EUROPA PROGRAM

for Orbiter version 2006 and 2010

Instruction manual and History

Installation recommandations

JacquesMoMO

CREDITS

Add-on for Orbiter flight Simulator versions 2006 (or 2006-P1) and 2010.

- 3D model of the original ***Europa I*** rocket: ***Thomas Ruth***. Thanks to Him.
- Changes, improvements and triturating of the 3D models of the rockets, adjustment and updates, flight plans, concept and realization of explosions: ***JacquesMoMo***.
- Modification and adjustment of the ELA-1 pad in Kourou (jaws and umbilicus): ***Papyref***.

ABOUT the TRANSLATION:

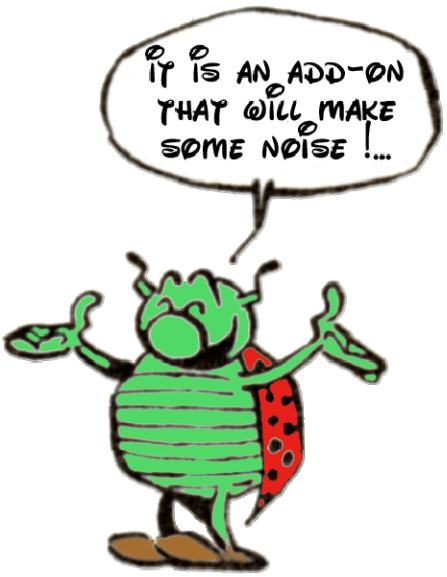
I tried to do by myself the translation of my French Manual into English. But I do not have an adequate level in this language to make everything perfect, especially the grammar and certain turns of phrase. I hope you will forgive me…

The purpose of this manual is just to help you how to pilot Europa and the others rockets, and may be discover the amazing History of Europa program, prelude to the saga of the Ariane program.

Have fun with this add-on… and good flight…

JACQUES

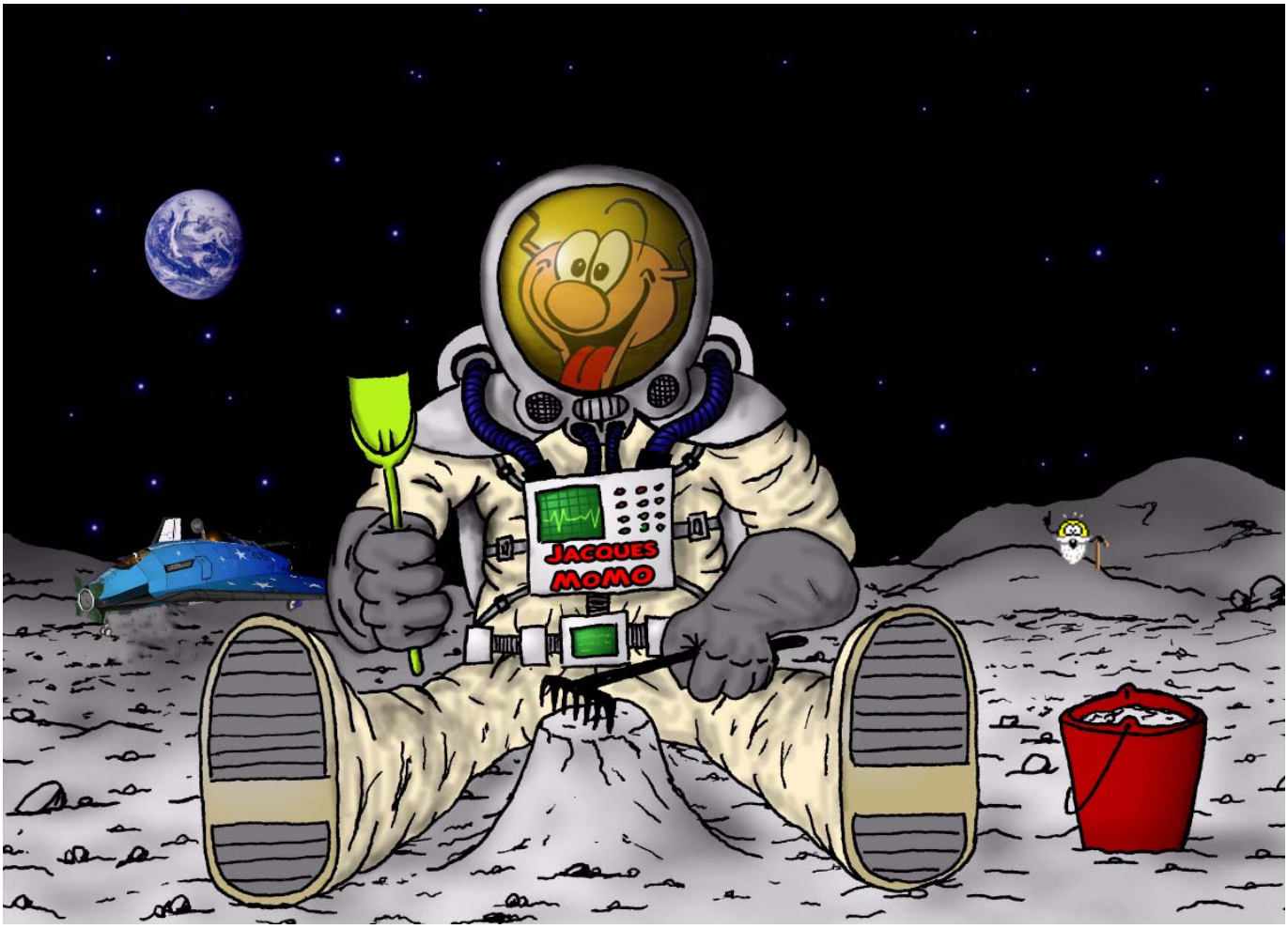
*Translation by **JacquesMoMo** may 2011*



VERY IMPORTANT

BEFORE YOU START TESTING THIS ADD-ON, YOU HAVE TO READ THE CHAPTER II ABOUT INSTALLATION, AND ALSO THE CHAPTER XV CONCERNING THE INSTALLATION OF REQUIRED ADDITIONAL ADD-ONS. (*And also the rest too!...*)

OTHERWISE YOU HAVE CRASH RISK AND OTHER CTD
YOU ARE NOW ADVISED…



Picture from ©Kévin Maurice *(my son)*

SOMMAIRE

I - PROLOGUE

A) Why I made Europa launchers

But what happened to me to get into such an adventure? I'll try to explain this...

I had chance to spend more than two years in ***French Guyana***, from 1979 to 1981. And I also had the chance to assist to launches of the three first Ariane, L01, L02, and L03 flights...

At this time, the main road of French Guyana (N.1) crossed the Spaceport of Kourou, and, outside of a launch campaign, the site is open and have free access, and anybody could walk quietly around (except around the ELA-1 pad, of course...). This is no longer the case today! Therefore, for each of my ballads, I "bumped" by chance on the remains of a rocket, forgotten in a disused hangar, the famous Europa 2. At least its first stage. Rare privilege and a chance that I was not aware at the time.

December 1979: This is me (a little younger) posing before the Blue Streak stage of Europa-II rocket (flight F12) abandoned in an old shed of Kourou spaceport. It does not rust, but is already in a pitiful state...

However, as you know, there are in Orbiter many French and European rockets (Diamant, Ariane, Vega etc...) with very good quality, except Europa. There was a good one, but outdated and lost in an add-on him also outdated (file ***clg.zip*** always available on **Avsim.com**, from 2 June 2003 by ***Thomas Ruth***). But I find that this rocket deserved better, because it is, do not forget, the ancestor of the **Ariane** launchers, and perhaps as if it had never existed, the family of different versions of the Ariane rockets would have never seen the day.

December 1979: The remains of the Europa-II (flight F12) rocket in a disused shed...

In my opinion, I find that ***Thomas Ruth***'s rockets are very successfully, and I started to think that it was not worthy to remain in limbo, and that it would be nice to give it to the taste of the day.

So, I contacted ***Thomas Ruth***, the author, to ask to him permission to use his "mesh" with its textures, to give it a new youth.
Here's his reply, very friendly:

> Hi Jacques,
> Nice to see someone's picking up these old meshes.
> Of course you can use the models for your project, good luck with it.
> Cheers, Tom

My purpose was only to reproduce the Europa-2 flight that had unfortunately exploded after just over two minutes of flight. And nothing else... But by searching on internet (and elsewhere) all available documentation (which is unfortunately very limited, there was no internet at this time!...) I learned a lot about the Europa programme, and this gave me desire to know the incredible story and adventure of this unknown launcher.
Thus, day after day, I got to "manufacture" other versions of this rocket (Cora, Blue Streak) etc… In a simple and quick project, I spend a lot of time on a project more complicated... It took me more than 6 months!...
Knowing not yet how to model 3D shapes, I used the genius software of **ar81** (José Pablo Luna Sánchez): ***Mesh Wizard 1.9d***, available on ***OrbitHangar***. This has helped me, without any knowledge of 3D software, to achieve a satisfactory result.

July 1980: The remains of the rocket are in a field

The inter-stage of Europa II sadly abandoned in a field..

Rest of stage Blue Streak from canceled flight F12.

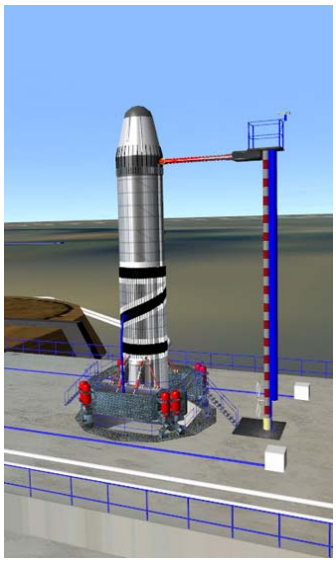
I just raved (and even a lot) with sounds and sound effects. Perhaps someone may find this "exaggerated" (and they won't be wrong), but I enjoyed myself so much!
I hope that purists will in not mind....
I still tried to stay as faithful to historical levels. The purpose of this add-on it is to make you known the Europa program, while remaining entertaining and fun. Finally ... I hope! ...

I think I was the first who had the idea to create explosions in flight, of course with the limitations due to Orbiter and Vinka's ***multistage***, and also the fact that I don't know yet how create ***dll***, which would certainly allowed greater realism. I hope you will have a great time watching and using this add-on, and I hope you will enjoy it. Last thing: send me small words on Dan's Francophone Forum to tell me your impression ... I will be pleased. Critics, of course, are not prohibited ... Have fun, and take care to the impact.... Exit sheltered!...

Jacques.

B) Available rockets in this add-on :

Cora

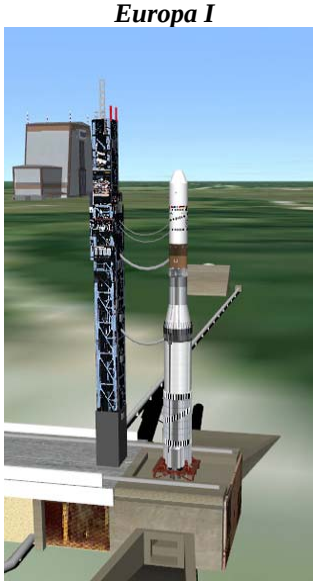


Blue Streak

Europa I

Europa II

Europa III-B



Europa III-E

II - INSTALLATION

Simply unzip ***Europa-Program.zip*** file as usual in your **Orbiter** main folder. Make sure to check "*use folder name*" in ***winzip***, and that's it.
The installation for Orbiter 2006 or Orbiter 2010 is identical, excepting file *stage.dll*.
(*See explanation below: note n.2*).

1°/ Required add-ons :

- **OrbiterSound 3.5** *from Dansteph* **USEFUL:** ***See chapter XII page 32 about "anomaly".***
  http://orbiter.dansteph.com/index.php?disp=d File: OrbiterSound35.exe
- **Kourou CSG-ELA** *from Papyref and Mustard* **REQUIRED**
  http://www.orbiterfrancophone.com/index.php?disp=addons&id=91 File: PackCSG_ELA_250610.zip
- **Woomera 6A** *from notebook* **IMPORTANT:** **See chapter XV about how to install this add-on.**
  http://www.orbithangar.com/searchid.php?ID=4176 File: Woomera 6A.zip
- **Multistage** and **Spacecraft** *from Vinka* **PROVIDED**
  http://users.swing.be/vinka/ **See below my little explanation about *stage.dll*.**

2°/ Add-ons that can be possibly needed :

- **Hammaguir v3** *from Papyref* File : Hammaguir_v3.zip
  http://www.orbiterfrancophone.com/index.php?disp=addons&id=94
- **Blue Streak F2(SC3)** *from Notebook* IMPORTANT: See chapter XV about installation of this add-on
  http://www.orbithangar.com/searchid.php?ID=4552 File: Blue Streak F2(SC3).zip

3°/ Optional add-ons (but recommended ... it looks more beautiful !!) :

- **High Res French Guyana** *from JacquesMoMo* (It's from me !..) File : Guyane_HiRes_tuiles.zip
  http://www.orbiterfrancophone.com/index.php?disp=addons&id=92
- **Woomera Hi-Res tiles** *from Artlav* IMPORTANT: See chapter XV about installation of this add-on.
  http://www.orbithangar.com/searchid.php?ID=3293 Fichier: woomera-hires.zip

- If you don't install ***OrbiterSound*** you'll **not have sounds**, it's sad and it's a pity…
- If you don't install ***Kourou-ELA*** you'll **not have a crash** but it's very ugly!..
- If you don't install ***Blue Streak F2*** it **will work**, but you will not see the umbilicus.
- If you don't install ***Woomera 6A*** you'll **have a crash of** Orbiter with missions **F1** to **F10**.
- If you don't install ***Hammaguir v2*** all **will work**, but it is downright ugly…
- If you don't install ***High Res French Guyana*** all **will work**, but it's **very ugly**…
- If you don't install ***Australia HiRes*** or/and ***Woomera HiRes tiles*** it will works and it does not matter.

