the EIn.

H.2) Explanations of procedures



Click on the image to enlarge

We are at ±30.00k on the altimeter

Explanations before proceeding

- * The value of the **EIn** is displayed in the **LunarTransferMFD**.
- * The **BANK** value is displayed in the **ATTITUDE HOLD AUTOPILOT**.
- * The ideal value of **EIn** should be +/-**0.00**.
- * If the **EIn** is > **+0.00**, press **4 key** to decrease it and **6 key** to stabilize the **BANK** at **0.0**.
- * If the **EIn** is < **-0.00**, press **6 key** to decrease it and **4 key** to stabilize the **BANK** at **0.0**.

01 - Decrease the **PITCH** to 5.0.

02 - Decrease the **E_{in} as explained previously without looking away from the **altitude**.**

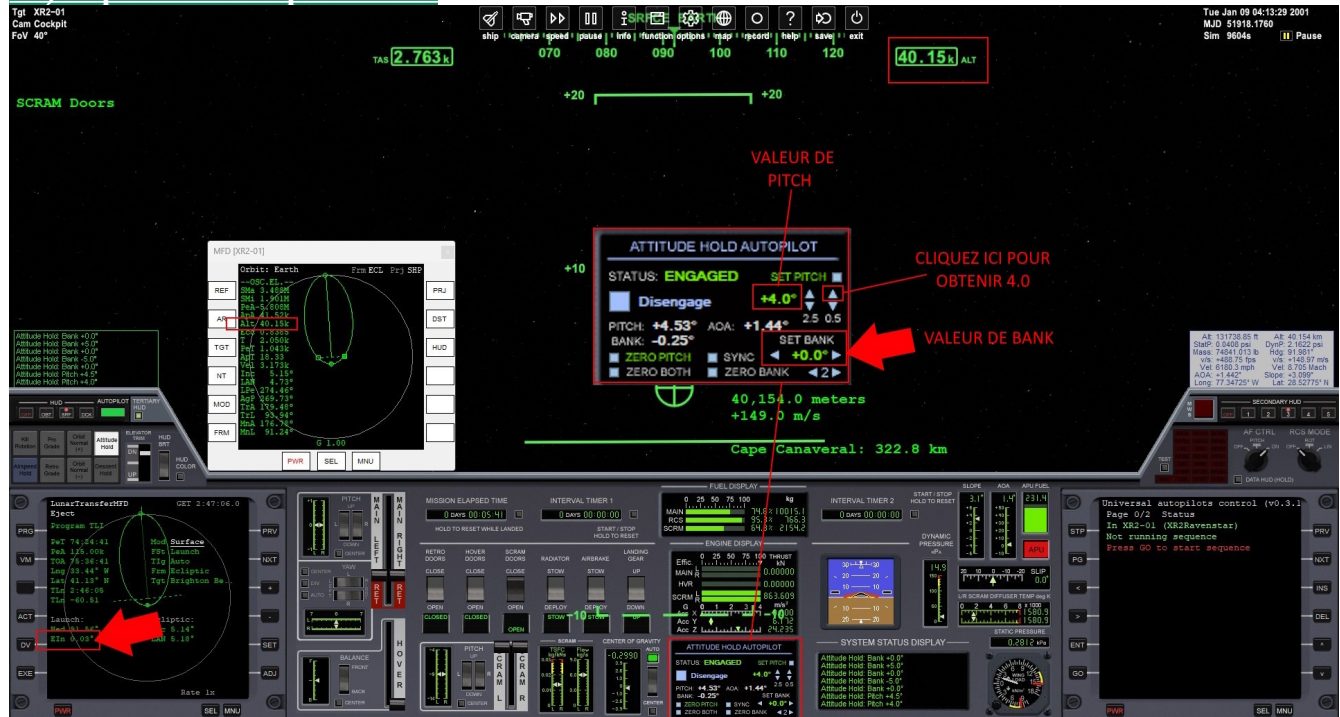
I) ± 40.00 k (altitude)

I.1) Procedures

01 - Decrease the **PITCH** to 4.0.

02 - Decrease the **EIn**.

I.2) Explanations of procedures



Click on the image to enlarge

We are at ± 40.00 k on the altimeter

01 - Decrease the **PITCH** to 4.0 at 40 kilometers altitude.

