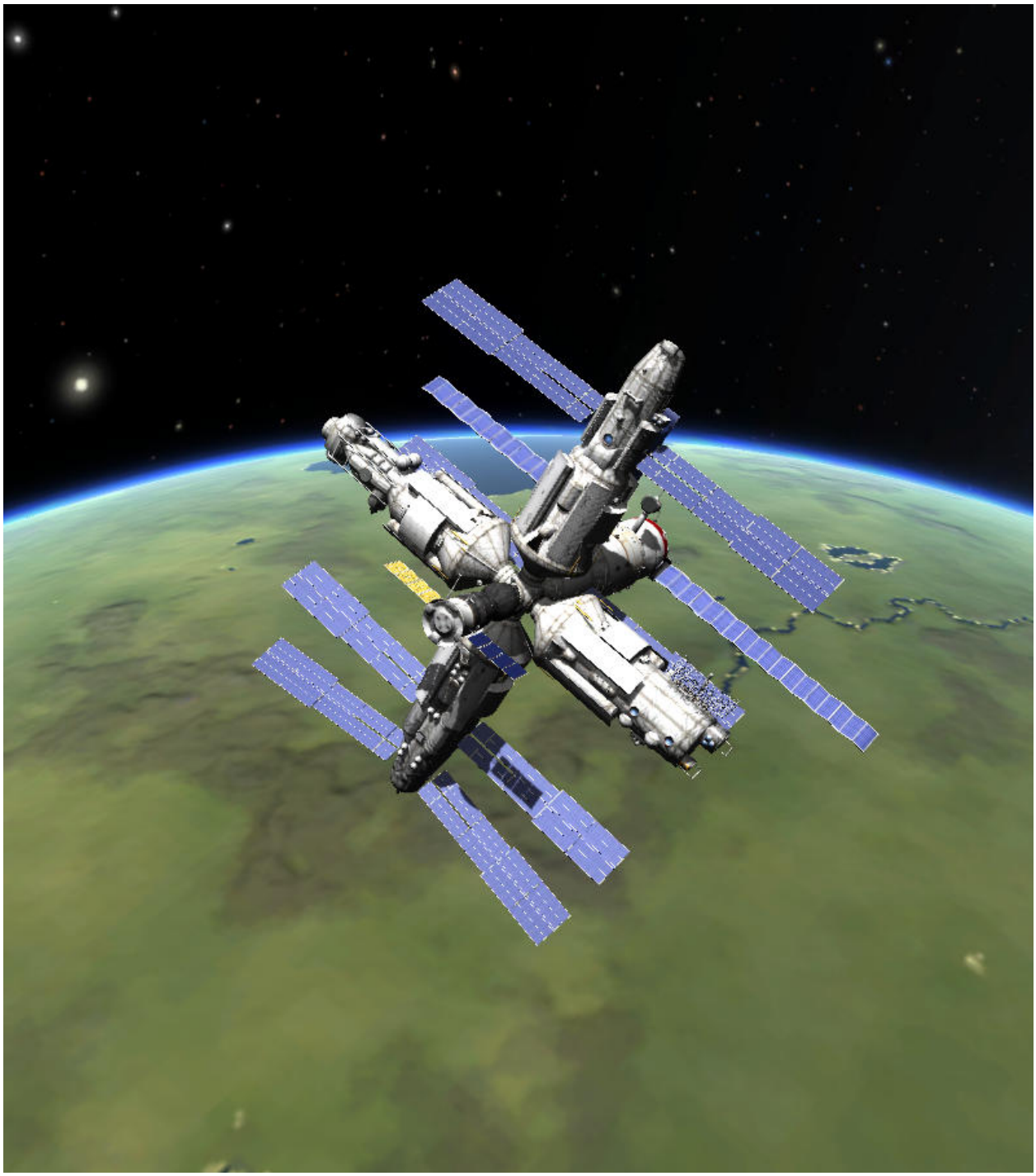
BobCat ind Historical Spacecraft Dept. Present

# "MIR" ORBITAL COMPLEX (USSR)



Assembly and flight manual

## HISTORICAL BACKGROUND

S.P. Korolev Rocket and Space Corporation Energia was the Prime Contractor for MIR Orbital Station, developer of the Core Module and the Station Modules, developer and manufacturer of the major systems supporting their on-orbit operation; responsible for the integrated electrical interface of the onboard systems and integrated ground electrical tests of the Station Modules; developer and manufacturer of the Soyuz and Progress space vehicles.
M.V. Khrunichev State Space Scientific-Production Center was a participant in the Core Module and Modules development; developer and manufacturer of the structure and systems providing the station Modules autonomous flight.