Note no 1: I joined all versions of ***Multistage*** et ***Spacecraft*** from **Vinka**.
That way you will not have to do it… Thanks, JacquesMoMo…

Note no 2 : As you know, in Orbiter 2010 there is a dysfunction with *Multistage2* and *Stage*. Fortunately, **BrianJ** (Let it be forever thanked!) has made a draft version but functional of ***stage.dll*** file. The installation is configured for Orbiter 2010, with **BrianJ's** file. If you want to install this add-on in Orbiter 2006, you will find in the ***Orbiter\Modules*** folder two zip-files: ***Stage dll 2006.zip*** and ***Stage dll 2010.zip***. You have simply to unzip the right archive into this folder (and thus overwrite the existing file) for the good) to have the good one. Thanks again, JacquesMoMo…

III - CONTROLS

A) Europa rocket

1°/ Automatic flight

Start the chosen scenario, and press P.
You just have to watch the show.
If you want to disable the automatic pilot, again at any time.

2°/ Manual flight

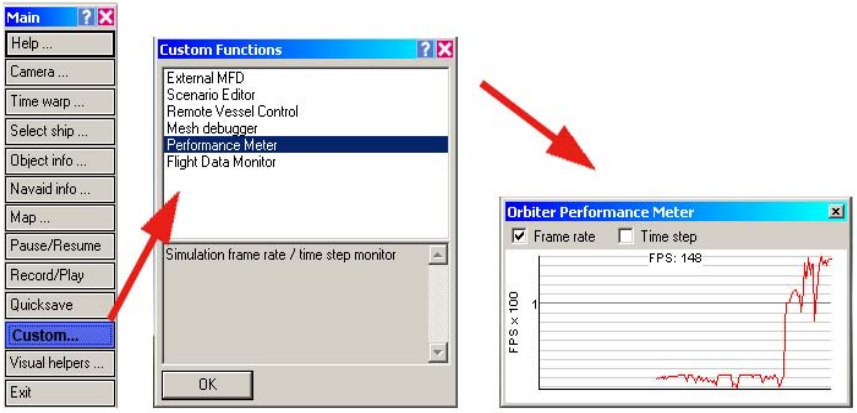
Start the chosen scenario, and press + (or Ctrl+ +) and you can pilot by yourself.
But it's a shame because you will not have sounds!

During the flight, you can also use the following keys:

- J to separate stages
- F to eject fairing

Note:
If you want to display the frame rate (the number of frames per second) at the beginning of simulation, do not press F, otherwise, during the takeoff of the rocket, the fairing will disappear! This is the key problem with ***Multistage*** who select this assignment, and you can not change it.

So if you want to see the "*frame rate*", you have to press Ctrl + F4 .



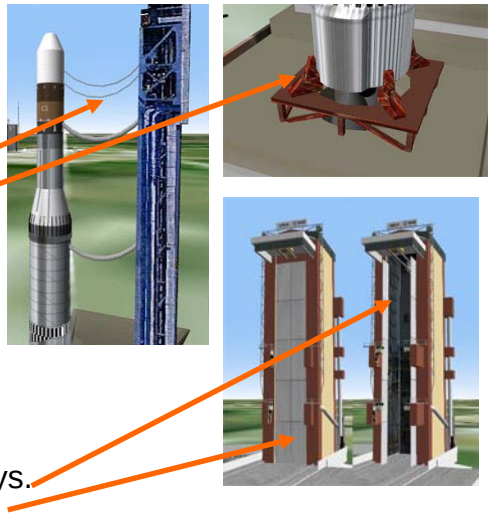
B) Pad ELA-1 of Kourou

1°/ Jaws and Umbilicus

By selecting the F3 button, then ***EuropaArms***,
You have two options before launching:

- You can maneuver ***umbilicus*** with key O (letter "O").
- You can open or close ***jaws*** with key I (letter " i ").

This is not very useful because it is done automatically during takeoff of the rocket. But why not …



2°/ Launching tower

By selecting the F3 button, then ***Zl1tower***,
Followings actions are possible prior launching:

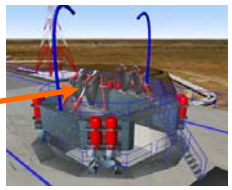
- **The Doors** : if you press key G you can :
  - *open* doors with deployment of gateways.
  - *close* doors with retraction of gateways.
- **The Tower** : - if you press key K : move the ***tower*** forward.
  - if you press keys Ctrl (left) + K :
    move the ***tower*** backward.
  - if you press again keys K : stop moving the ***tower***.

C) Pad 6A of Woomera

1°/ Jaws

If you select key F3 then ***LaucherMecanism(6A)***,
following action is possible before launching:

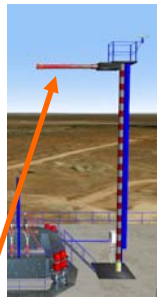
- You can open or close ***jaws*** with keys Maj (left) + 0 (NumPad)



2°/ Umbilicus

If you select key F3 then ***UmbilicalTower(6A)***,
following action is possible before launching:

- You can retract or move out the tower ***umbilicus*** with keys Maj (left) + 0 (Num Pad)



IV - SCENARIOS

All the scenarios of ***Europa Program*** are located in the ***Europa Program*** folder.
You can find a description of each scenario in the ***"launch pad"*** of **Orbiter**.
Here is the list of available scenarios:

A) In folder …\ *Europa Program* \ *Europa 1* :

This folder contains all the flights of the rocket Europa 1, since the single-stage configuration, to the configuration up to three stages...

- Europa (F 1) Configuration 1 stage
- Europa (F 2) Configuration 1 stage
- Europa (F 3) Configuration 1 stage
- Europa (F 4) Configuration 1 stage + model
- Europa (F 5) Configuration 1 stage + model
- Europa (F 6.1) Configuration 2 stages + model
- Europa (F 6.2) Configuration 2 stages + model
- Europa (F 7) Configuration functional 3 stages
- Europa (F 8) Configuration functional 3 stages
- Europa (F 9) Configuration functional 3 stages

And bonus:

- Europa (F 10) Config 3 stages: everything is functional.

B) In folder …\ *Europa Program* \ *Europa 2* :

- Europa (F 11) Europa II rocket on ELA-1 pad in Kourou, in 3 stages configuration, BUT with an autopilot set to cause an explosion (as happened in reality!) which was fatal to the European launcher.
- Europa (F 12) Europa II rocket on ELA-1 pad in Kourou in 3 +1 stages configuration, functional, with an autopilot set to place the satellite into a geostationary transfer orbit.
- Europa (F 13) Europa II rocket on ELA-1 pad in Kourou, Enhanced. (Bonus !)

C) In folder …\ *Europa Program* \ *Europa 3* :

- Europa III-B (Vol 001) Europa III B rocket on ELA-1 pad in Kourou, in 2 stages configuration, BUT with an autopilot set to cause an explosion. (We never tire of it!)
- Europa III-B (Vol 002) Europa III B rocket on ELA-1 pad in Kourou, in 2 stages configuration, functional, with an autopilot set to place the satellite into a geostationary transfer orbit.
- Europa III-E (Vol 001) Europa III E rocket on ELA-1 pad in Kourou, in 4 stages configuration, functional, with an autopilot set to place the satellite into a geostationary transfer orbit.
- Europa III-E (Vol 002) Second Europa III E rocket on ELA-1 pad in Kourou, in 4 stages configuration, But ... I shall say no more … (Novel)

D) In folder …\ *Europa Program* \ *Fusée Cora* :

This folder contains all the test flights of the rocket Cora, testing rocket for stages 2 and 3 of launcher Europa

- Cora (G 1) First flight of the rocket Cora, almost succeeded …
- Cora (G 2) Second flight of the rocket Cora succeeded! Yes!
- Cora (G 3) Third flight of the rocket Cora!..
- Cora (G 4) A fourth flight (fictional) of rocket Cora, fully functional.

D) In folder …\ *Europa Program* \ *Historic Flights* :

As their names suggest, these are the historic launches of the successive versions of launcher Europa (flights F) and rocket Cora (G flights). The "***scenarios***" are identical to those of other folders, but in ***chronological order*** ... except No.***13b*** ... but it's a surprise ... Go and have a look …

- For flights F1 to F9, add-ons ***Woomera 6A*** and ***Blue Streak F2*** are required… → otherwise CTD
- For flights F10 and F11, add-on ***Kourou CSG-ELA*** is highly recommended...
- For flights G1 and G2, add-on ***Hammaguir v2*** is highly desired.

Again, you will find a description of each scenario and a summary of historic flights in the Orbiter "***lauchpad***".
As always, key **P** for automatic flight, so you just have to look and enjoy…

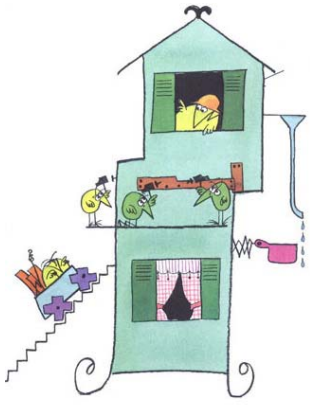
- 01 - Europa 1 (flight F 1)
- 02 - Europa 1 (flight F 2)
- 03 - Europa 1 (flight F 3)
- 04 - Europa 1 (flight F 4)
- 05 - Europa 1 (flight F 5)
- 06 - Cora (flight G 1)
- 07 - Cora (flight G 2)
- 08 - Europa 1 (flight F 6.1)

- 09 - Cora (flight G 3)
- 10 - Europa 1 (flight F 6.2)
- 11 - Europa 1 (flight F 7)
- 12 - Europa 1 (flight F 8)
- 13 - Europa 1 (flight F 9)
- 13b - Europa 1 (flight F 10)
- 14 - Europa 2 (flight F 11)

E) In folder …\ *Europa Program* \ *KSC* :

This folder contains some flights of Cora and Europa rockets, but launched from Cape Canaveral.
These scenarios are just for people impatient to see this famous European launcher, Ariane rockets ancestor, and who do not want to install the Woomera Hammaguir and French Guyana add-ons. (But they are wrong!).
The autopilot plays only sounds, all dialogs (in French) were removed...

- Cora (explosion)
- Cora (functional)
- Europa (functional)
- Europa I (canceled)
- Europa I (functional)
- Europa II (explosion)
- Europa II (functional)
- Europa III-B (explosion)
- Europa III-B (functional)
- Europa III-E (functional)
- Europa III-E (surprise)



And 2 bonus-scenarios :

- Europa Collection
- Europa Collection (the end)

These are all different versions of all the rockets grouped next to each other. Functional for the first scenario, and the second one ... I'll let you imagine!..

To enjoy the beautiful sceneries of Woomera, Hammaguir, and French Guyana, go to ***chapter II : installation***.

- Scenarios *"Kourou"* require installation of ***Kourou CSG-ELA*** (see previous chapter)
- Scenarios *"Woomera"* require installation of ***Woomera 6A*** and ***Blue Streak F2***.

- Scenarios *"KSC"* require ***no additional*** installation…
  These are not very reflecting reality, but you can test the *Europa launcher* without having to install anything.

Don't miss ***Cora G1*** and ***G2*** scenarios, ***Europa-II F11*** and ***Europa-IIIB flight 001*** (and/or ***KSC* (explosion)*** scenarios if you're impatient) because it is especially why I "did" this add-on… The management of explosions took me a lot of time ... but I was much enjoyed!... Also ***13b - Europa-I (flight F 10)*** scenario … Joke!..

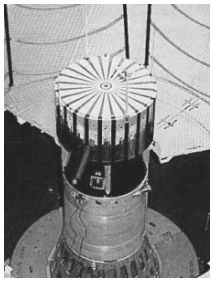
V - CHARACTERISTICS OF DIFFERENT VERSIONS

A) stages of Europa 1 et 2 rockets

Stage 1: (Blue Streak)
Take off Mass: 95 tones.
Empty Mass: 6 997 kg.
Motors: two Rolls-Royce RZ-2.
Thrust: 1 672 671 kN.
ISP (vacuum specific Impulse): 282 seconds.
Autonomy: 156 seconds.
Propellant: 89 t of liquid oxygen (LOX) and Kerosene.
Length: 18.75 m - Diameter: 3.05 m.

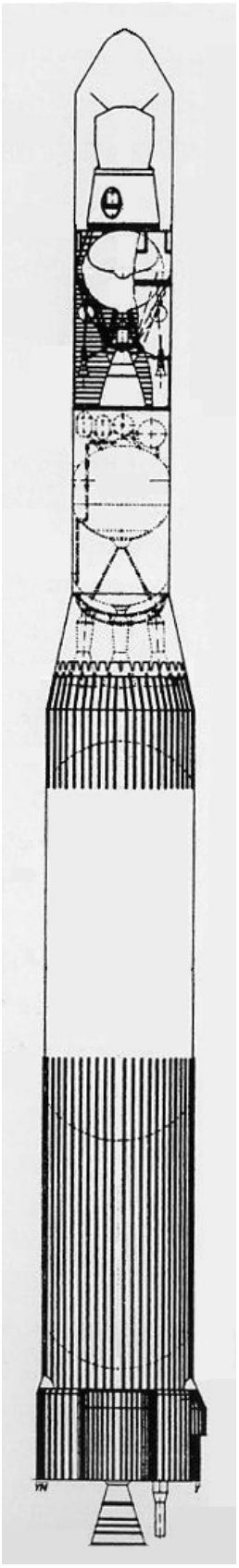
Stage 2: (Coralie)
Take off Mass: nearly 12 tones.
Empty Mass: 2 099 kg.
Motors: four Vexin A.
Thrust: 274 000 kN.
ISP: 277 seconds.
Autonomy: 96 seconds.
Propellant: 9.85 t of N_2O_4 and UDMH.
(UDMH: diméthylhydrazin or $H_2N\text{-}N(CH_3)_2$).
Length: 5.70 m - Diameter: 2.00 m.

Stage3: (Astris)
Take off Mass: 3.370 tones.
Empty Mass: 610 kg.
Motors: one principal motor and two Verniers motors.
Thrust: 23 330 kN.
ISP: 310 seconds.
Autonomy: 330 seconds.
Propellant: 2.94 tones of N_2O_4 and aerozine-50.
(Aéozine : mixture of 50% hydrazine and 50% UDMH).
Length: 3.36 m - Diameter: 200 m.