02 - Decrease the **EIn** as on the previous page, **without looking away from the altitude**.

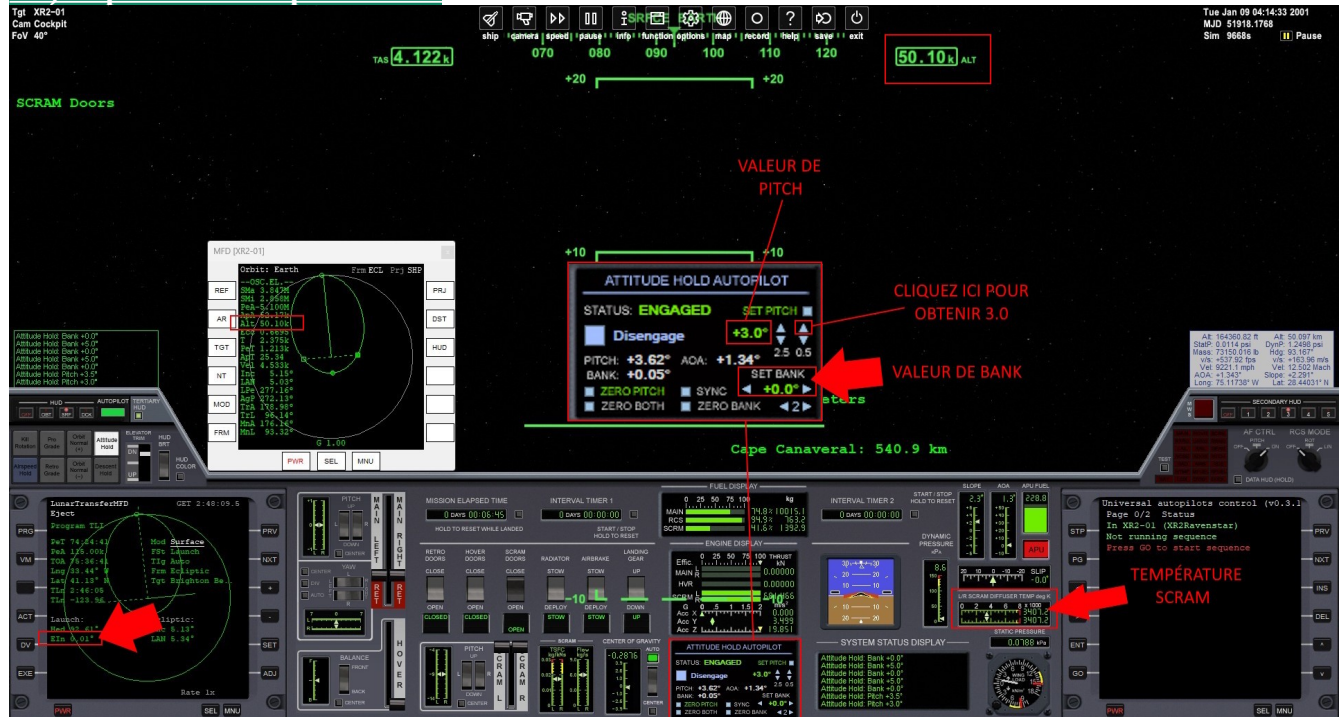
J) ± 50.00 k (altitude)

J.1) Procedures

01 - Decrease the **PITCH** to 3.0.

02 - Decrease the **EIn**.

J.2) Explanations of procedures



Click on the image to enlarge

We are at ± 50.00 k on the altimeter

01 - Decrease the **PITCH** to 3.0.

02 - Decrease the **EIn** without looking away from the **SCRAM** temperature on the right.

K) SCRAM temp $\pm 7700^{\circ}\text{K}$

K.1) Procedures

01 - Close the SCRAM DOORS.

02 – MAIN at 100%.

K.2) Explanations of procedures



Click on the image to enlarge

The SCRAM temperature reaches 7700°K or you hear SCRAM fuel low

01 - Press the SCRAM DOORS button to close the SCRAMs.

02 - Press the red MAIN area to turn on the main thrusters.

Quickly move to the next page.

IMPORTANT: Place your finger on the “*” key on the numeric keypad before the procedure.