| Station Element | Launch Date | Docking Date |
|---|---|---|
| **Core Module** | 20 February 1986 | - |
| **Kvant Module** | 31 March 1987 | 09 April 1987 |
| **Kvant-2 Module** | 26 November 1989 | 06 December 1989 |
| **Kristall Module** | 31 May 1990 | 10 June1990 |
| **Spektr Module** | 20 May 1995 | 01 June 1995 |
| **Docking Compartment** | 12 November 1995 | 15 November 1995 |
| **Priroda Module** | 23 April 1996 | 26 April 1996 |
| Transport and maintenance support of the Station flight was provided by the Soyuz-TM-type manned transport and Progress-M cargo vehicles. | | |
| **GENERAL MIR COMPLEX CHARACTERISTICS** | | |
| **Altitude of Working Orbit** | 320 - 420 km | |
| **Orbit Inclination** | 51.6 degree | |
| **Operation Duration** | more than 15 years | |

**Core Module** was a major part of the entire Orbital Station combining its modules into a single complex. The core module accommodated control equipment for the station crew life support systems and science hardware, as well as crew rest locations. The core module consisted of the transfer compartment with five passive docking assemblies (one axial and four side assemblies), working compartment, transfer chamber with one docking assembly, and unpressurized instrument compartment. All docking assemblies were of a passive type of a "probe-drogue" system.

**Module Kvant** was intended to conduct astrophysical and other scientific research and experiments. The module consisted of a laboratory compartment with a transfer chamber and unpressurized compartment for science instruments. The module on-orbit maneuvering was provided by the service propulsion compartment, that separated after the module docking to the Station. The module had two docking assemblies located along its longitudinal axis, namely active and passive ones. In a free flight the passive assembly was closed by the service compartment. The Kvant module docked to the transfer chamber of the core module (X axis).

**Kvant 2 Module** was intended to resupply the Station with science hardware, equipment and support crew spacewalks, as well as perform various scientific research and experiments. The module consisted of three pressurized compartments, i.e. instrument-cargo, instrument-science compartments and dedicated airlock compartment with an egress hatch of 1000 mm in diameter that swung outward. The module had one active docking assembly installed along its

longitudinal axis on the instrument-cargo compartment. The nominal location of Kvant-2 within Mir was along -Y axis.

**Kristall module** was intended to conduct technological and other scientific research and experiments to support dockings with the vehicles outfitted with androgynous peripheral docking assemblies. The module consisted of two pressurized compartments, i.e. instrument-cargo and transfer-docking compartments. The module had three docking assemblies, i.e. axial active assembly on the instrument-cargo compartment and two androgynous peripheral docking assemblies on the transfer-docking compartment (axial and lateral). The nominal position of the Spektr module as part of the MIR Station was along the -Z axis.
Spektr module was intended to conduct scientific research and experiments to investigate Earth resources, proper external atmosphere of the orbital complex, geophysical processes of a natural and artificial origin in a near-earth space and in the upper Earth atmosphere, as well as resupply the station with additional electric power supplies. The module consisted of two compartments, i.e. pressurized instrument-cargo and unpressurized compartment, on which two major and two additional solar arrays and science instruments were mounted. The module had one active docking assembly, located along its longitudinal axis on the instrument-cargo compartment. The nominal position of the Spektr module as part of the MIR Station was along the -Y axis.

**Docking Compartment** (developed at S.P. Korolev RSC Energia) was intended to support dockings of the U.S. Space Shuttle Orbiters to the MIR Station without modifying its configuration. It was delivered to orbit by the U.S. Atlantis Orbiter (STS-74) and docked to the Kristall module (- Z axis).

**Priroda module** was intended to conduct science research and experiments to investigate Earth resources, upper Earth atmosphere, space radiation, geophysical processes of a natural and artificial origin in a near-earth space and in the upper Earth atmosphere. The module consisted of one pressurized instrument-cargo compartment. The module had one active docking assembly located along its longitudinal axis. The nominal location of the Priroda module within the MIR Station was along the -Z axis.

