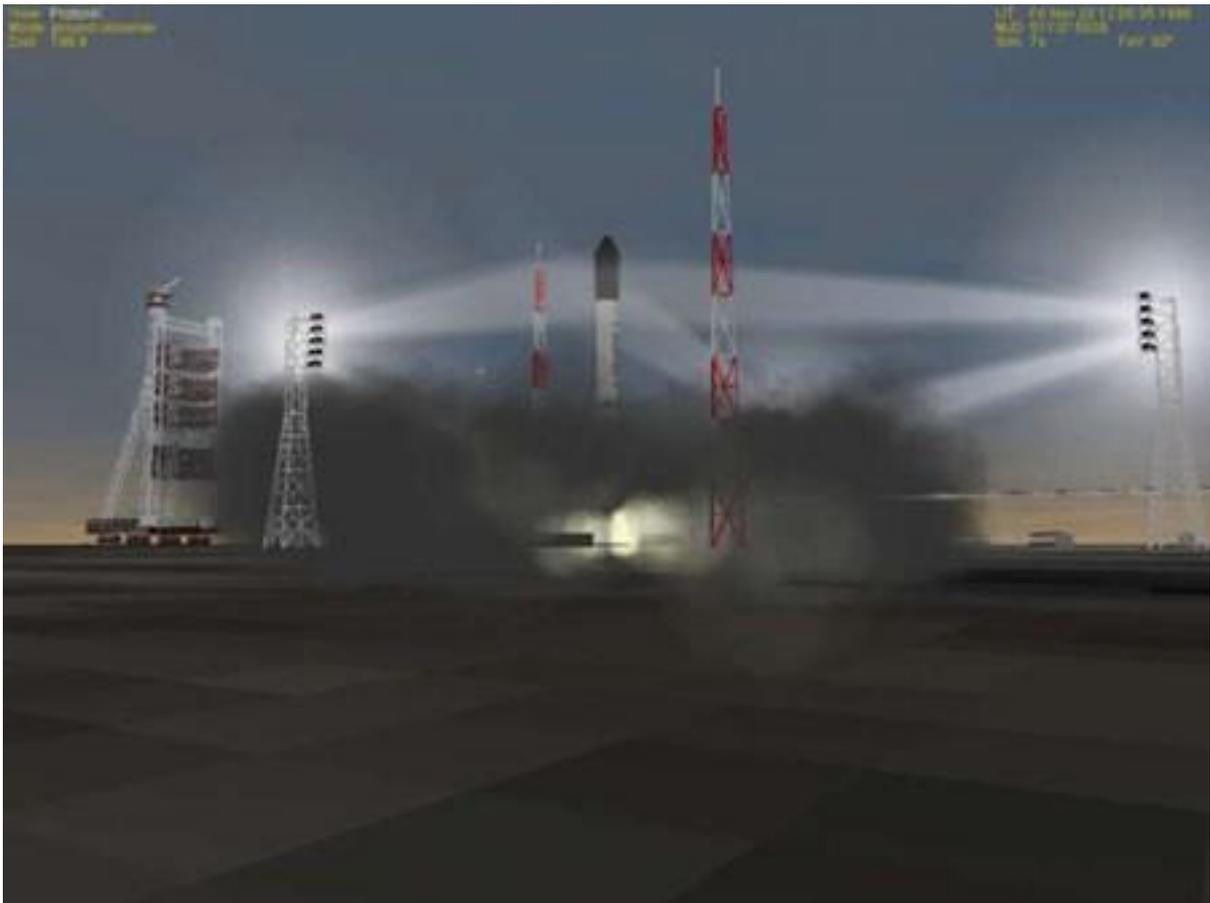


PROTON UR500 BAIKONUR PAD 24

Pack by Papyref
for Orbiter 2016

Corrected April 2018



HISTORICAL

The concept of Proton start with a study for ballistic rocket begun in 1961. The goal was to create a universal family of rockets called project UR (Universal Rocket)

The first Proton K takes off on July 16, 1965. It is a high rocket on three stages of 38m weighing approximately 740 tons without load and developing a thrust of 9,5 MN (970 tons)
It could put into orbit a little more than 8 tons in low orbit.
Various later evolutions of this model (lengthening of the second stages, increase in the engine output...) one allowed to put into orbit 22 tons in low orbit.

A fourth stage called block DM made its appearance in 1974 to make it possible to initially place a load in parking orbit and then to place it on a transfer orbit making it possible to reach the generally geosynchronous final orbit.

Proton DM give possibility to place 19 tons in low orbit and 5 tons in geosynchronous orbit
In this version with a long cap the height of the rocket is about 60 m and the weight without load 760 tons.