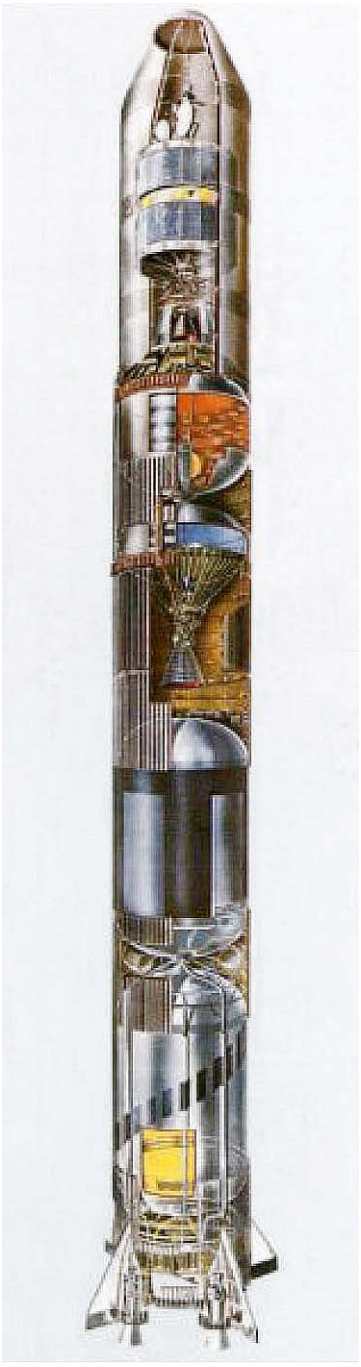
Stage 4: (Diamant B3 ou P.068)
Take off Mass: 800 kg.
Empty Mass: 120 kg.
Motors: one SEP-P6.
Thrust: 50 000 kN.
ISP: 211 seconds.
Autonomy: 46 seconds.
Propellant: Solid.
(Composition: polyurethane+ ammonium per chlorate +aluminum).
Length: 1.67 m - Diameter: 0.80 m.

Payload and Fairing
Utilizable masse: 308 kg.
Effective length: 4.08 m.
Maximum diameter: 2.01 m.



B) Stages of Europa 3 rocket

Stage 1: (L-150)
Take off Mass: 166 030 kg.
Empty Mass: 13 590 kg.
Four Viking motors, each with 885 kN thrust.
Specific Impulse: 2736 m/s (à vide).
Thrust: de 2446 kN à 2736 kN.
Autonomy: 152 seconds.
Propellant: N_2O_4 and UDMH.
Length: 21.00 m.
Diameter: 3.80 m.



Stage 2: (H-20)
Take off Mass: 23 000 kg.
Empty Mass: 3 000 kg.
One Vexin-A motor with four combustion chambers.
Specific Impulse: 4395 m/s (empty).
Thrust: 200 kN.
Autonomy: 448 seconds.
Propellant: Hydrogen / Oxygen.
Length: 10.50 m.
Diameter: 3.80 m.

Payload and Fairing
- Fairing
  Length: 8.50 m.
  Diameter: 3.80 m.
  Mass: 570 kg.
- Payload:
  - 5500 kg for an equatorial orbit 200 km high.
  - 4500 kg for a polar orbit 200 km high.
  - 1550 kg for a geostationary orbit.

C) Characteristics of the family of launchers Europa

Europa 1

Maximum load:
- 1440 kg on a 200 km altitude orbit.
- 1000 à 1200 kg on a 500 km altitude orbit.
- 200 kg on a geostationary transfer orbit.

Thrust Start: 1 500 kN.
Take off weight: 104.670 tones.
Body Diameter: from 3.05 to 369 meters.
Total length: 31.65 meters.

Europa 2

Maximum load:
- 360 kg on a geostationary transfer orbit.

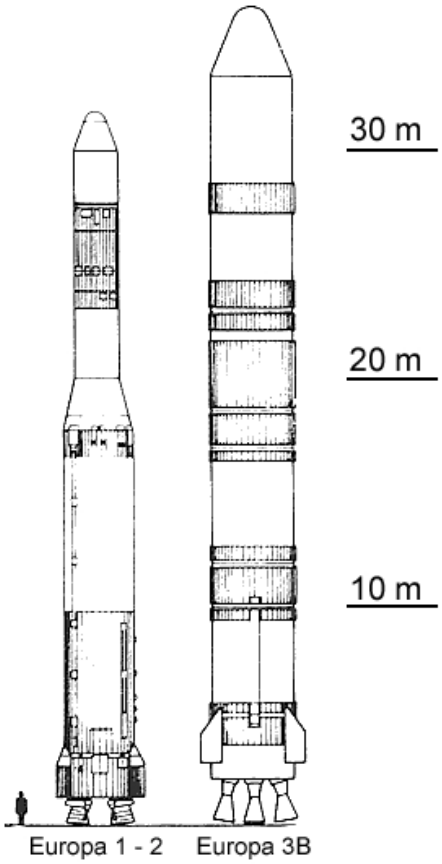
Thrust Start: 1 512 kN.
Take off weight: 111.700 tones.
Body Diameter: from 3.05 m to 3.69 meters.
Total length: 31.70 meters.

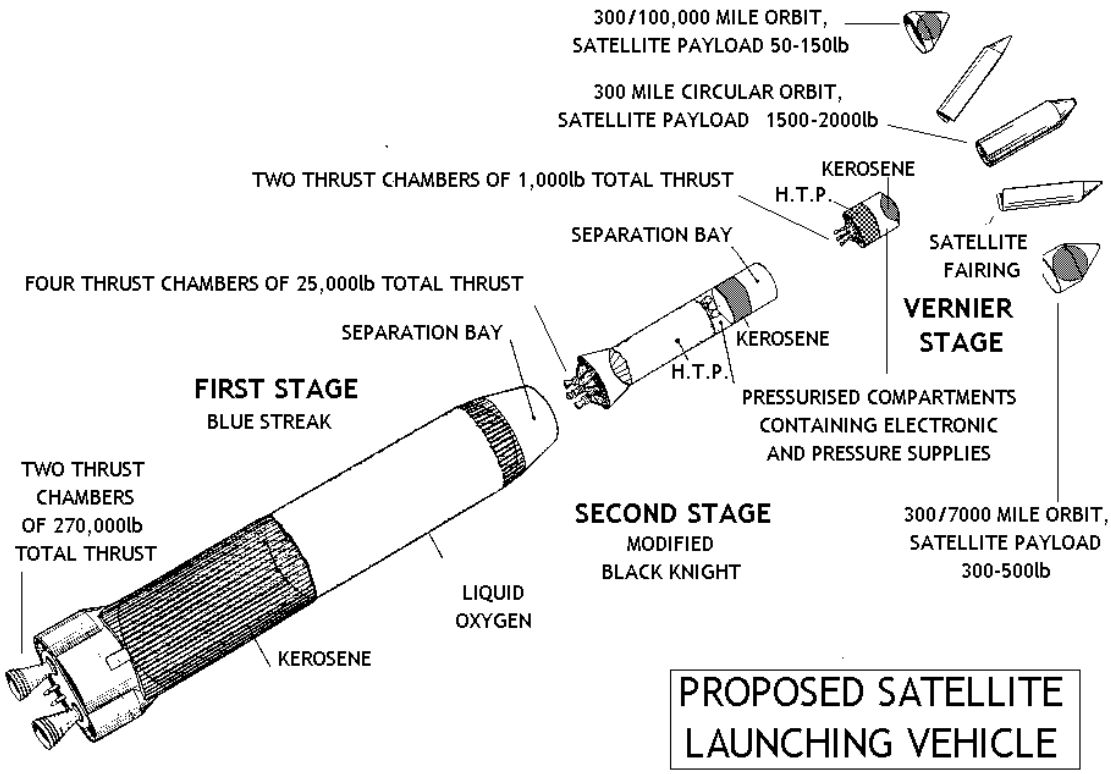
Europa 3

Three versions were planned: 3B, L3S and 3N. These values are theoretical, this rocket existed only on plan…

Maximum load:
- 5650 kg on a 200 km altitude orbit.
- 1560 kg on a geostationary transfer orbit.

Thrust Start: 2 363 kN (4 'Viking 2' motors).
Take off weight: 191 tones.
Body Diameter: 3.8 meters.
Total length: 42.76 meters.





VI - EUROPA PROJECT : HISTORY

A) Beginning of the project

In October 1957, the shockwave of Sputnik shook the world. In France, many physicians consider that they have to create an organization dedicated to space research in the image of CERN (*European Center for Nuclear Research*) created in 1952 on an idea by Professor Rabi, an American delegate to UNESCO.

This will be done in 1958 with the creation of COSPAR (*Committee on Space Research*). Its work is to coordinate and facilitate research by the scientific community in spatial domain.

In January 1960, during the first meeting of COSPAR, the idea of a real European organization of space is accurate and gives birth on June 24th, 1960, of the GEERS (*European Group for Study and Space Research*). Its objective is to create a more elaborate structure. Meanwhile, after spending over 100 millions of sterling pounds, the British government announced the official cancellation of ***Blue Streak*** program under study since 1955. The development of this machine was nearly completed; it was intended to be used as first stage of a satellite launcher. The British then proposed to the European countries to build together a three-stage rocket capable of putting into orbit a payload of one tone in low orbit.

March 29th, 1962, ELDO (*European Launcher Development Organization*) was born in London. This convention, which was signed only in 1964, included Germany, Belgium, France, Italy, the Netherlands and the UK, with Australia as an associate member

The works will be allocated as following:
- United Kingdom will provide the first stage,
- France will build the second stage,
- Germany the third stage,
- The experimental satellites will be developed by Italy,
- Belgium will take charge of tracking stations,
- Holland will take charge of telemetry data and remote controls,
- The launches will take place at *Woomera*, Australia.

Some market studies conducted by the British show that it is expected to have three or four launchings in a year for high orbits.

ELDO A launcher will be a three-stage launch vehicle, high nearly 32 meters, with a maximum diameter of 3.69 meters and a take off weight of nearly 105 tons. It must be able to put about a ton on a circular orbit at 500 km altitude.

The first stage will consist of the ex strategic English missile ***Blue Streak***.

The second stage ***Coralie*** will be built by France from research of rocket probes ***Veronique*** and ***Vesta***.

The third stage ***Astris*** will be built by Germany.
Italy will manufacture the ***fairing***.

In April 1964, France decided to build a launch site in French Guyana...

B) First version of the launcher : Europa 1

This first version of the rocket, called ***ELDO-A***, then renamed ***EUROPA-1***, will consist of three stages, will measure 31.7 meters tall and weigh over 110 tons. This launcher should be operational in 1966. It is designed to send a payload of 1000 to 1200 kg on an orbit at 500 km altitude.

• The first stage, built by the British, will be named "***Blue Streak***".
• The second stage, built by the French, will be named "***Cora***".
• The third stage, built by the Germans, will be named "***Astris***".

Other countries are participating in the program Europa:
- Italy for the construction of experimental satellites.
- Netherlands and Belgium who are collaborating to develop the module ***Blue Streak***.

The second and third stages were tested by the French. The assembly of these two parts was named ***Cora rocket***.

The testing program consisted of firings called "**F**" with the first stage ***Blue Streak***, and firings called "**G**" of ***Cora rockets*** (derived from the stage *Coralie* which have added a second stage *Astris* and a *fairing*).

However, the program took a significant delay, and the cost estimates, established in 1961, was largely exceeded. In addition, the missions that they wanted to give to a European launcher had changed. The program was then redirected during the summer of 1966: in addition to a redistribution of financial contributions, it was decided to transform Europa-1 launcher to a Quad-stage rocket, able to place a satellite in a geostationary transfer orbit, and to use for it a low equatorial launching base, in this case Kourou in French Guyana.

After ten launchings and eight years of work, the Europa-1 program ended without any successful satellization... The Europeans realized that this rocket had no use: telecommunications satellites should be placed on a geostationary orbit, much higher than the first version would allow it.

It was then decided to change it for a new rocket: ***Europa-2***. This rocket should be able to place satellites weighing 150 kg in geostationary orbit.

C) Second version of the launcher : Europa 2

In January 1966, the project ***ELDO B*** is decided: It will be a launcher for geostationary orbit for telecommunications satellites from ESRO. The French Coralie stage will be replaced by a cryogenic stage. Two configurations are examined:
- ELDO B1 with a H5.5 stage and an engine of 6 tons.
- ELDO B2 with a H14 stage and a other stage H5.5.

On 17 February 1966, after a second crisis in ELDO (delay and cost overruns), the project ELDO B is placed to the background, merely ELDO finish ***ELDO A*** (that is "***Europa-1***") and modernize it to reach the geostationary orbit. A new launching base will be built near the equator to reach directly a zero inclination. Three sites are proposed: Port Darwin in Australia (12°N), Kourou in French Guyana (5°N), and a maritime platform Santa Rita (0°N) close to the African coast.

After the failure of launch F9 (fifth consecutive failure), ELDO decides to start the Europa-2 program. The rocket is undergoing significant changes. Europa-2 has a fourth stage derived from powder stage BP4 of the French launcher Diamant-B, named P-068. This craft is called PAS (Perigee Apogee System), and the launcher Europa-1, renamed Europa-PAS or Europa-2, acquires the capacity to send a payload in geostationary orbit.

The telecommunications market begins to rise and the future is in geostationary orbit witch have an altitude of 36 000 km. Europa-2 program is financed by France and Germany at 90%. The UK and Italy have left the project in 1969.

With a capacity up to 150 kg in orbit, it was planned to launch two rockets for the qualification test of the launcher, and then to send two telecommunication satellites (***Symphony 1*** and ***2***), developed under bilateral cooperation between France and Germany.

In May 1969, CNES presents the new launching pad of ELDO in French Guyana.

Unfortunately, Europa-2 was fired only once (F11 firing), on November 5, 1971, from the ELA-1 pad in Kourou, the new base of CNES. The rocket takes off at 10:00 am, but 107 seconds later it stops responding! At 150 seconds, the motors stop, and the stage Blue Streak explodes, causing the explosion of the stage Coralie and then the fallout of the launcher 4 minutes and 44 seconds after the launching.
The investigation will show that a malfunction of the inertial system was the cause of this failure.

April 27, 1973, France and Germany have decided to abandon the Europa program, although Blue Streak stage (for launch F12) was on the way to Kourou since 27 days, with the Coralie stage.

Other rockets in preparation were stopped although they were already being manufactured.

D) Third version of the launcher : Europa 3

While working on the launcher Europa 1 and 2, France, Belgium and Germany conducting parallel studies since 1968 on another much more powerful launcher, the future Europa 3.