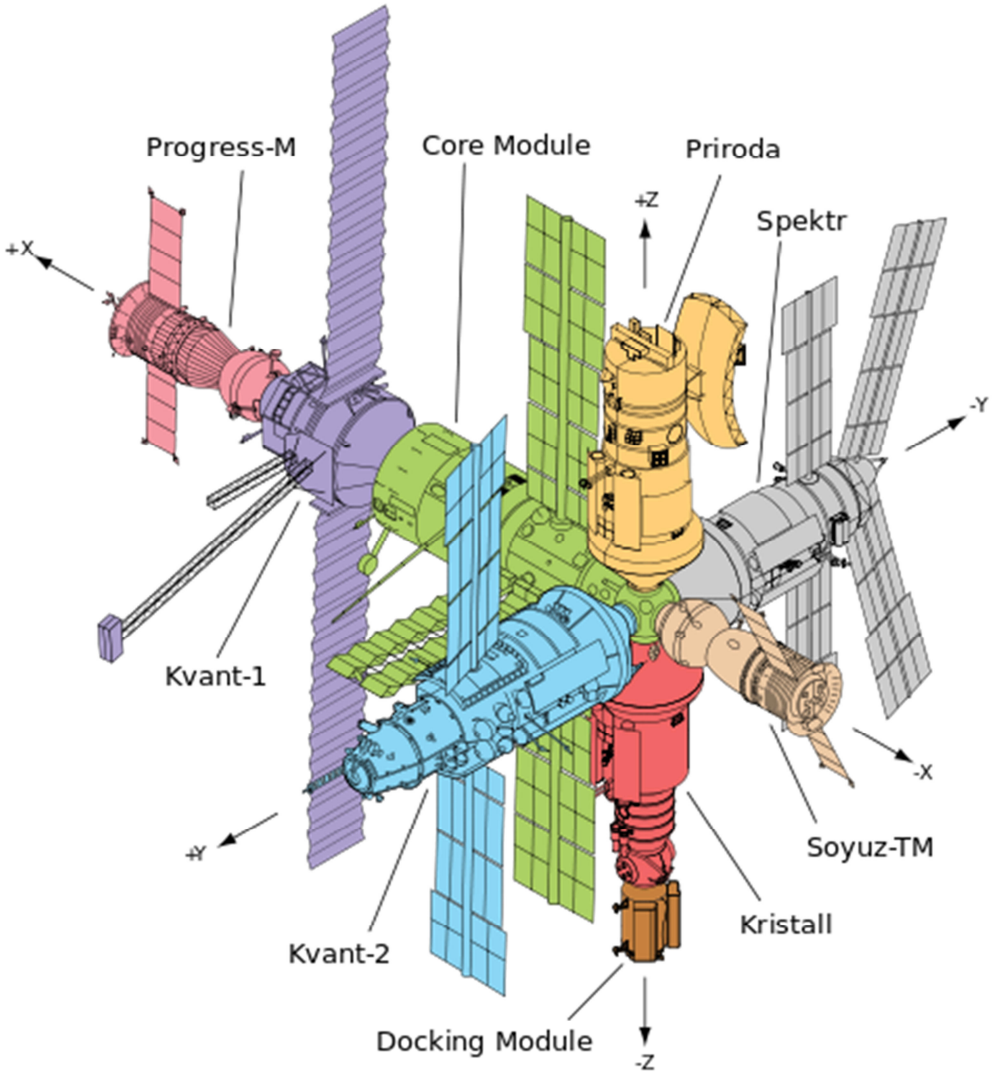
During the MIR Station operation absolute world records of man's continuous on-orbit stay-time were achieved:
1987 - Yuri Romanenko (326 days 11 hrs 38 min)
1988 - Vladimir Titov, Musa Manarov (365 days 22 hrs 39 min)
1995 - Valery Polyakov (437 days 17 hrs 58 min).
In 1995 Valery Polyakov also became an absolute world record-breaker in total on-orbit stay time, in 1999 his achievement was exceeded by Sergey Avdeev:
Valery Polyakov - 678 days 16 hrs 33 min (for 2 flights)
Sergey Avdeev - 747 days 14 hrs 12 min (for 3 flights).
Among women world records of space flight duration were achieved by:
Elena Kondakova (169 days 05 h 1 min) in 1995
Shannon Lucid, the USA (188 days 04 hrs 00 min, including a stay-time on the MIR Station of 183 days 23 hrs 00 min) in 1996.

Orbital complex "Mir" was launched in orbit in a time when the economy of the Soviet Union began a rapid decline. Top political leadership has declared that now we do not have enemies, and we do not need the Cosmos. It's too expensive. Military and space industries were privatized. Specialists did not receive any wages. Engineers left the design offices and traded Chinese rags markets to survive and feed their families somehow. Unique and secret technologies were bought on the cheap by Western businessmen. And in the 1992m, the Soviet Union collapsed. "Mir" was doomed.

Minister of General Machine Building of the USSR Oleg Baklanov, "It happened at the end of 1989-90, it was noticed by Gorbachev and his company, who did not believe in the strength of our science, industry, the strength of our economy. Gorbachev and Yeltsin deliberately broke the Soviet economy. All have turned away from the space".

Cosmonaut Gennady Strekalov: "What we are going to sink the station" Mir "- a political decision. First of all, you need the U.S. - the main rival to Russia in space ..."

March 23, 2001 year orbital complex "Mir" was dropped with the orbit and sunk in the Pacific Ocean.