In 1995 new fourth stage called Bloc Briz was put at least to improve the performances. It makes it possible to put into orbit 21 tons in low orbit and 6,2 tons on geosynchronous orbit.

The complete family counts at least 10 types of assemblies of launchers and 10 types of fairings adapted to the various loads.

The pad 24 is a part of complex SK 81 on the site of Baikonur. It was renovated at the end of the years 1990 to allow the launch of Proton rockets with Briz stage since 2003.

The complete launcher is charged on a railway vehicle which leads it to the launching pad and it is placed on a retractable arm.

The arm equipped with powerful jacks makes it possible to straight the rocket in approximately 4 hours posing it on supports which return in the table of launching at the time of takeoff.

Then the tower of service is advanced to carry out the last preparations. It is what I tried to simulate in my animations.

The position of the launch table is 46.0709390 °N 62.9847630 °E

INSTALLATION

- **Unzip Pad24_ProtonUR500_O2016.zip in your Orbiter 2016 folder**
- **Install and activate OrbiterSound 4.0 by DanSteph you can download on the site <http://orbiter.dansteph.com>**
- **Install and activate Multistage2015 for Orbiter 2016 you can download on the site <http://orbithangar.com>**

If you use D3D9 client, create links in the Launchpad Video → Advanced → Create Symbolics Links otherwise you have CTD

SCENARIOS

Six scenarios are provided with an autopilot

It is preferable to avoid especially accelerating time during the phase of lighting of the first and the second stage.

It is possible to release the fairing manually by using **the key F**

The payload can be released by using **the key J**

Autopilot start by using **the key P**

- **1 - Proton KD-NPL sans charge** simulates the launch without load on an orbit inclination $74^{\circ}79'$ with periapsis = 176 km and apoapsis = 176 km
- **2 - Proton KD + Spot** simulates the launch of Astra satellite (one uses Spot5 failing this) by Proton block DM (4 stages)

Goal:

To put Spot5 on an orbit inclined at $0^{\circ}10'$ with into final an altitude at the perigee = 35778 km and the apogee = 35793 km

When you are in correct orbit, appreciably observe on the MFD Map the regular passage of the satellite per same hour at the equator

- **3 - Proton KD + Spot + Carina** simulates the launch of Astra satellite (one uses Spot5 failing this) with Carina by Proton block DM (4 stages) to give an example of launch with two satellites
- **4 - Proton K + Zarya** simulates the launch of Zarya by Proton K (3 stages) at the time of the mission which allowed its placement on orbit as the first element of ISS

Launch of Proton 8K82K/11886 (in other words Proton K 3 stages) the 20/11/1998 6h40 GMT to put Zarya into orbit.

Objective:

To put Zarya on an orbit inclined at $51^{\circ}55'$ with a periapsis = 176 km and an apoapsis = 343 km
Correction then to carry out an orbit 383x396 km and one awaits the shuttle which brings Unity.(not included in the scenario)

- **5 - Proton KM + Zvezda** simulates the launch of Zvezda by Proton block Briz (4 stages) on a high orbit.

The purpose of it is only to try the capacity of carrying of the rocket. By lighting the Briz stage again with the perigee one can create a very elliptic orbit with an apogee with 10Mkm.

In fact as Proton block DM this rocket is intended especially for the launching of the geosynchronous satellites.

When Zvezda is in orbit it is possible to try to dock with ISS or Zarya

- **6 - Proton K-NPL launch + Proton K en standby** Proton K-NPL (no load) ready for launch is on the pad and Proton K in standby on the train for placement when the pad is free

UTILISATION DU PILOTE AUTOMATIQUE

At scenario load , the MET count automatically start

Auropilot must be armed before MET=0 and in the scenarios MET has negative value (in seconde)

- MET = -120 for scénarios 1,2 ,3 et 6 (for Proton K-NPL) for rockets ready to launch
Two minutes after load of scenario the launch is automatic
- MET = -600 for scénarios 4,5 et 6 (for Proton K) for rocket in standby on the train for placement on the pad . During this time you can move Tower and Train and light to play

You must start the autopilot with P before MET = 0

You can see MET with two possibilities



In internal view with F1 you can view T value on the HUD

T- :000 :01 :43 show that it remain a maximum of 1minute 43 secondes before autopilot start

In internal view using MFD Multistage 2015 in GNC mode (see Multistage 2015 doc) Here we can see **T- :000 :01 :42**

You can accelerate time to 10x before start when MET is too long for you.
You can too modify MET in the scenarios if you want

ANIMATIONS

You must take the element control with F3. Take tab Class to have all the elements

IMPORTANT

If you use Windows 7 you must deactivate the number function on the numeric keyboard

- **For the tower (ProtonTower)** the initial position in the center, is placed on the

rocket. Opening of the footbridges > key G
Closing of the footbridges > keys Ctrl+G

Stop in progress > key G
Stop in progress > key G

Distance of the tower > key K
key K Bringing together of the tower
progress > key K

Stop in progress >
> Ctrl+K keys Stop in

The height adjustment of the 9 footbridges of the tower can for adaptation to the rocket. They are numbered from 1 to 9 on the basis of the top and their position can be modified by using keys 1 to 9 of the digital keyboard following the footbridge to be ordered.