In effect, rockets Europa 1 and 2 were powerful enough to launch the first European satellites, but the next generation of satellites would weigh 800 kg then 1200 kg. The new launcher has to be able to send satellites from 400 to 700 kg into geostationary orbit, and 800 to 1400 kg into geostationary transfer orbit. In addition, this new launcher will be much cheaper than Europa 2 which cost for about 20 million U.S. dollars. By comparison, the U.S. Delta rocket cost only 6 millions dollars.

This launcher will consist of a first stage *Blue Streak*, with a second cryogenic stage located above, and probably boosters with liquid propellants derived from the *Diamant* rocket, joined to the first stage.

The Europa 3 program is scheduled to start on 1st October 1972, to be operational within seven years, after five tests. A new pad will be built at Kourou in French Guyana, 12 km from the pad Europa 2.

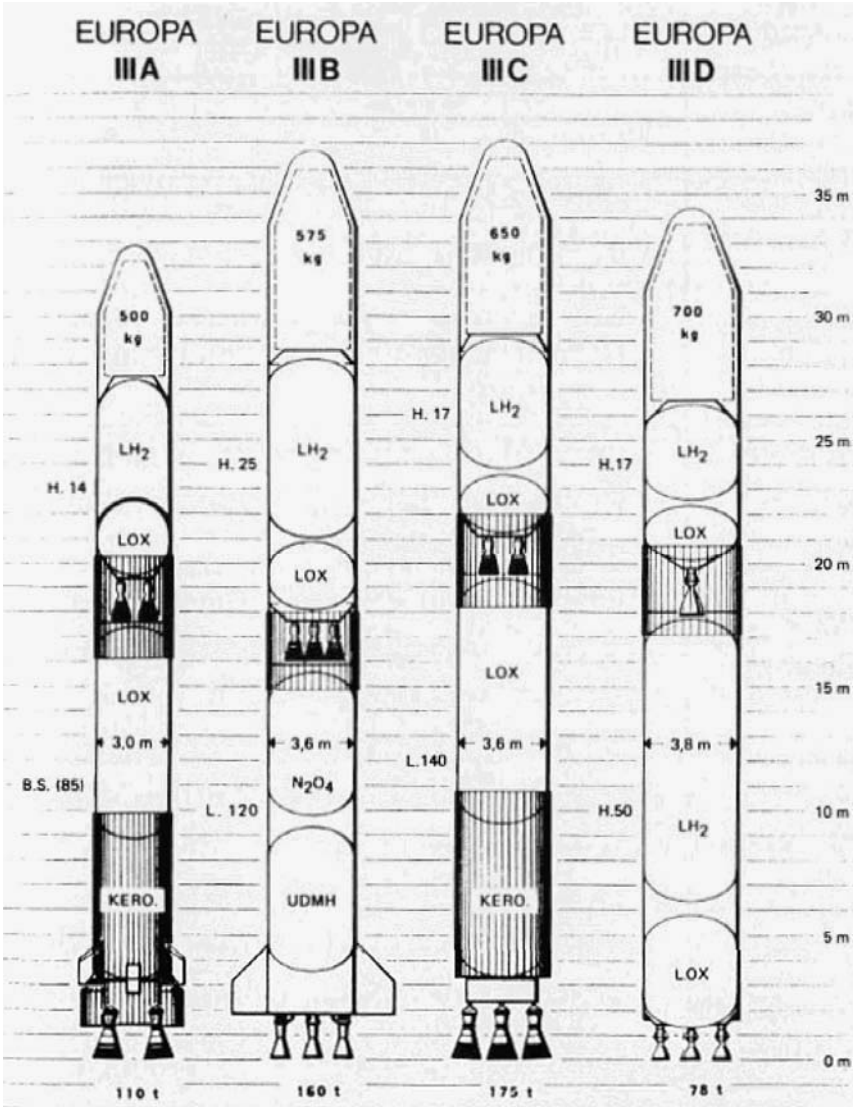
During the summer of 1970, France, Belgium and Germany presented their project for a new launcher, called Europa 3. Five different models are proposed:

- Europa 3 A: This is a two-stage rocket. The first stage would be a *BlueStreak* modified and thus more powerful, propellant is hydrogen. Its takeoff weight would be about 110 tons.

- Europa 3 B: The rocket, with also two stages, would be equipped for the first stage with a Viking engine manufactured by France, with 55 tons of thrust each. The second stage would be powered by a "high energy" motor with a thrust of 25 tons. Its takeoff weight would be about 160 tons.

- Europa 3 C: Four motors Rolls Royce RZ-13 will power the first stage, making the propellant charge decreased significantly. Its takeoff weight would be of 175 tons.

- Europa 3 D: Two stages powered with a "high energy" motor with a lower total mass. Its takeoff weight would be 78 tons.



- Europa 3 E: This launcher will consist of three stages with conventional storable propellants.

After long discussions, the "Europa 3B" project was chosen. Proposals to use the stage BlueStreak and its motors did not have much support, especially due to the withdrawal of England project. Thus, both Europa 3 A and C are eliminated. The proposed Europa 3D is technically very demanding, and would be extremely costly in terms of development. About the proposal Europa 3E, the concept of multistage does not cause the enthusiasm ... We can always do it later, which should increase the weight of the payload of the rocket.

The Europa 3B Project seems to be the most realizable. Viking motors on the first stage are based on technology developed and tested by rockets *Coralie* and *Diamant*. The second stage should be cryogenic, and will be developed by MBB and SEREB. On its side, also, Germany had launched since 1967 an experimental program called LH2 and consisting of the development of a hydrogen stage. Meanwhile, at MBB, similar research has been made.

The Europa 3 rocket will send a 5500 kg satellite in an equatorial orbit of 200 km altitude, or 4500 kg on a polar orbit altitude. In orbit, it could send a satellite of 1550 kg.

In June 1972, France decided to abandon cooperation with the U.S. and to develop Europa-3B. Germany choose to develop the Spacelab rather Europa.
But Europe's space goes wrong ... The participating countries decide to stop the project in December 1972, after more than three years of research, and although before arriving at a real development of this launcher. CECLES (*European Commission for the Development and Construction of Space Vehicle*) was dissolved in May 1973.

At that time, only a few preliminary studies have been made, although some elements are already developed:

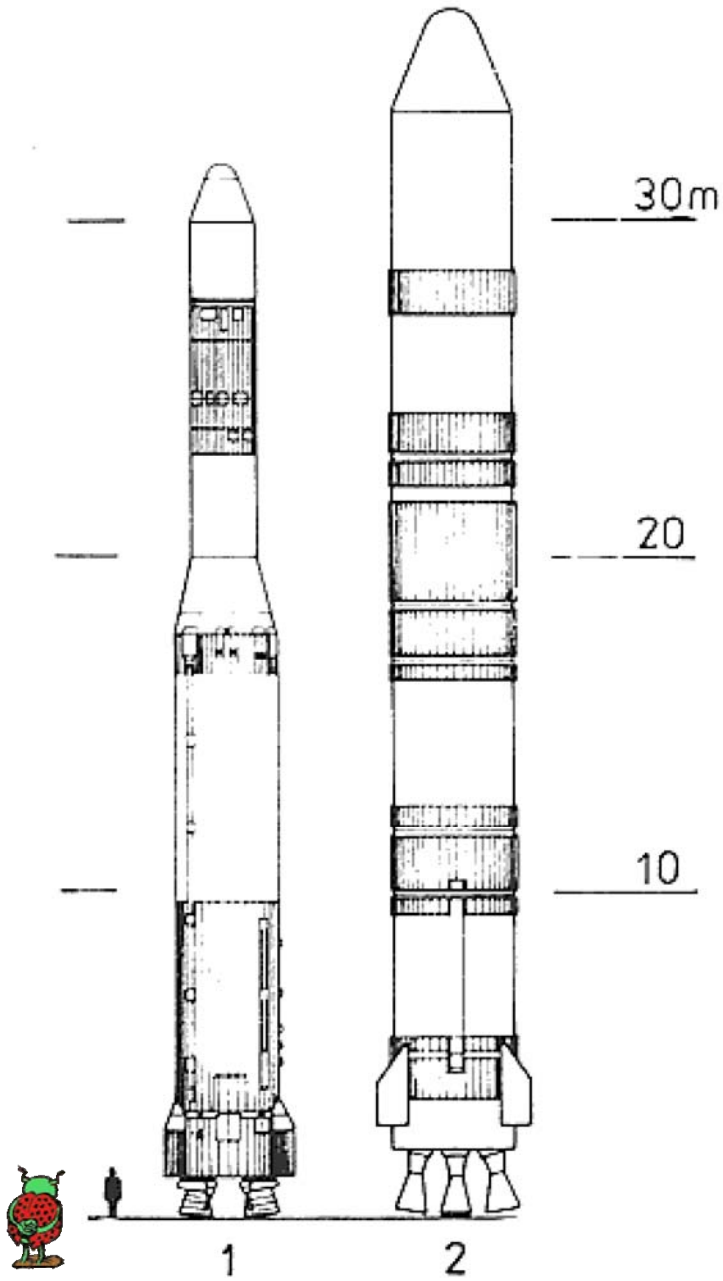
- The propellant tanks and the engines of the first stage,
- The propellant tanks of the second stage,
- Some parts of the motors of the second stage (combustion chamber, nozzle ...)

The Europa project was too ambitious, too complicated and too expensive. The main cause of the failure of this program was the lack of coordination between the participating countries. This failure brought an end to cooperation ELDO (*European Launcher Development Organization*).

Europa-3 was never realized, but its first stage served as the basis for the European launcher ***Ariane***.

After the unimaginable debacle of Europa program, the Ariane program will be the success that everyone knows ... if it was slightly grace to Europa ?...

1 – Europa 1/2 (1960–1972); **2** – Europa 3B (1972–1973)



VII - LAUNCHING FACILITIES FOR EUROPA PROGRAM

A) Woomera in Australia

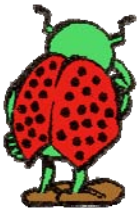
(Woomera time zone = UTC + 10)

Australian Woomera base becomes reality in response to requests from the British defense after the Second World War. The army needed space to be able to test their new weapons systems.

Pad 6A with Europa-I rocket, at Woomera.

Several sites are searched, including Canada. In the end, Australia is chosen on April 24, 1947, because the density of its population is very low. The ***Long Range Weapons Establishment*** (Woomera rocket range) becomes reality on 1 April 1947.
The history of Woomera will divided between weapons testing, launched satellites and tracking network for spacecrafts like Mercury program.
The first missile is launched on March 22, 1949, and the first British ***Black Knight*** rocket on September 7, 1958.
The original program ELDO is born in 1960 with the cancellation of English Blue Streak missile program. This missile becomes the first stage of the launcher Europa, with a French stage in second and German in third. Australia, which was not a member of ESRO, provided its launch base. Two pads, 6A and 6B, were built at dried up Lake Hart.

*Woomera in Orbiter with **notebook**'s add-on (nice, huh?) and Europa-I on pad 6A.*



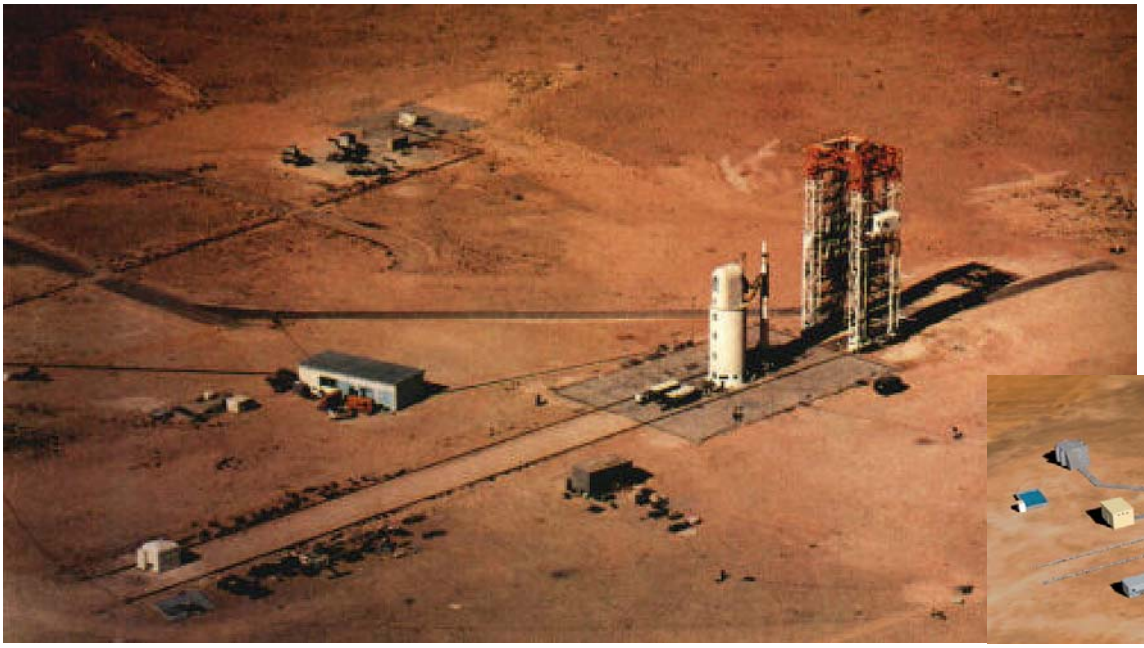
B) Hammaguir in Algeria *(Hammaguir time zone = UTC + 1)*

The testing center of Special Equipment (SEES) was established 24 April 1947 in French Algeria at Colomb-Bechar. The primary purpose of this site was the development of ballistics missiles for the French nuclear deterrent force

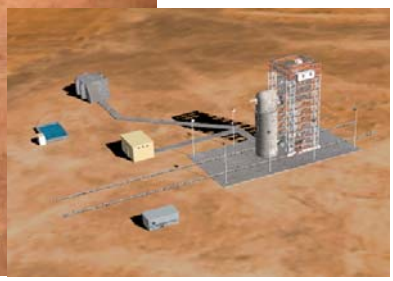
Colomb Bechar in 1966.

Two sites were selected for the launching of missiles:
- B0 for missile testing,
- B1 (1949) for larger rockets.
  From this site was launched the first rocket *Veronique*.

But these two launching sites were not sufficient for launching bigger rockets. Because of the political and military situation in Algeria, it was decided to develop the site of *Hammaguir* rather than investing in a new launching site, which in all probability, should be abandoned at terms.
It was decided in 1952 to create another complex called ***B2 Hammaguir*** (a contraction of "*Hamada du Guir*") located 120 km south-west of Colomb-Bechar.