## INTRODUCTION

The package contains

| Folders | Name in VAB | Name in Package |
|---|---|---|
| **Parts** | Mir ASAS | MIR_ASAS |
| | Mir Core Module (aka Base Block) | MIR_core |
| | Mir Solar Panel | MIR_core_solar |
| | Mir Core Top Solar Panel | MIR_core_solar_top |
| | Mir Kvant-1 | MIR_KVANT_core |
| | Mir Kvant-1 Solar Panel | MIR_KVANT_core_solar |
| | Mir Launch Probe | MIR_probe |
| | Mir RCS Thruster Block | MIR_RCS |
| | Mir Docking Port Drogue | MIR_soviet_dockport |
| | Mir Docking Port Probe | MIR_soviet_dockport_papa |
| | Mir Kristall | MIR_TKS_KRISTALL |
| | Mir Kvant-2 | MIR_TKS_KVANT2 |
| | Mir Priroda | MIR_TKS_PRIRODA |
| | Mir Spektr | MIR_TKS_SPECTER |
| **Internals\Spaces** | - | TKS_internal |
| | - | MIR_core_internal |
| **Plugins** | - | AdvSASModuleToggle.dll |
| | - | KAS.dll |
| | - | Romfarer.dll |

## INSTALL

To install you should unpack the zip file to the directory in which the executable file (ksp.exe) is located.

If the installation is successful, you will find parts in VAB in these sections:

| PODS | CONTROL | UTILITY | | | | |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |
| Mir Launch Probe | Mir ASAS | Mir Core Module | Mir Core Solar Panel | Mir Core Top Solar Panel | Mir Kvant-1 | Mir Kvant-1 Solar Panel |
| |  |  |  |  |  |  |
| | Mir RCS | Mir Docking Port Drogue | Mir Docking Port Probe | Mir Kristall | Mir Kvant-2 | Mir Priroda |
| | | |  | | | |
| | | | Mir Spektr | | | |

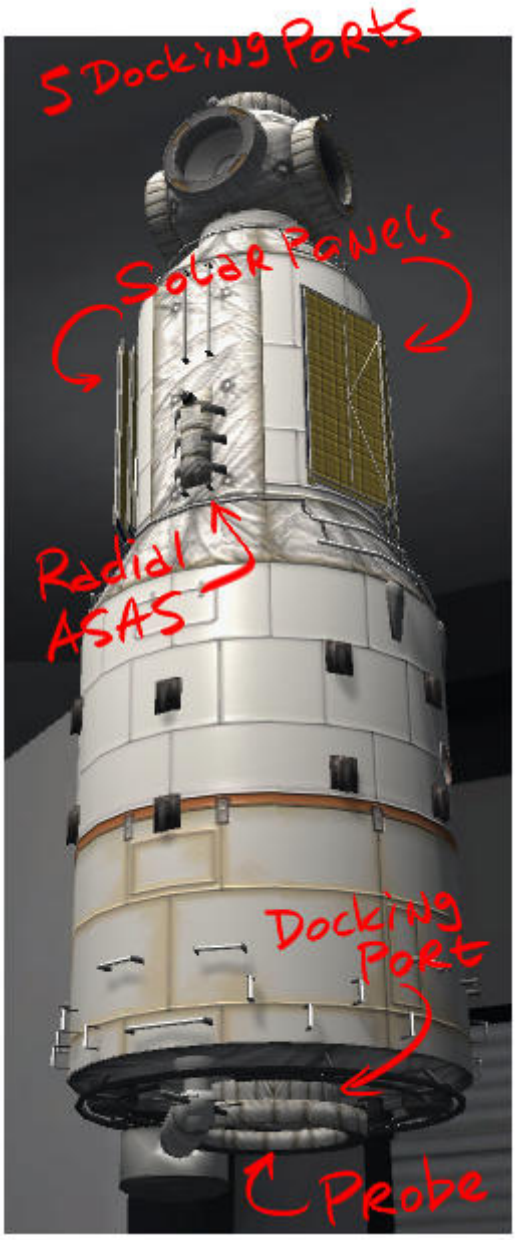
Make sure that the Plugins folder contains the following files:
- AdvSASModuleToggle.dll
- KAS.dll
- Romfarer.dll

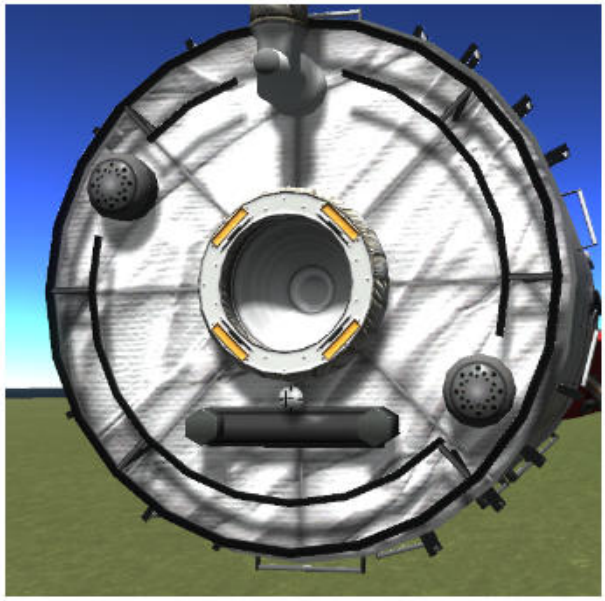
## ASSEMBLY

The modules of the "Mir" Orbital Complex can operate in both the manned and in manned mode. However, they do not envisage the existence of orbit crews within modules.