L) ApA ± 200.00 k

L.1) Procedures

01 - MAIN at 0%.

L.2) Explanations of procedures



Click on the image to enlarge

ApA value reaches ±200k

01 - Quickly press “*” on the numeric keypad to turn off the thrusters (MAIN).

02 - Relax.

We reached 73.73 kilometers above sea level.

The following procedures will be more relaxed.

M) ± 90.00 k (altitude)

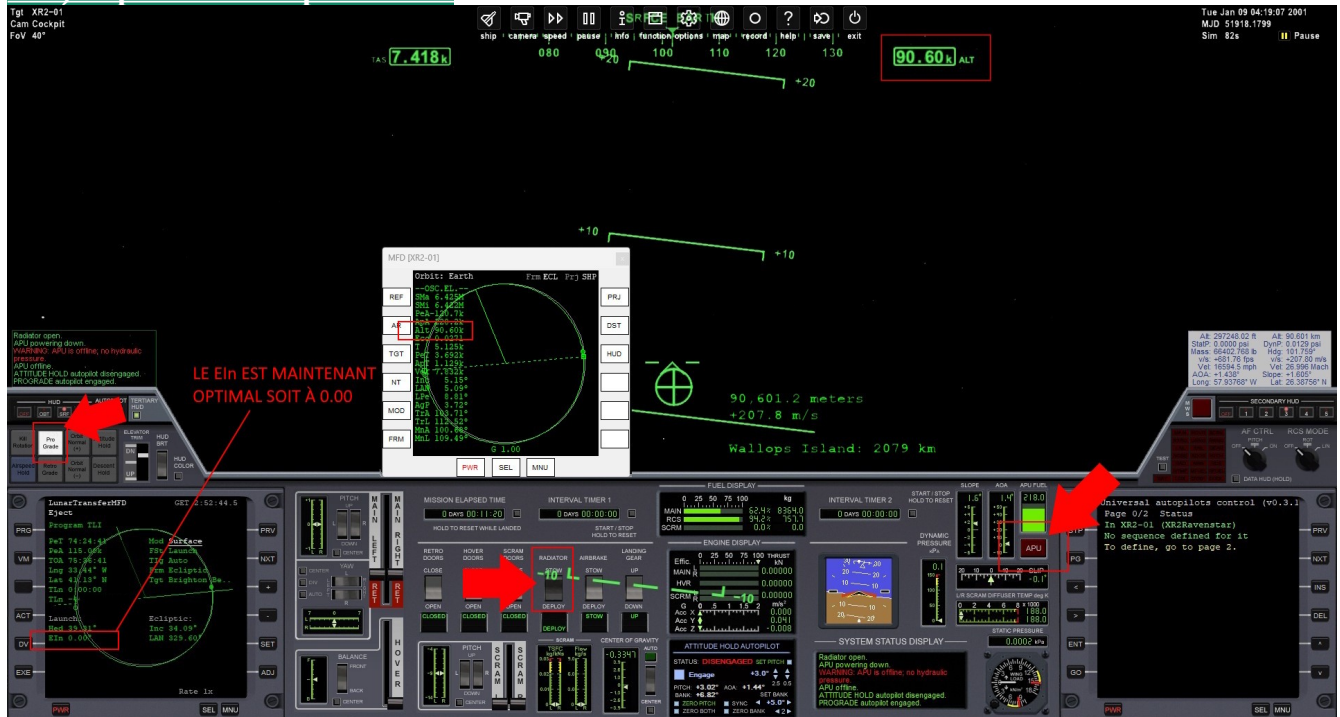
M.1) Procedures

01 - Open the **RADIATORS**.

02 - Activate PRO GRADE.

03 - Close the **APU**.

M.2) Explanations of procedures



Click on the image to enlarge

We are at ±90.00k on the altimeter

01 - Click on the **RADIATOR (DEPLOY) button.**

When you no longer hear the sound of the RADIATOR opening

02 - Click the **APU button to turn it off.**

03 - Click on the PRO GRADE button.