At Hammagir



In Orbiter (by ©Papyref)

Four bases are equipped at Hammaguir in 1952:

- ***Blandine*** and ***Bacchus***, designed for launching probe rockets.
- ***Béatrice***, used for testing ground-to-air missiles but also for launching rockets *Cora* from *Europa program*.
- ***Brigitte***, affected to the experimental rocket program of the series of "Precious Stones", as the space launcher *Diamant*.

In 1962, the Evian agreements contained some clauses annexes, said "secret", authorizing the French presence extended for some military sites. The base of launching Rockets of Colomb-Bechar was left available to French authorities another five years. This base was evacuated on July 1, 1967, in accordance with the agreements of Evian.

1966…

C) Biscarosse in France *(Biscarosse time zone = UTC + 1)*

In July 1962, four months after the signature of the *Evian agreements* who projected closing of the base of *Hammaguir* in Algeria on 1 July 1967, the French government decided to create a missile testing center in ***Landes*** near ***Biscarosse*** (France).
The CEL (*Centre d'Essais des Landes*) was to test tactical vehicles, tactical missiles and nuclear strategic missiles. The site would allow testing and launching missiles toward the Atlantic Ocean.

Testing Center of Landes near Biscarosse

Longitude 1.2548°
Latitude 44.3403°

The resources test required were repatriated from Hammaguir or started into production. SEREB realized the ballistic launching base, and other ground facilities came to complete those of the principal establishment of ***Biscarosse***. A tracking station was established in ***Hourtin***, 100 km north, to take over the means of Biscarosse after few tens of seconds of powered flight. Another station was established in ***Britain***, near Quimper.
As the impact area is situated near the Azores, a tracking station has been opened in October 1966 on the Portuguese island of *Flores*, its main function is to follow the trajectory of objects in the ballistic phase.

The naval and air resources of the launching site located to the receptacle (area fallout for the main objects of payloads of missiles) had for primary mission to collect measures relating to the different objects during the sixty seconds between re-entry in atmosphere and impacts in the sea. The *Henri Poincaré* vessel, equipped with trajectory tracking radars, antennas of receipt of telemetry and optical resources, was the main naval means. It was operational from March 1968 until 1991.

The site became operational for testing short-range missiles in March 1964.
The CEL was enabled to test the various stages of French missiles.
As regards for civil rockets, the CEL was used to launch the latest exemplars of ***Ruby*** and ***Cora*** rockets in 1967. There were at least 175 launches from 1965 to 2007.

D) Kourou in French Guyana *(Kourou time zone = UTC - 3)*

The launching facilities for ***Europa***, the CECLES Equatorial Base (***French***:*Commission Européenne pour la mise au point et la Construction de Lanceurs d'Engins Spatiaux = European Commission for the Development and Construction of Space Vehicle*) - or BEC - is one of the three launching complexes of the CSG (*Guyana Space Center*) located 15 km from **Kourou**. They are located at 2 km north of ***Diamant*** Pad.

The decision to build this base was the subject of agree between the CECLES-ELDO and France, giving to the French government the primary responsibility for the construction of the base. This base includes whole the launch complex for Europa and the production factory of liquid oxygen. Agreement provides the free access of the base for all the launchings which the member states of CECLES-ELDO will proceed.

The BEC is completed in June 1970 and inaugurated in the summer of 1971. In the following spring, the MSRV (*Reference Multi Stage Europa 2 Vehicle = Véhicule de Référence Multi étage Europa 2*) rises in the sky of Kourou. This model, representing the complete launcher, is composed of elements not qualified for flight. Only the first and third stage will be filled with propellant for a static test, the second stage *Coralie* will be filled with water, and the fourth stage will be empty. The static test will be an opportunity to validate whole the launch complex *Europa* at Kourou with the erection of the different stages, assembly and complete control of the launcher, and counting operations resulting to ignition of the Rolls Royce-RZ 2 motors during 20 seconds.

The ELDO facilities include a launch pad in the shape of T, with the axis of symmetry oriented north-south. It is a platform of 45 m x 27 m, located 5 m above the ground, whose upper part forms the launch pad flanked by two stream deflectors and prolonged backwards by a series of technical rooms witch the roof is a rolling path for the tower and ends with a ramp vehicle.

Technical rooms, located below the platform, include control systems for propulsion and pressurization, production units of hot and cold air, power distribution, control equipment of the rocket, and air conditioning.

The mobile tower is 43 meters high and weighs 800 tons. It may deviate of 50 m from the firing platform. It is equipped with seven gateways, with the system for switch on the first stage, and with a 20 tons rolling bridge.

The umbilical pylon is a fixed Pylon of 30.5 m high, located at 10 m from the vehicle. Several propellant tanks (kerosene UDMH, N_20_4, Aerozine 50) and fluids (liquid and gaseous nitrogen, helium, water, etc...) are installed around the launch pad.

The Launching Center is a circular building made with reinforced concrete, located 250 m from the launch pad. It includes on two levels the control room, the records examining room, the offices, the electronic laboratories, etc…

The assembly area of the launch vehicle, located about one kilometer from the platform, is composed in an assembly hall, all the secondary locals, and an assembly building for the perigee stage.

At last, for practical reasons, ELDO had built in CSG a liquid oxygen production factory (combustive for the first stage *Blue Streak*) and liquid nitrogen (pressurization of the first stage and servitudes for the pad) able to produce 376 tones of liquid oxygen and 166 tones of liquid nitrogen in two months.

VIII - LAUNCHES OF EUROPA

A) Year 1964 : flights F1 and F2.

1°/ Flight F1 :

The first flight of a Europa rocket version "*a single active stage*" occurs on June 5 h, 1964.
Originally scheduled for April 18th, it was delayed five times...
It is 9:15 a.m. when the rocket is launched in west direction in a ballistic trajectory.

Unfortunately, the motors prematurely cut off at 146 seconds and at 53.5 km altitude, 7.3 seconds before the combustion scheduled time. Its apogee will be 157 km and it will fall back after 850 seconds. The point of impact is found at 1015 km instead of 1600 km expected
The motors had stopped functioning too early, because of excessive vibrations in the electric injection system which has caused the premature extinction of the motors. But, despite this incident, the launch was considered as a success.

1°/ Flight F2 :

For this flight, many changes were made to minimize these vibrations. This flight is also an important test of the autopilot.
On October 20th, 1964, flight F2 is successfully completed from Woomera with still 24 hours behind schedule. The launcher took off as scheduled at 8:31am local, and followed a ballistic trajectory taking him to 248 km altitude and 1575 km away.

B) Year 1965 : flight F3

On March 22nd, 1965, Europa flight F3 is once again a success. The Blue Streak stage reached an altitude of 240 km and went 1500 km away. It was a ballistic flight.

Now, the launcher F4 will be sent to the Stevenage factory for final and general checking, then by boat to Woomera for a flight planned in March 1966.

C) Year 1966 : flights F4 and F5

1°/ Flight F4 :

Flight F4 occurs May 24th, 1966. This is the first launch of an Europa in configuration "*complete launcher*", but only the first stage is active, the others are models. The duration of the flight was 136 seconds.

May 25th takes place the first qualification launch ***Q1*** of a stage ***Coralie***. The second occurs on June 5th.

2°/ Flight F5 :

November 15th, 1966. This launching, always with the upper stages inert, was for testing the system of separation of stages 1 and 2. The launcher lifted off at 9:39 p.m. Paris time, from pad 6A at Woomera. It crashed 410 seconds later in the Australian desert, 820 km away. The test of the separation of stages 1 and 2 was successful.

D) Year 1967 : flights F6-1 and F6-2

1°/ Flight F6-1 :

On August 4th, 1967, flight F6-1 must test the first "two active stages", *Blue Streak* and *Coralie*, and the separation of the fairing. The rocket takes off at 1:24 p.m. local, but it fails because the second stage did not ignite! Mini short-circuit causes a reset of the sequencer, thus inhibiting punctual ignition of the motors.

Flight F6-2 is still planned for November 23rd to test the separation of stages 2 and 3.

2°/ Flight F6-2 :

On October 3rd, 1967, after the establishment of *Blue Streak stage* on launcher Europa, it is ignited for a static firing.
4 December 1967, F6-2 launching is delayed at 12 seconds before take off, following a failure in the electrical system.
On 5 December, the countdown is completed to the end. The engines ignite, but Europa does not take off: the hooks did not release the launcher. New Report!
Europa F6-2 takes off at 10:01 p.m. Paris time. The first stage operates normally, but the second does not separate and do not ignite, again because of a sequencer problem.

E) Year 1968 : flight F7

November 30th, the launching of Europa-1 F7 occurs at 8:42 a.m. local time. This flight is the first launching of a complete Europa with its three ***active stages***.
First and second stages are working properly, but the third stage only works 7 seconds instead of 180 seconds as expected: the common basis of the two tanks of this stage broke, causing the explosion...

But for ELDO, this flight is a success, because the Coralie stage, recently changed (new electronic equipment), has performed in an exemplary manner, after two failures on flights F6-1 and F6-2. The next flights F8 and F9 will launch a Europa rocket in flight configuration.

F) Year 1969 : flight F8

July 31st, 1969 at 8:24 a.m. local time, the launcher F8 lifts off from pad 6A at Woomera. The controlled powered flight of the first two stages is nominal, and the jettisoning of the fairing also. But the third stage will not ignite and explodes, just like the flight F7.

Flight F9 (the last from Woomera) is still planned for November. But in September, ELDO delays the flight F9 to April 1970 because the German team must elucidate the failure from the third stage *Astris* during flights F7 and F8. The first elements of the investigations indicate that the inadvertent activation of the system of "destruction" of the stage might have destroyed it during the flight.

G) Year 1970 : flight F9

On June 12th, 1970, after many reports caused by obsolescence of facilities in Australia, the launcher F9 takes off from Woomera at 1:10 GMT. After a nominal functioning of all the stages, the fairing refuses to be separated at the 222nd second, preventing satellization of the satellite, which falls back in the Caribbean after flying over the North Pole. For ESRO, this flight is still a success, because for the first time the launcher has operated fully...

Flight F10, last firing of the Europa 1 rocket, is canceled for financial reasons.

The following flights, F11 and F12, will be occurs at Kourou, in French Guyana, to test the perigee-apogee stage (the one of the French *Diamant*) allowing to reach geostationary orbit.

H) Year 1971 : flight F11

Flight F11, first use of ***Europa 2***, is expected to launch a satellite of 360 kg to simulate the future satellite *Symphony* (which will be launched on the F13 flight planned for March 1973). This launching from the French Guyana should correct the problem of the fairing (displacement of the umbilical plug). The apogee motor will not be used to circularize the orbit at 36,000 km. A test launch with a vehicle with VRME (*Reference Vehicle Multi Stage*) is scheduled for November in Kourou on the base BEC of ELDO. The Europa 2 Launcher will be ignited for 8 seconds, hold on the ground by the system of jaws.

In October 1971, at day -22, F11 Launcher is assembled on the launch pad of BEC.
From October 27 to 29, filling tests for the stages are done, as well as repetition of the launch countdown. On october 31st, a first test of static firing is canceled at the last second. On november 1st, a static firing of F11 is made during 3 seconds.

On 5 November 1971, the Europa 2 Launcher F11 takes off from Kourou.
Unfortunately, the flight ends with an ***explosion*** only **150 seconds** after launch...

At T+107 seconds, the Launcher no longer behaves as planned. In fact, telemetry indicates a total shutdown of the control signals: Following an electrostatic discharge of the fairing, charged by the friction of the surrounding air on itself, the inertial fails. Around T+150 seconds, there is a stop of propulsion, and *Blue Streak* stage explodes! 10 seconds later, the second stage *Coralie* also explodes. After T+4 minutes and 44 seconds, the remains of Europa 2 fall into the Atlantic Ocean, at 485 km of launch pad.

After this failure, managers of the program are dismissed, as some other staff. The Launcher Europa is modified for the flight F12 planned for summer 1973. This will delay the launching of satellite Symphony on the flight F14 planned in 1974…

I) Year 1972 : results of the investigations about flight F11

On May 12th, 1972, the Commission Investigation of flight F11 failure renders its first conclusions:
Between T+105 and T+108 seconds of flight, there occurred three incidents: a break of the onboard computer skips of the sequencer, and also disturbances of pressure in the fairing. Then, all became calm, but the interruption of the flight at T+107 seconds causes a deviation of the launch vehicle, who took an incidence of 35° instead of 0°. Under this incidence, the result with the aerodynamic forces and with asymmetrical kinetic heating caused the fracture of the launcher on the inter-stage between 1 and 2 stages.
At T+150 seconds occurs a collision between these two stages, which caused the tearing of the LOX tank of *Blue Streak*, and then a crack in common basis with Coralie, causing the

contact with the two propellants, and then the explosion of the first stage at 27 km altitude and at a speed of 1000 m / s.
Then, at T+162 seconds, *Coralie* exploded, and finally at T+189 seconds, the fairing was disintegrated.

It was found during the investigation that the shield line of the instrumentation of the fairing was not connected to the mass. In addition, it was connected to the five pressure taps of the fairing (one on top, and the other four at 45°). It was thus an isolated electrode subject to electrostatic influences. As the shield connected to the sensor was not connected to ground, it could occur a breakdown. This occurred at T+105 seconds, stopping the computer. A second breakdown stopped the sequencer, and with the heating of the fairing, all that caused breakdowns in pressure sensors. The resume of the breakdowns at T+150, 162 and 189 seconds was explained by the separation of stages which produced redistribution of charges, reloading the fairing and resupplying the problem until the destruction of the launcher.

This inquiry commission will be the last act of ELDO, and the most positive of its existence.
In effect, the conclusions indicate the default of uniformity of all the stages, the use of solutions too much complicated for the third stage, many errors in the design (described as serious) and in integration of guidance and telemetry systems of this stage, and the failure of the fourth stage. The rocket was sentenced to never work.

J) Year 1973 : flight F12 canceled and termination of program

In March 1973, ELDO delays the flight F12 from 14 July to 1 October 1973, following delays in delivery of equipment associated with the third stage. It remains to make four flights of this third stage because of the failures during flight F11.
April 1st, stage *Blue Streak* is leaving Britain. It should be used for flight F12 of Europa-2, planned for October 1.
On 27 April, at the 64th session of Council of ELDO, France and Germany decided to abandon the program Europa-2, while the *Blue Streak F12* is in the way for Kourou...