Therefore, the Assembly of each module of the "Mir" Orbital Complex begins with Launch of Probe to the Mir unmanned management module. This detail provides control at the stage of launching into orbit. After the release of a circular reference orbit, Mir Launch Probe must be undocked from the display module. After that, each module can maneuver in manned mode. Testing confirmed the compatibility with the most popular avtopilotami– MechJeb, ORDA.

## CORE MODULE



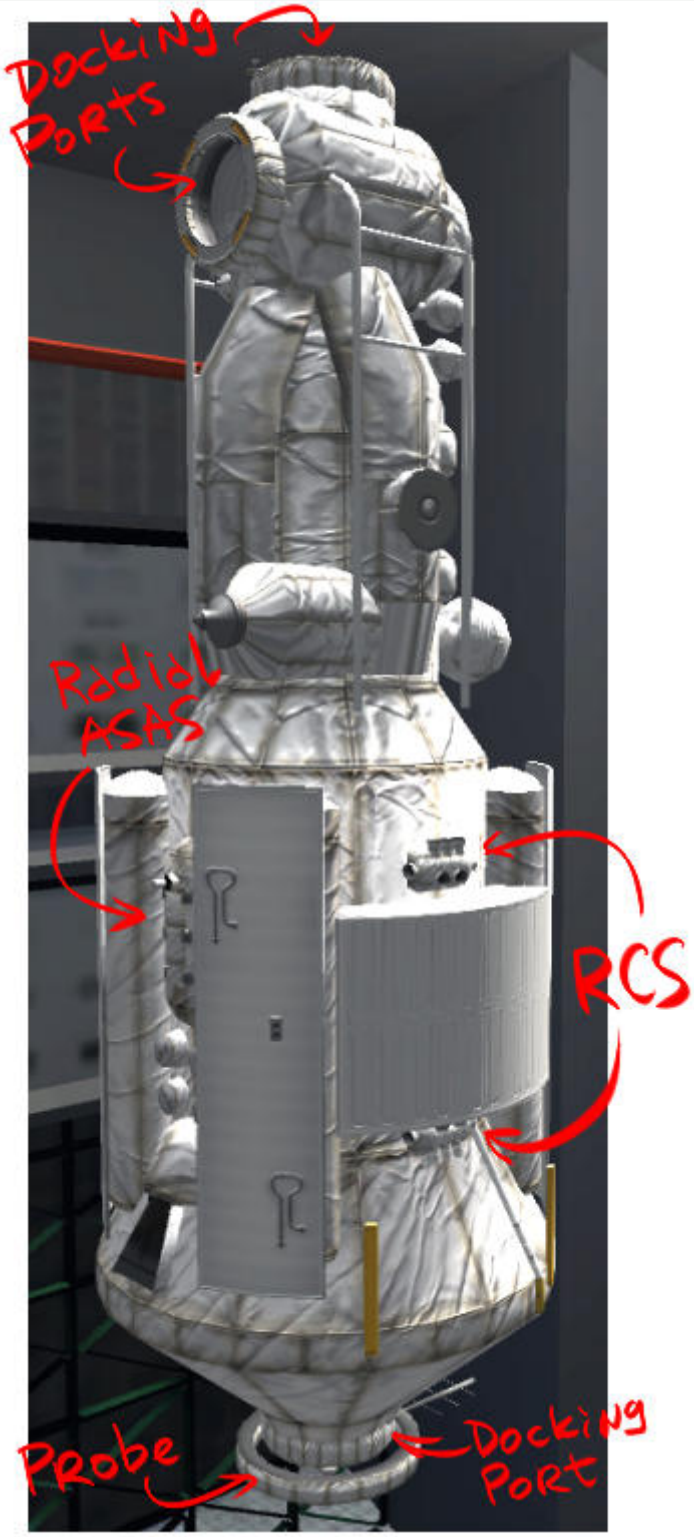
- Five passive docking device top
- Radial switchable ASAS
- 2 solar panels
- Passive docking device at the bottom
- An unmanned control module

**ATTENTION!**

Mutual position of the docking device should be the same as in the picture below.

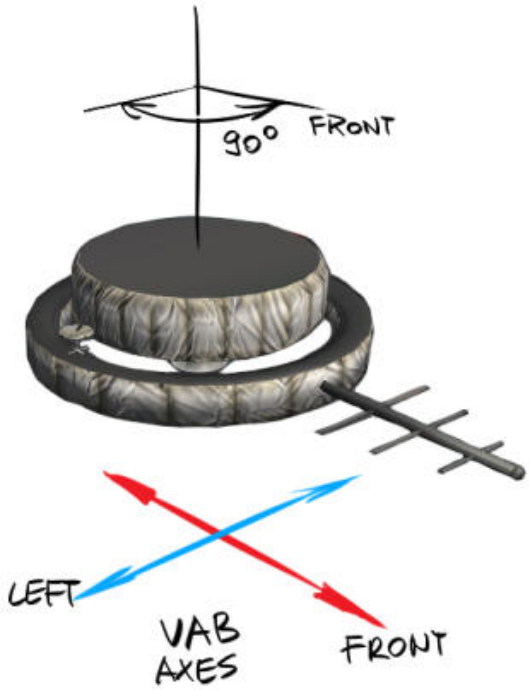
Once in orbit, expand the built-in antenna and the open portholes.