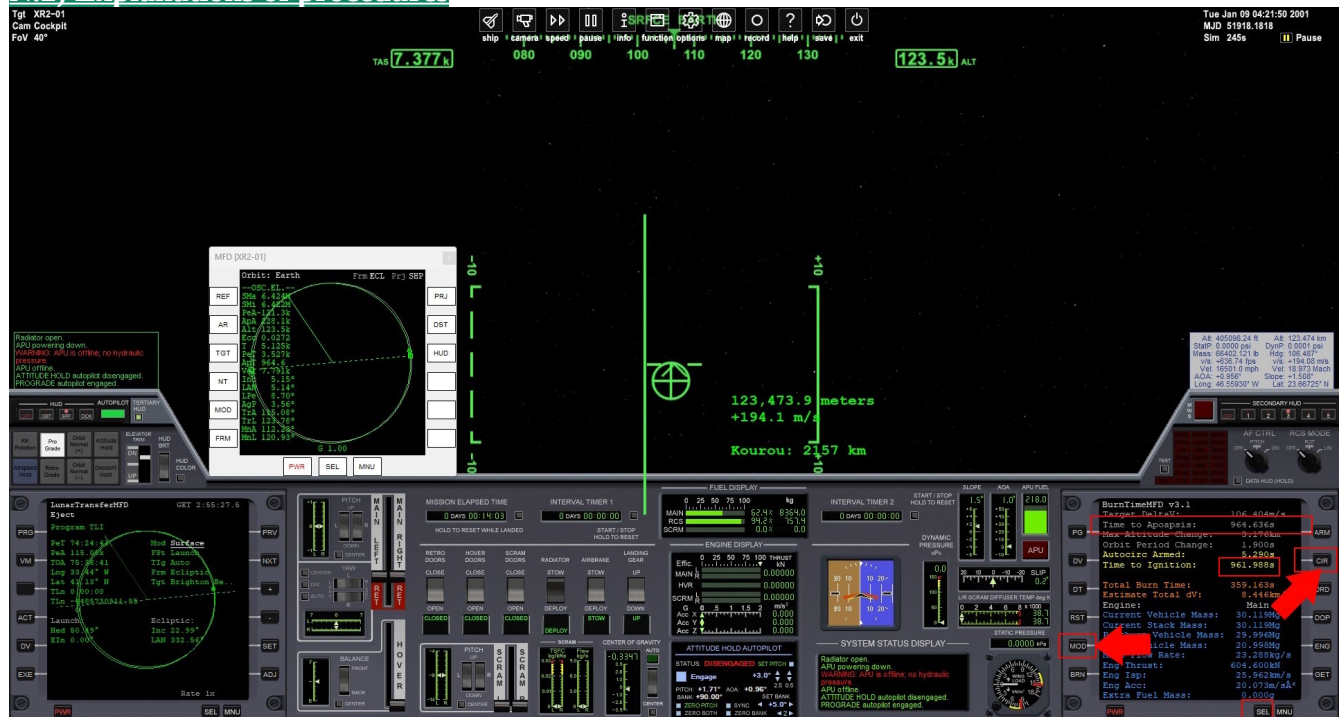
We reached **90.60 kilometers** of altitude.

N) EOI

N.1) Procedures

- 01 - Open the **BurnTimeMFD** on the right MFD.
- 02 - Choose the MOD "Time to Apoapsis".
- 03 - Press **CIR**.

N.2) Explanations of procedures



Click on the image to enlarge

Perform these procedures as soon as possible

- 01 - Click on the **SEL** button, as many times as necessary, in order to see **BurnTimeMFD** in this menu.
- 02 - Click on the button to the right of the word **BurnTimeMFD** to select it.
- 03 - Click the **MOD** button to select **Time to Apoapsis** (see red box).
- 04 - Click on the **CIR** button to execute this MFD.
- 05 - You will see in yellow **Time to ignition: 961.988s**.
- 06 - Accelerate then decelerate the simulation, **carefully**, to obtain the value $\pm 200.00s$.
- 07 - At **0.00s**, thruster (**MAIN**) will turn on.

Relax! You will see a beautiful sunrise.

Congratulations !

You have successfully completed the first part of your mission.

Save your flight for next tutorial

- 01** - In the context menu, at the very top of the screen, click **exit**.
- 02** - Click on the **Save current...** button (at the bottom of the screen) to save your scenario.
- 03** - In the Scenario name field enter "**XR2 is going to the moon**".
- 04** - Click the **OK** button to accept this name.