So, the Europa program ends, although F12 to F18 launchers are in process. Europa-3 will never exist, but the failure of the Europa program will indirectly contribute to the development of a new project called ***Ariane***, but that's another story...

Finally, this explosion is really an historical positive explosion… 

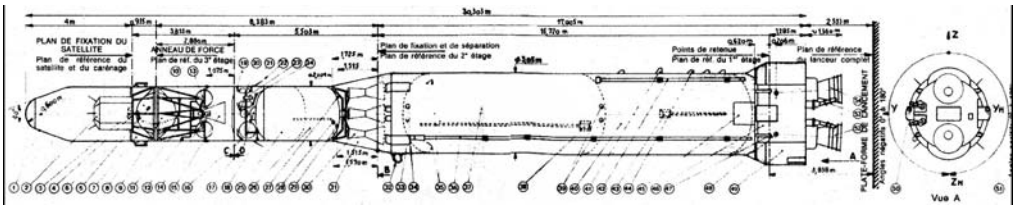
K) What happened to the others rockets Europa ?

The launch vehicle **F12** is still in French Guyana, where some pieces were collected, including the inter-stage. It appears that the stainless steel tanks, which has resisted to the power of corrosion of the hot and humid equatorial climate, was used to make cages for chickens…

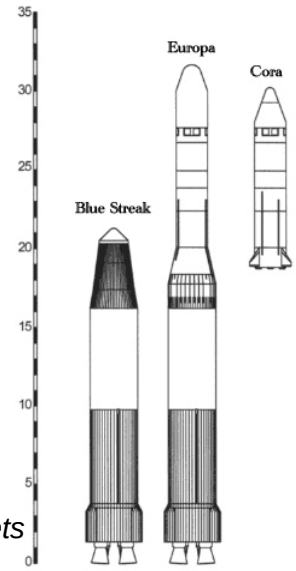
The launch vehicle **F13** is in *Munich*, in Germany.
The launch vehicle **F14** is in the Air Museum of *East Lothian* (near Edinburgh) in Scotland.
The launch vehicle **F15** is at Space Camp in *Redu*, Belgium.
The launch vehicle **F16**, which has not been fully completed, is exposed at the Space Museum in *Leicester*, England.

L) Recapitulative table of the launches of Europa

Date of firing	Launch Vehicle Flight number	Configuration of the launcher	Places of launching	Results	Reason of the failure
5 june 1964	**Europa 1** F1	- Blue Streak	Woomera	Semi-success	Earlier cut off of the motors at 146 sec.
20 october 1964	**Europa 1** F2	- Blue Streak	Woomera	Success	
22 mars 1965	**Europa 1** F3	- Blue Streak	Woomera	Success	
24 may 1966	**Europa 1** F4	- Blue Streak - *Model*	Woomera	Success	
15 november 1966	**Europa 1** F5	- Blue Streak - *Model*	Woomera	Success	
4 august 1967	**Europa 1** F6-1	- Blue Streak - Coralie - *Model*	Woomera	Failure	Coralie stage does not ignite.
5 december 1967	**Europa 1** F6-2	- Blue Streak - Coralie - *Model*	Woomera	Failure	Coralie stage does not ignite.
30 november 1968	**Europa 1** F7	- Blue Streak - Coralie - Astris STV1	Woomera	Failure	Earlier cut off of Astris stage.
31 july 1969	**Europa 1** F8	- Blue Streak - Coralie - Astris STV2	Woomera	Failure	Earlier cut off of Astris stage.
11 june 1970	**Europa 1** F9	- Blue Streak - Coralie - Astris STV3	Woomera	Failure	The fairing did not separate.
5 november 1971	**Europa 2** F11	- Blue Streak - Coralie - Astris - PAS STV-4	Kourou ELA-1	Failure	Succession of several problems, structural failure of the third stage... and… explosion!!!



Blueprint of a Europa rocket

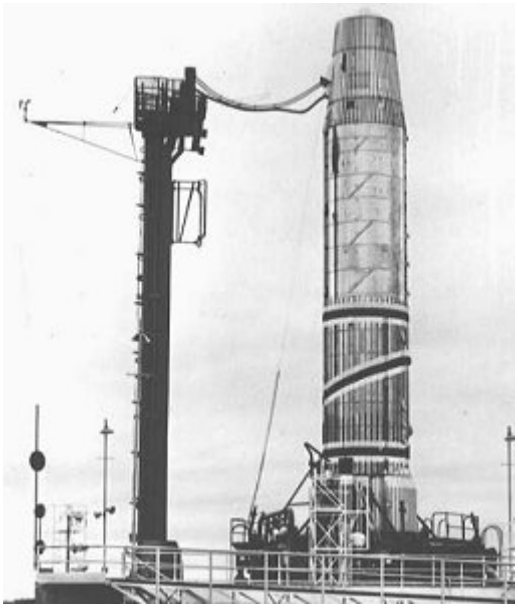


Blue Streak, Europa and Cora rockets

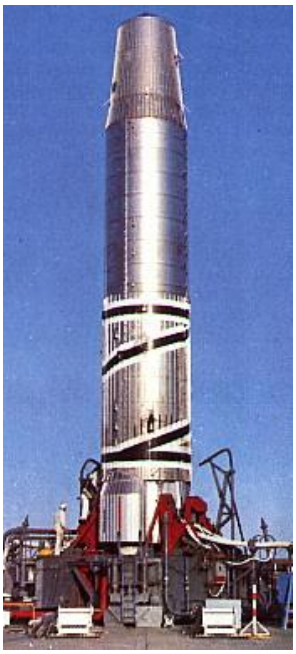
IX - PROGRAM PRIOR TO EUROPA

A) Blue Streak rockets

Initially, *Blue Streak* was a medium-range missile produced by the British. It could launch a 2-tons warhead over a distance of 4400 kilometers. This rocket was developed from 1954 for the British nuclear armament, and then the program was abandoned because of excessive costs (100 millions of pounds Sterling in April 1960). The British prime minister considers necessary, for internal political reasons, to use the missile Blue Streak for other military applications to justify the large sums of money engaged in its development.



This rocket was based principally on the technology of the rocket *Atlas* from the USA, and was built under license. With a size of 4.18 meters long and 3.5 meters wide, the initial thrust of *Blue Streak* was 136 tons. Its empty weight was 6.44 tons and 89.4 tons with full tanks. Rolls Royce was developing for it two liquid-propellant motors RZ-2, with 67 tons of thrust.



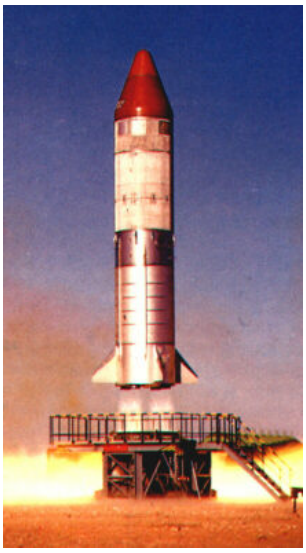
Studies initiated in May 1959 in Great Britain show that it is possible to make a civil launch vehicle composed of a first stage, the *Blue Streak rocket*, and a second stage, the *Black Knight* rocket. In September, the British government proposes a European cooperation for the development of a launch vehicle, with the *Blue Streak* as the first stage, with *Black Knight* as the second stage, and with a third stage to be developed.
But the French government wishes that the realization of the second stage of this launch vehicle is French. This stage will be French and its

The test program will include firings called "**F**" with a first stage named ***Blue Streak***.

The first three launchings, F1 to F3, made between June 1964 and March 1965 from Woomera, are launchings of the *Blue Streak* "only single stage", and are all crowned with success. The following launchings, F4 and F5, are tests with complete launcher externally, but with the upper stages as *models*. These flights will be all successful.

B) Cora rockets

In the framework of ELDO's Europa program, it was planned to develop the upper stages of the launcher by using an experimental rocket named ***Cora***. This rocket should include a first stage ***Coralie*** (manufactured by France), a second stage ***Astris*** (manufactured by Germany) and a ***fairing*** (manufactured by Italy).



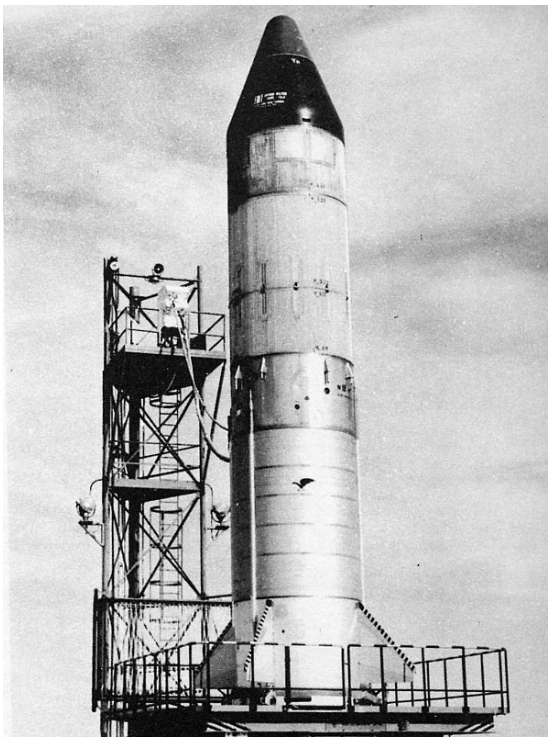
The test program of the ***Coralie*** stage plans to launch ***6 Cora rockets*** from the base of **Hammaguir** in Algeria during the year 1965.

- Version **Cora 1** (the first of three rockets) should include only an active stage surmounted by models.
- Version **Cora 2** (the last two rockets) should be an active two-stage craft for the development of the third stage of Europa.

Only the first version was effectively produced and tested 3 times only.

With its specific fairing, although derived from that of Europa, the ***Cora rocket*** measured 11.50 meters high, 2.1 meters in diameter and weighed 16.5 tons at take off.

The stage ***Coralie*** carried 9.85 tons of storable propellants (UDMH and N_2O_4). Its Motor, with four thrusters, was developing 268 kN in empty space. The thrust starting was 220 kN.



Three exemplars of the ***Cora*** rocket were launched: two at ***Hammaguir***, and one at ***Biscarosse***. It is the biggest rocket which was launched from Western Europe, unfortunately without success…

The first test (***G1***) fails on november 27th, 1966, after a failure of flight control system at the 62nd second.
Next december 18th, the second test (***G2***) is successful. The rocket reached an altitude of 55 kilometers.
On 25 October 1967, the third firing of Cora (***G3***) fails due to a cabling problem.
This will be the last firing of the series, because tests ***G4*** to ***G6*** will be canceled: the test ***G4*** is substituted by the *Europa-flight F7*, and ***G5*** and ***G6*** tests by ***Europa F6-1*** and ***Europa F6-2***.

Coralie was the first craft with propellant storable to fly in Europe. It had allowed to French engineers to control the propulsion of these propellants. It has opened the way to the motor Valois of ***Diamant B*** and BP4, and to the Motor Viking.

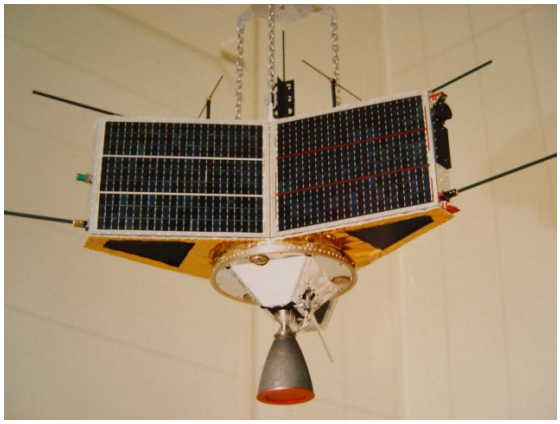
The launchings of the rocket Cora:

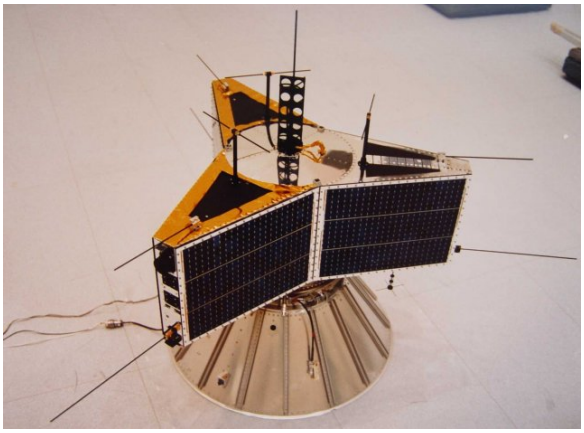
Identification	Date	Place	Results
Cora G1	27 november 1966	Hammaguir	Lost of control after 62 s.
Cora G2	18 december 1966	Hammaguir	Success
Cora G3	25 october 1967	Biscarosse	Wiring error.

X - SOME SATELLITES …

A) Satellite Amsat Oscar

This is a German 90 kg microsatellite. This is the first amateur satellite equipped with a motor for its propulsion and also propellant tanks. Its dimensions are: 60 x 4 x 20 centimeters.





This satellite was never launched by a Europa rocket, but as I had to put a satellite inside, I used it, provided by ***Ruth Thomas***, the designer of the original mesh of the rocket Europa1. You will also find with launcher Europa3 the same satellite, but enlarged on my way, so not very realistic...

In reality, Europa-2 (flights F13 and F14) should put into orbit satellites ***Symphony 1*** then ***Symphony 2***.

B) Satellite Symphony

Symphony is the first civil telecommunications satellite stabilized 3 axes, instead of being by rotation. This is also the first satellite using an apogee motor bi-liquid multi-thrust instead of a single powder-thrust engine. His weight was 402 kilograms.

Symphony is the first technological project from Franco-German alliance witch will allow the reconciliation between the teams of the two countries. Due to of its technical ambitions, it ranks at the level of U.S. programs. A leadership team directed by 6 members makes the program in charge that will result to a launch a satellite by Europa.

In April 1973, the suspension of the Europa program calls into question Symphony. Studies are made to adapt the satellite for a new launcher, and contacts are made with NASA. An agreement of 1968 stipulated that Americans could launch experimental satellites but operational systems should in no circumstances compete with Intelsat in the present or the future.