KRISTALL

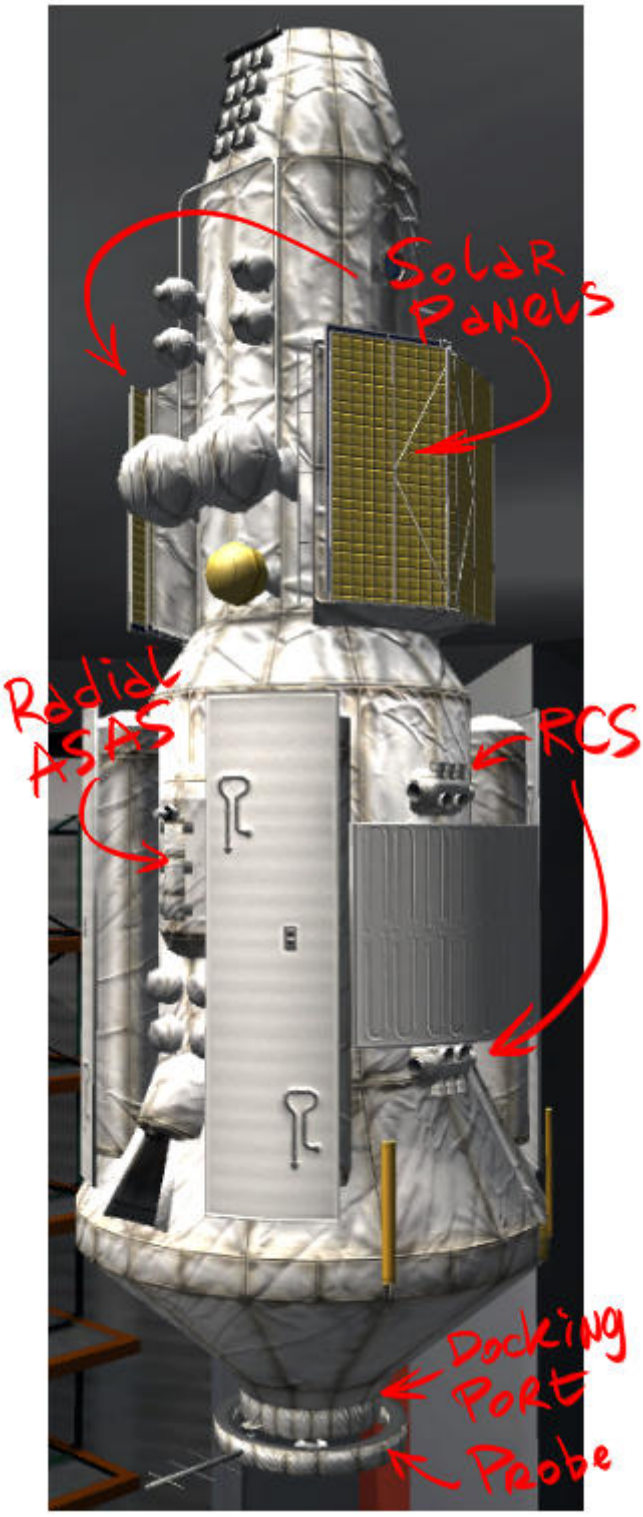



- Two passive docking unit upstairs
- Radial switchable ASAS
- 4 blocks RCS - two on the left and right side
- Active docking device
- An unmanned control module

**ATTENTION!**
Mutual position of the active docking device and the unmanned control module should be the same as in the picture below.



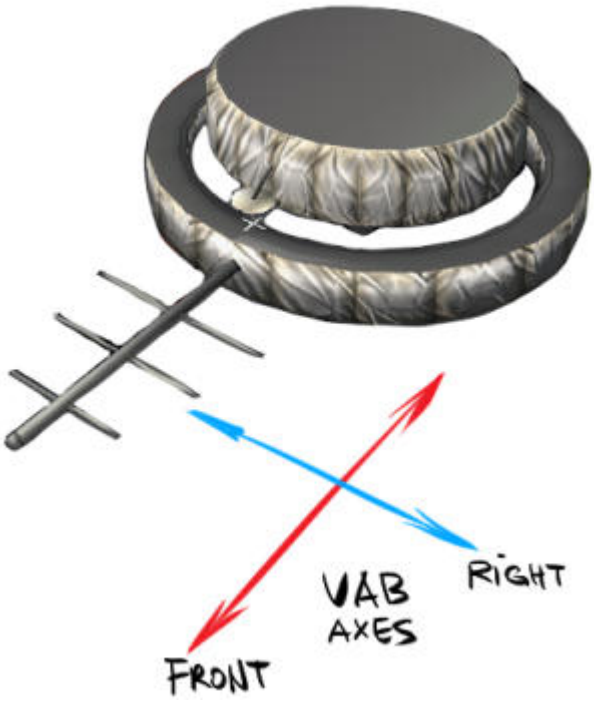
KVANT-2




- Two solar panels
- Radial switchable ASAS
- 4 blocks RCS - two on the left and right side
- Active docking device
- An unmanned control module