Descent > Shift+ key 1 to 9

Stop in progress > the same

Rise > Ctrl+Shift+ keys Ctrl+1 to 9

Stop in progress > the same

Pay attention because nothing prevents from overlapping the footbridges, also it is necessary well to look at which is the possible amplitude and the direction of the displacement which can be carried out.

- **For lighting (ProtonLights)**

Progressive ordering of the lamps by using keys 0 and. (not) of the numeric keypad as for the ordering of a Hover engine.

- **For the train (ProtonTrain)** the initial position is in the center of the launching pad to the foot of the rocket

After selecting ProtonTrain using F3 the commands are:

Train advance > K key Stop in progress> K key
Train back > Ctrl + K keys Stop in progress> K key

Raise the support > G key Stop in progress> G key
Lower support > Ctrl + G keys Stop in progress> G key

The rocket can be released by doing Ctrl + Q followed by Shift + 0 on the numeric keypad
It can be reloaded if the support is erected against it by performing the same maneuver

A text Attach: Fixation: bottom left of the screen gives the status of the attachment point <FREE> it is free MS_LAUNCHPAD_PROTONK he is busy

For the likelihood of unloading a rocket, it is necessary to lift the support only when the train is in extreme position ready to pose on the launch pedestal
The jaws open and close automatically when the support is vertical. Move away a little the train before lowering the support otherwise you will crush the rocket !

LES CHARGES

If you wish to modify the payload, it is enough to modify the Payload paragraph in the file ini of the rocket (in config / Vessels / ProtonUR500). to put that which you wish.

For example in the ProtonK.ini file one finds:

```
[PAYLOAD_1]
MeshName="Zarya-J"
name="Zarya-J"
Module="spacecraft\spacecraft3"
off=(0,0,38)
Diameter=3.00
Height=12.00
Mass=18500
```

It is enough to replace the values MeshName, Name and Module by those which correspond to the satellite that you wish to launch.

You can regulate his position under the cap by modifying the last value in the offset (here 38). While increasing it is placed higher, and while decreasing lower

If you modify the mass it may be that the file of guidance of the autopilot does not function correctly any more. I advise you to keep that there even if it is not the truth, if not you risk surprises!

If the dimensions allow it you can to put a second load by creating one [PAYLOAD _ 2]

For example like Zarya 12m measures and weighs more than 18 tons you can without problem embark for example two satellites of 5m length weighing each one up to 9 tons (It is preferable to keep a total weight for the loads equal to 18500 kg even if it is not the truth.

The overall diameter of the satellites should not exceed 4m.

The scenario Proton KD with Spot5 and Carina show this.

It is enough to create a file cfg and a file ini in the ProtonUR500 file in Vessels folder to create a new rocket by copying an existing file ini and adding a payload

In my example I took two files Proton KD2.cfg (not modification) and a file KD2.ini proton with an added load. Here the end of the file ini

```
[PAYLOAD_1]
MeshName="Carina"
name="Carina"
module="Carina"
off=(0,0,57)
Diameter=2.00
```

Height=5.40
Mass=3030

```
[PAYLOAD_2]
MeshName="Spot5"
name="Spot5"
Module="spacecraft\spacecraft3"
off=(0,0,53.5)
Diameter=2.00
Height=5.40
Mass=3030
```

In Payload_1 you find Carina which must be released in first since it is in front of Spot5.(see offset)

Read the explanatory note of Multistage to know some more

If you want to change the launch heading, it is enough to modify the third value in the first line of guidance file to replace it by the desired course

For example -5=orbit(35778, 35793,0.1,1,80). Here the heading is 0.1°

TAKE CARE

Don't modify the general structure of scénarios.

With O2016, Spacecraft don't function for the vessels on the ground as ProtonTower, ProtonTrain and ProtonLights and an invisible platform (a rocket in reality) wear this vessels as satellites. You can see in scenarios this element named Socle and the attachments to the Spacecrafts

Thanks to Jacquismomo for his assistance

LIMITATIONS

This addon is limited to a use with the Orbiter software
Its commercial use is strictly prohibited

I hope that you will take as much pleasure with this addon than I had of it to do it

Papyref April 2018