Negotiations with NASA in June 1974 result to a launch with a Delta rocket. The non-compete clause against Intelsat is widely put ahead in this period, so it is why Europe was going to makes the ***Ariane*** launcher, which guarantees its independence.

The first satellite Symphony is launched on December 19th, 1974, the second one on August 27th, 1975, by an American *Thor-Delta* 2914 rocket. De-orbit occur on August 12th, 1983 for Symphony-A, and December 19th, 1984 for Symphony-B.

XI - CREDITS and LINKS

A) A great thanks you to the following peoples :

Thomas Ruth for having allowed me to use his great 3D model of the Europa rocket.

Papyref for modeling a pedestal jaws and umbilicus adapts to the Europa rocket and Kourou ELA-1 pad, with automatic movements, and for his indispensable tips and help. I also "borrowed" few pieces of some of he's 3D models (pad and a few tanks, among others ... without forgetting the "vacuum mesh").

Papyref and **Mustard** for having created a splendid Space Center in French Guyana!

Vinka for its modules *multistage* and *spacecraft* which have allowed me to modify Europa, and to realize a simulation of explosion (which I hope will please to all) without having to create dll, which I do not know yet how to do...

BrianJ for updating the "*stage.dll*" module for Orbiter 2010. He gave me the possibility to operate (or explode) these rockets in this new version of Orbiter.

ar81 for his famous *Mesh Wizard* program, which enabled me to modify 3D models from *Thomas Ruth* very easily, without having to redraw them.

DanSteph for *orbitersound*, and his forum, dedication, availability and everything.

Nulentout my best beta tester, not beta at all.

Hitman57 for his photo of Europa in the museum.

Dr. Martin who makes me spend many sleepless nights due
(or because?) to its great space simulator, unique and essential.

Thank you for encouragements and pertinent comments from:

- **SolarLiner** for having made me thinks about a trick for the explosion of the rocket Europa-2.
- **Arnoledingue** for the comments about the ailerons of the rocket Cora.
- **Wehaveaproblem** for his hangars (*AIA Generic_Hangars.zip* file, on *OrbitHangar.com*)

Also a big thank you to:

- **Notebook** for having created the *Pad de Woomera_6A* and other version of *Blue Streak*.
- **Artlav** for having made *Australia zone with high resolution*, and especially *Woomera.*

Thanks to over 3000 visits to my post on the Dan's French-forum, and especially for their encouragements to:

Papyref, Fast_toche, Alexandre, Etudiant spatial, Pagir, Bib Uncle, Nulentout, Charlotman, SolarLiner, Siriusfett, Tallinn, DagoO, DanSteph, Pyro, Arnoledingue, MerciMartin, Geoair, Hitman57, Jim Lovell, MrSpock, Vladimir2000, Nicosmos, and also to all that inevitably I forget…

B) Some links for Europa rocket and the French space program :

http://www.avas.free.fr/aventure/lrba/europa/europa.htm
Site well documented on the Europa program. *In French*.
http://www.capcomespace.net/dossiers/espace_europeen/ariane/index.htm
Site on Europa and Ariane programs. *In French*.
http://membres.multimania.fr/europespace/
Site on the European space program. *In French*
http://www.astronautix.com/lvs/europa.htm
An abstract of the program Europa. *In English.*
http://sylvainm.free.fr/europa/europa.htm
A private site with pictures of details of the Europa rockets. *In French*.
http://www.raf.mod.uk/rafspadeadam/gallery/historyinpictures.cfm
Images of the launching facilities British of Blue Streak. *In English.*
http://www.spaceuk.org/bstreak/bstreak.htm
Site about the British rockets. *In English.*
http://www.bernd-leitenberger.de/europa.shtml
An abstract quite well done on the program Europa. *In German.*
http://www.spaceuk.org/videos/vid.htm
One of the rare videos of a take off of a Europa rocket.
http://www.nielspapermodels.com/bluestreak.htm
To make paper models.

C) And essential links indispensables for all « Orbinauts » :

http://orbiter.dansteph.com/forum/index.php
The indispensable site of Dan's francophone forum. We can not live without it !..

http://www.orbiterfrancophone.com/
The site where you can find a lot of add-ons, including *Kourou* and *French Guyana.*

http://www.orbithangar.com/
The site where you can find *Woomera* and everything you need to spend hours with ***Orbiter***.
http://users.swing.be/vinka/
The Vinka's site, famous creator of *Spacecraft* and *Multistage* modules.

D) And finally an old magazine :

I found some old numbers of the magazine *Science & Avenir* from years 1970, 1971 and 1972! I've selected all the Articles on the Europa program. You can read them... but sorry, all is in French…

File ***Sciences&Avenir.pdf*** in folder …***\Add-on Docs\Europa***.

Happy reading!

XII - BUGS (which are not really), abnormalities and limitations

- I do not know why, when we run one of my scenarios, we can hear the sound of approach-radar of *Dan*'s ***OrbiterSound***. (beep-beep-beep). To avoid this, I suggest you to ***disable*** in the configuration program of ***OrbiterSound*** (SoundConfig.exe) this option: ☐ play radar bip when less than 800m from an object.
- In the configuration ***Europa one single stage rocket***, when the stage *Blue Streak* falls on the ground after the flight, he put oneself vertical and few meters over the ground.

- Do not use the acceleration option until the first stage has not finished to operate, and especially not during the phase of "*roll operation*" otherwise you will have problems. After separation of the first stage, you can switch to 10x if you want. But it's cheating ...
- I had to modify the parameters of the fourth stage of Europa-II rocket (flight F12) to reach the geostationary transfer orbit ... I substituted the original fuel by some ***Cosmogol 999***. Sorry for the involuntary deviation of reality ...

- The position of the base of ***Biscarosse*** is probably not in conformity with reality: I did not found a lot of documentation. (Defense secrets?)
- The specifications of weight and size of the satellites specified in the configuration file of Europa 1 and 2 rockets (*"ini" files*) are not conform, and thrust settings are fanciful. (I did not have enough time to invest me in spacecraft and its parameters. That's for later.) I hope you'll not mind ...
- In Orbiter 2010, the atmospheric parameters could be different from those of Orbiter 2006, so it is possible that there is a difference time between the touchdown and the explosion (if any) of the rocket when it falls (Cora rocket for example). Same for GTO.
- I do not know why, sometimes, Orbiter version 2010 crashes on starting. This is apparently the basis Woomera_6B that poses the problem. Yet I tried and changed the corresponding *file.cfg* ... If you look at the file *Orbiter.log* you can find at the end these lines:

  BaseObject: Parse error

  Or sometimes :

  **** WARNING: Mesh not found: .\Meshes\.msh **(But I checked : no meshes are missing!)**

Solution : Quit Orbiter, restart a different scenario, if necessary delete the file *Orbiter.log* (I do not know why, it seems cancel the problem) and leave again Orbiter. Usually, if you restart the scenario that makes the crash, it starts and works.
If someone finds the cause, thank you for to make me know why...

XIII - ABOUT SOUNDS…

Remember to enable the sound in *external views*, otherwise you will not hear the ground control during the flight, which is a shame….

To do this, uncheck ☐ Allow the Silence of Space (Realistic, recommended)
in *configuration program* of *OrbiterSound*.

All sounds are in folder *Your_Orbiter\Sound\EUROPA.*

Most of the voices come from videos of launches of ***Ariane*** rockets. This explains the low quality and the background noise. The "sounds" are nearly all extracts from an old game named "*Apollo 18 the Moon Mission*". You'll find also extracts of Tintin *Destination Moon*, and two or three sounds are from the excellent Dan's *FsPassengers* for Flight Simulator. Others are from sound bank sites, such as explosions or applauses. Some sounds are from websites of "voices synthesis".

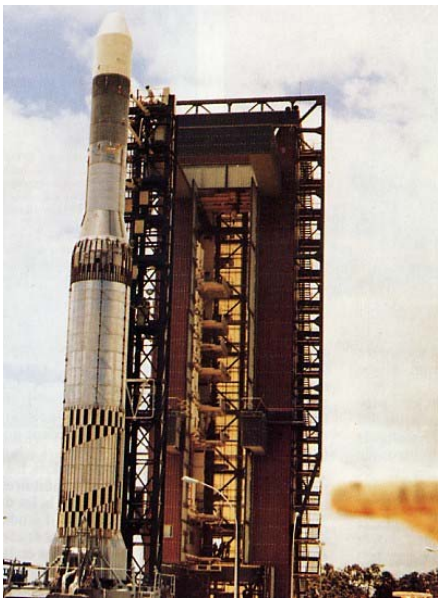
The song ***Iagwiyann péi-à ké lévé*** is from
Yapoko *and* ***Edma***, French Guyanese singers.
It dates from 1979.
(http://redris.pagesperso-orange.fr/HTML/Iagwiyann.html).

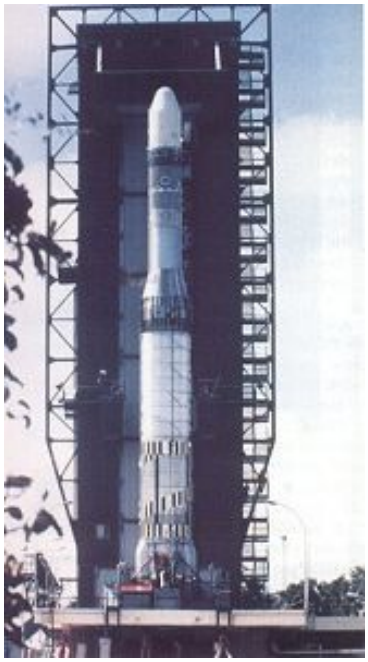
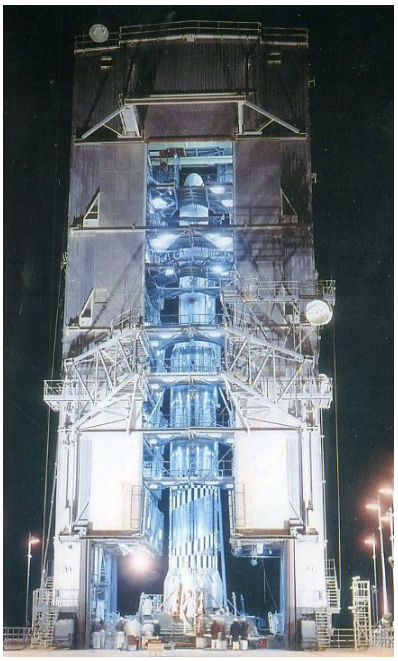
XIV - SOME PHOTOS OF EUROPA 1 and 2

Woomera

Kourou

Kourou

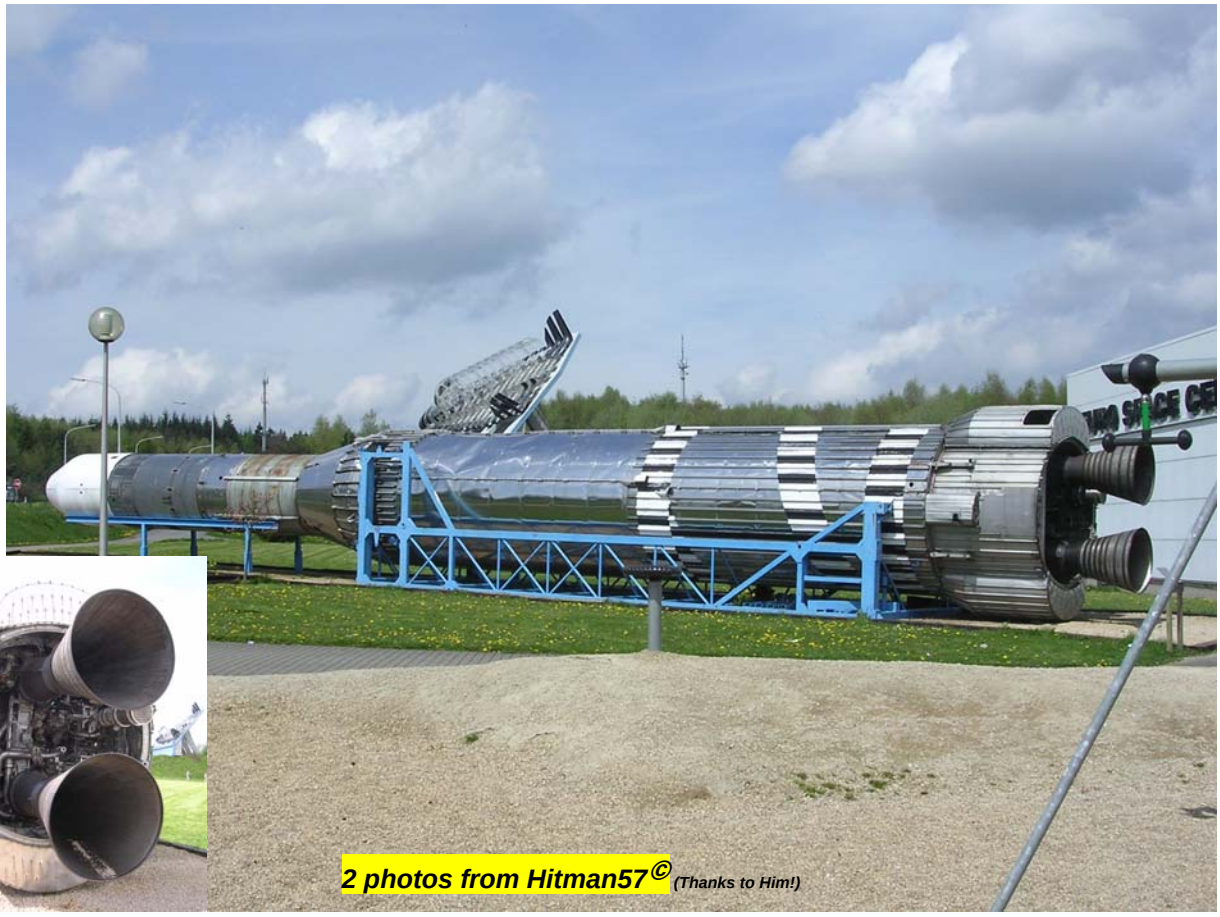



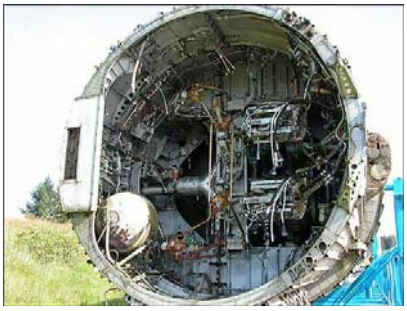
Explosion of Europa II F11 flight...