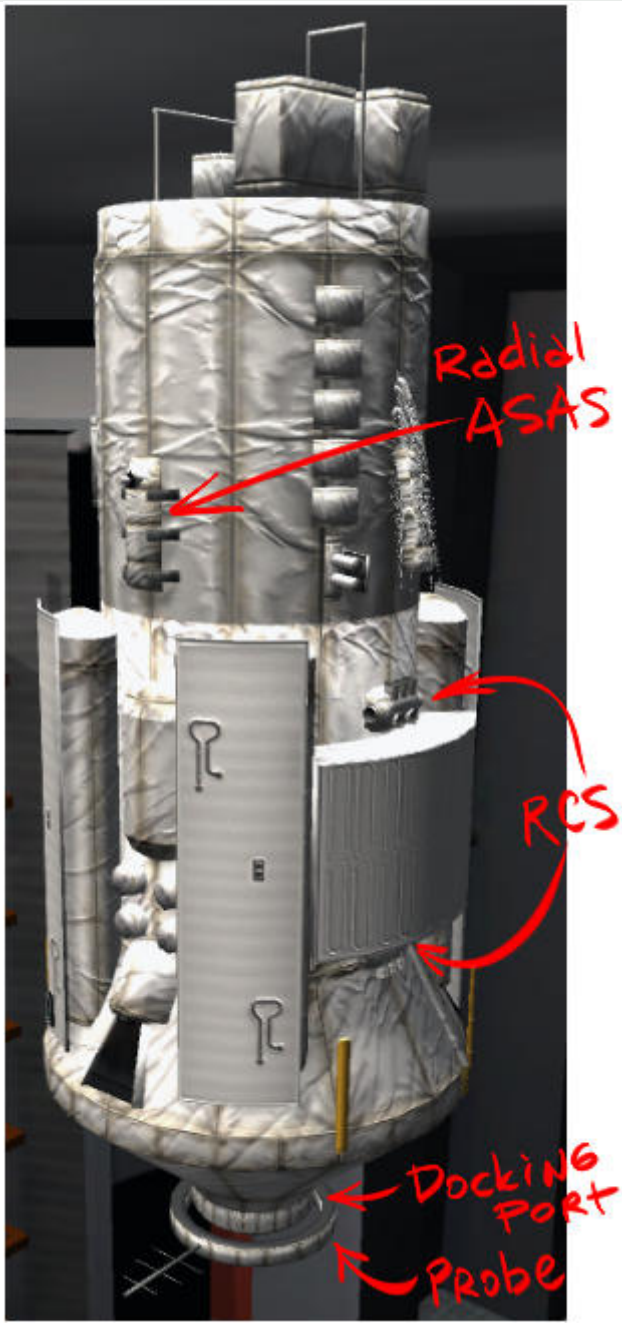
**ATTENTION!**

Mutual position of the active docking device and the unmanned control module should be the same as in the picture below.




After docking with the Core Module, expand built-in equipment.

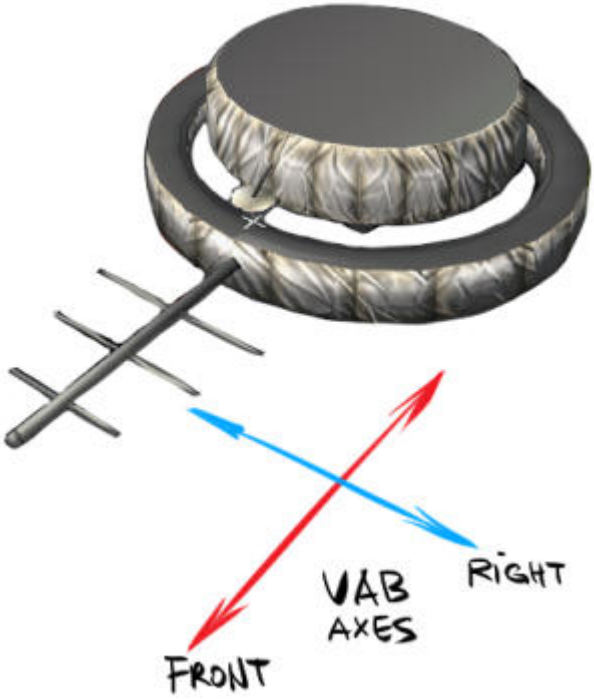
PRIRODA




- Radial switchable ASAS
- 4 blocks RCS - two on the left and right side
- Active docking device
- An unmanned control module

**ATTENTION!**

Mutual position of the active docking device and the unmanned control module should be the same as in the picture below.