Kourou

Museum



2 photos from Hitman57© *(Thanks to Him!)*



XV - PRECISIONS FOR SOME ADD-ON INSTALLATIONS :

A) Woomera_6A, Blue_Streak_F2(SC3) and patch Installation :

I had a lot of trouble with this add-on, I quickly found for Orbiter 2006, but for Orbiter 2010 (which seems less tolerant) I spent a lot of time to find why it crashed... Correction of the 2 *files.cfg* took me a long time ... But it seems to work now. Otherwise thank you to tell me if there is still a false note!..

Here's what you have to do:

a) First install ***Woomera 6A*** add-on by unzip file ***Woomera 6A.zip***
in your ***Orbiter*** folder, make sure you have checked "*Use folder names*".

b) Then install after ***Blue Streak F2(SC3)*** add-on by unzip file
Blue Streak F2(SC3).zip in your ***Orbiter*** folder, keeping still the directory structure.
In fact, this file is an interesting update for Woomera Pad 6A, and in addition,
you'll get another Blue Streak rocket different from mine.

c) Then, install my **patch**, witch is file ***Woomera_6A_6B_patches.zip***.
In this file.zip are 2 files: **Woomera_6A .cfg and Woomera_6B.cfg**

You can find this patch :
- either in folder \Add-on Docs\Europa\Patches
- either in folder \Config\Earth\Bases

There are two ways to install this patch:

1) With file ***\Add-on Docs\Europa\Patches\Woomera_6A_6B_patches.zip***
In this case you have to unzip it (with "*Use folder names*").
The two files contained in this archive must go into the folder
\Config\Earth\Bases and will overwrite the file ***Woomera_6A .cfg***
and file ***Woomera_6B.cfg.***
2) With file ***\Config\Earth\Bases\Woomera_6A_6B_patches.zip***
It's easier: you unzip it directly in the folder where it is.
(*\Config\Earth**Bases***). Are you still ok? You still are following ?
These two files will overwrite files ***Woomera_6A .cfg*** and ***Woomera_6B.cfg.***

That's it, it's done.

A small comment : You may have noticed that in **Woomera_6A. cfg** there is a *space* between "**A** " and "**.**" ... You did not see it? I do, and I respected this particular feature in my patch naming it identically.
Otherwise, if it have both ***Woomera_6A. cfg*** and ***Woomera_6A.cfg*** files, I do not tell you the panic in Orbiter…

That was the Tip!

B) Tiles for Woomera Installation :

1°/ A small drawing is better than a great speech :

Here are pictures that you will have on the Woomera area, depending installed add-on:

With only ***Woomera 6A***

With ***Australia*** tiles (Woomera zone only)

With ***Woomera*** tiles

With ***Australia*** tiles **+ *Woomera***

So you have 4 different installation options for ***Woomera*** and / or ***Australia*** tiles:

a) with **Woomera 6A** from *notebook* (picture n.1)
http://www.orbithangar.com/searchid.php?ID=4176
File : ***Woomera 6A.zip***
No problem, this add-on is **essential**.
You must install it!!!

Otherwise you will have this

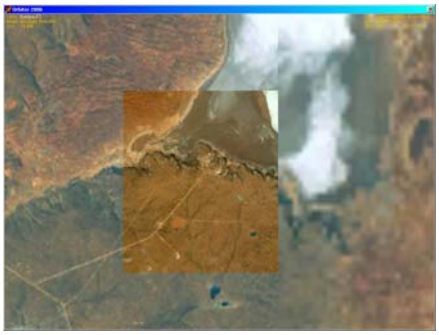
b) with **Woomera Hi-res tiles** from *Artlav* (picture n.2)
http://www.orbithangar.com/searchid.php?ID=3293
File : ***woomera-hires.zip***
In my opinion, this is the best solution.
So **to be installed**, even it is **no essential**.

c) with **Australia Hi-res tiles** from *Artlav* (picture n.3)
http://www.orbithangar.com/searchid.php?ID=3945 File : ***australia_hires_pack-080404.zip***
Complicated and less well than the previous one, unless you want have all the Australia country.
In addition, it is not easy to install ... See for yourself

d) with **Australia Hi-res tiles** + **Woomera Hi-res tiles** from *Artlav* (picture n.4)
In my opinion there is no interest to install these two add-ons together. One is enough.

2°/ *Woomera Hi-Res tiles* (from Artlav) installation

It's very easy: after downloading the add-on from ***OrbitHangar***, you will just have to unzip it. But there is a manipulation to be done, otherwise the detailed *Woomera_6A tiles* will not be seen: they will be below the other tiles! It's too bad…
To do this, go to *YourOrbiter\Config\Earth\Base* folder and find the ***Woomera_region.cfg*** file, then rename it in ***Woomera_1.cfg***. Like that, it will be read before the one of Woomera_6A and you will see the tiles in the correct order, as shown in the pictures below. Yep ... had to know...



That's how it should be after the manipulation.

***Before**, in closer view*

***After**, same view. Beautiful, no?..*

3°/ *Australia Hi-Res* (from Artlav) installation

As I said above, this does not seem useful. But hey if you want to install it, I will give you some instructions to install just the Woomera area. If you want to install the whole region of Australia, do it by yourself...

Installation is a bit more complex, because if you unzip the file ***Australia_hires_pack-080404.zip*** as it, it will not work. In addition, if you do not want to install all the tiles in Australia...

Well…

Suppose you only want the Woomera area. Here is the how to proceed:

a) Unzip this file into your ***Orbiter*** main folder, as always.

b) Go to your folder ***\textures2*** then in the new sub-folder ***\Ok***.
There, you will find several sub-folders, including **2** which interest us: ***Woomera*** and ***woomera-center***.
Move all the files located in these 2 sub-folders to the folder ***\texture2***.
Delete all subfolders in ***\texture2*** (so the folders ***\Ok*** and ***\ocean*** with their sub-folders) because we no longer need them.

How do you feel? Are you still here? It's not over...

c) Now open the file ***Australia_omni.cfg*** located in the folder ***\config\earth\base*** with a *text editor* such as Windows Notepad.
Then look in the section

```
BEGIN_SURFTILELIST
(...)
END_SURFTILELIST
```

the lines located below

```
;Woomera
```

and those located below

```
;Woomera – center
```

You'll keep all these lines, but you can delete the others lines.
Save the file ***Australia_omni.cfg*** and it's done!

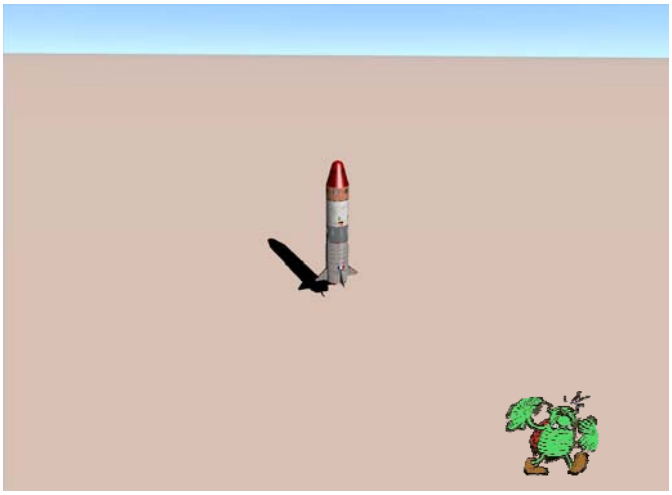
Um ... Well, no, it's not finish ... Same problem as above, detailed tiles of Woomera_6A will not be visible: they will be below! Yes…

Go and see one more time in the folder *YourOrbiter\Config\Earth\Base* and look for file ***Woomera_ omni.cfg***, then rename it to ***Woomera_1.cfg***. (If you already have installed the ***Woomera*** zone as described before, rename the file *Woomera_region.cfg* to *Woomera_2.cfg*). Like that, ***Australia*** zone will be read before ***Woomera_6A*** zone (and also before ***Woomera-zone*** if necessary) and you will see the tiles in the correct order…

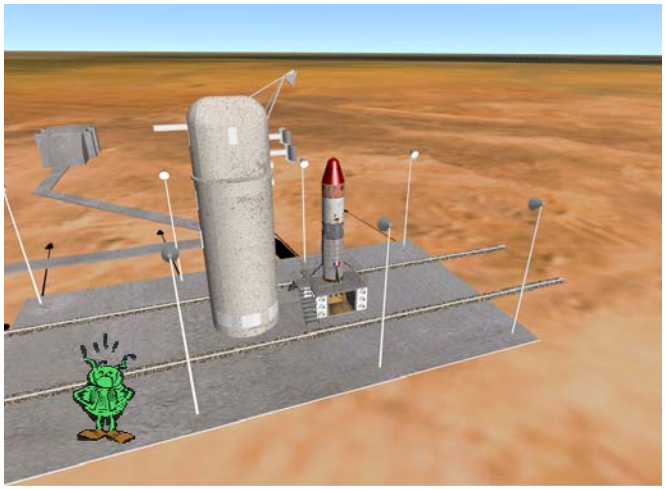
How do you feel? Some aspirin?

C) Hammaguir v3 installation:

There is no problem to install this add-on, ***Papyref*** © trademark is a guarantee of high quality! See why you must install it, even if you will not have crash without...



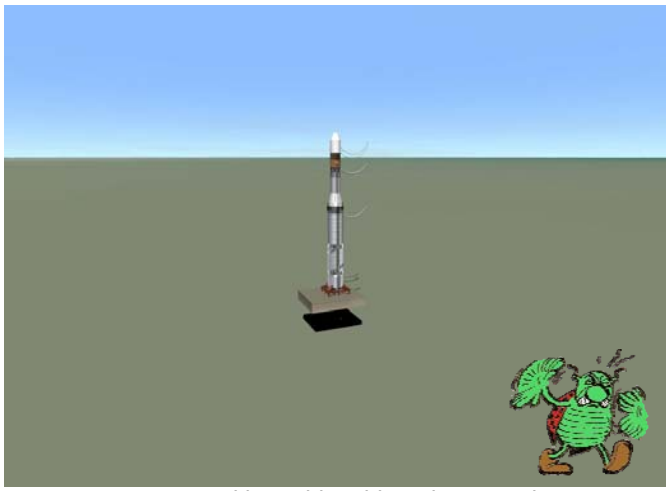
The Cora rocket in Hammaguir without the add-on: it is empty!



Same view but with the add-on installed. That's better, right?

D) Pack Kourou-CSG Installation:

Here again, as with Hammaguir, this add-on is stamped Papyref (and Mustard), so install it. If not, your Kourou area will be desperately empty! See for yourself:



Europa-2 without this add-on: it's so sad!

Same view but with the add-on installed. Ah! That's better!

Just a little remark: during installing it, as ***Multistage*** and ***Spacecraft*** files are included, they'll overwrite yours. No problem, they are the most recent. But for ***stage.dll*** file, you have to select the one you want to keep.
Anyway this is not very serious, you have mine as zip file, as explained at the beginning of this exciting manual...

E) French Guyana HiRes tiles installation:

Even if the installation of this add-on is not required, you should install it, first because it is from me, and secondly because the graphical improvement is incomparable ... (By the way, thank you for the 2681 downloads on French site, and for the 352 downloads on OrbitHangar: it's nice for me!) Look:

Without Guyana tiles

With Guyana tiles

F) If you don't want to install add-ons required :

You would be wrong, but here is the solution to prevent any crash:

1°/ In folder « Europa 1 » (*Woomera_6A* and *Blue_Streak_F2(SC3)* required**)**

Delete in all scenarios the following lines that are in the section:

```
BEGIN_SHIPS (...) END_SHIPS :
  LauncherMechanism(6A):Spacecraft\Spacecraft3
    (…)
  END
  UmbilicalTower(6A):Spacecraft\Spacecraft3
    (…)
  END
```

2°/ In folder « Europa 2 » and « Europa 3 » (*Kourou-ELA* required**)**

Delete in all scenarios the following lines that are in the section:

```
BEGIN_SHIPS (...) END_SHIPS :
  Zl1tower:Spacecraft/Spacecraft3
    (…)
  END
```

Keep section EuropaArms:EuropaArms (…) END. (These are jaws and umbilicus)

3°/ In folder « Historic Flights»

(*Woomera + Blue_Streak_F2(SC3)* and / or *Kourou-ELA* required**)**

Delete in scenarios 01 to 05, 08, and 10 to 13 the following lines that are in the section:

```
BEGIN_SHIPS (...) END_SHIPS :
  LauncherMechanism(6A):Spacecraft\Spacecraft3
    (…)
  END
  UmbilicalTower(6A):Spacecraft\Spacecraft3
    (…)
  END
```

Delete in scenarios 13b and 14 the following lines that are in the section:

```
BEGIN_SHIPS (...) END_SHIPS :
  Zl1tower:Spacecraft/Spacecraft3
    (…)
  END
```

Of course, the rockets will "float in the air", because there is no pad. Too bad!
You can adjust the altitude of the rocket by modifying in the ***. ini*** file the value of the parameter "**cog =** ".
These files are all located in the Folder***\Config\VESSELS\EUROPA***.

G) If you want to uninstall my nice Europa add-on:

What, what what what?..
Hmm…
It is not too much difficult; simply delete all subfolders named "Europa" or "Europa program". It will remain only very few files elsewhere, and they will not disrupt your favorite simulator.

But beware: do not confuse the folder ***\Config\Vessels\Europa***
with the folder ***\Config\Europa***…
In the second case this folder is that of *Europa*, one of Jupiter's satellites,
but not *Europa* my rocket.
So do not delete it, but as you will not delete mine ... huh? huh?

XVI - CONCLUSION :

I would be very happy (and gratified) to have your feedback on the Forum…
Anyway, I hope you enjoy all of this, and especially I hope I had a little contributed to make you know the story of this damned launcher… but, do not forget, it is **the** precursor of the ***Ariane program*** !!!

Upcoming (or not) in future :

- Maybe some improvements (textures, flight plans and others) depending on your remarks and also my good wish and the limited spare time I have!..
- The satellite ***Symphony***, (May be Tallinn will model it one day) and which should be launched by Europa II.
- Bugs fixes if you find some, and big mistakes fixes if I did... I hope not !

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for the add-on.

©***Jacques – May 2011***
for the translation in English.