After docking with the Core Module, expand the built-in antenna.

KVANT-1

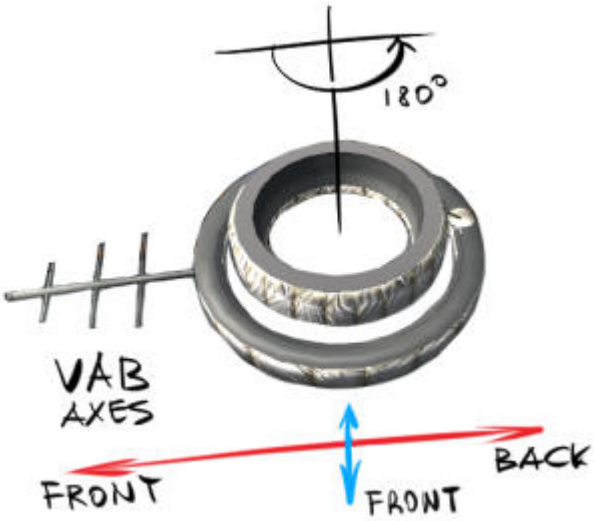

- Active docking device top
- Passive mating device at the bottom

Because the module "Kvant-1" has no engine and is not able to perform the orbital maneuvers, rendezvous and docking, you have to build for him a lift (not included).

Collect unmanned tug of any in-stock parts. Do not forget the alignment engine approach and orientation relative to the center of mass.

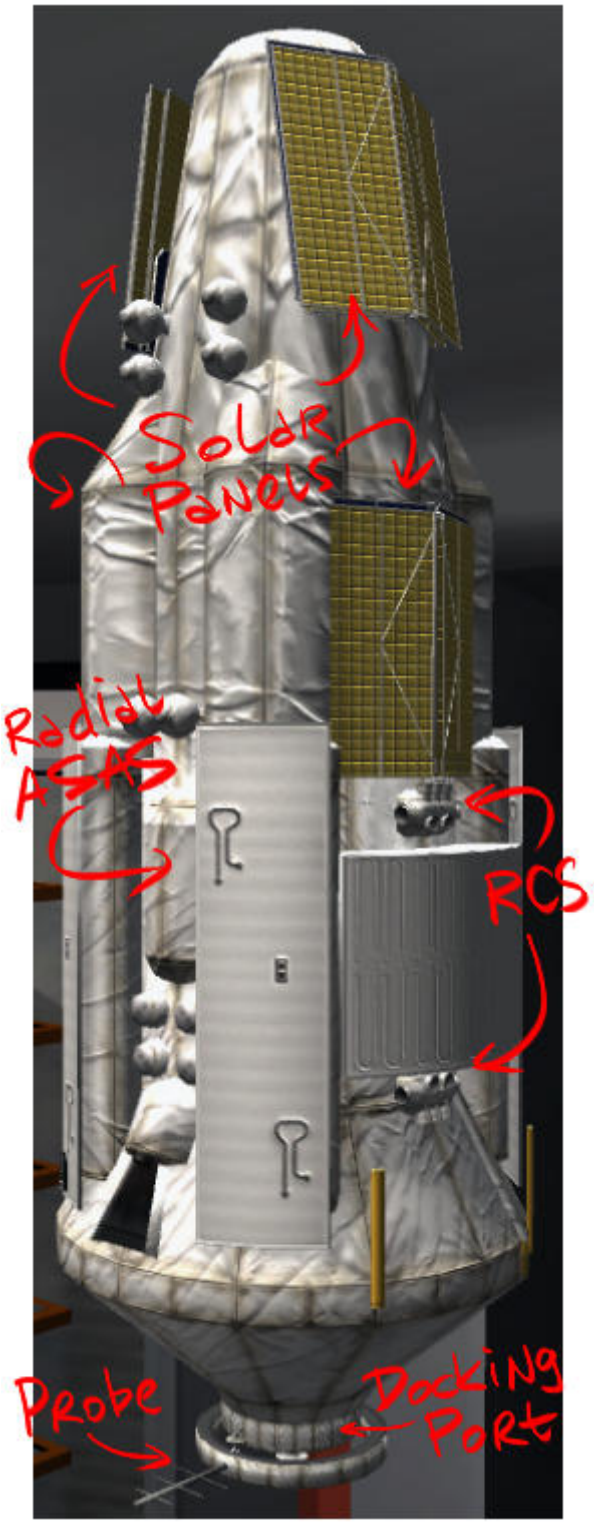
**ATTENTION!**

Mutual position of a passive docking device and the unmanned control module should be the same as in the picture below.




After docking with the Core Module, expand the built-in antenna.

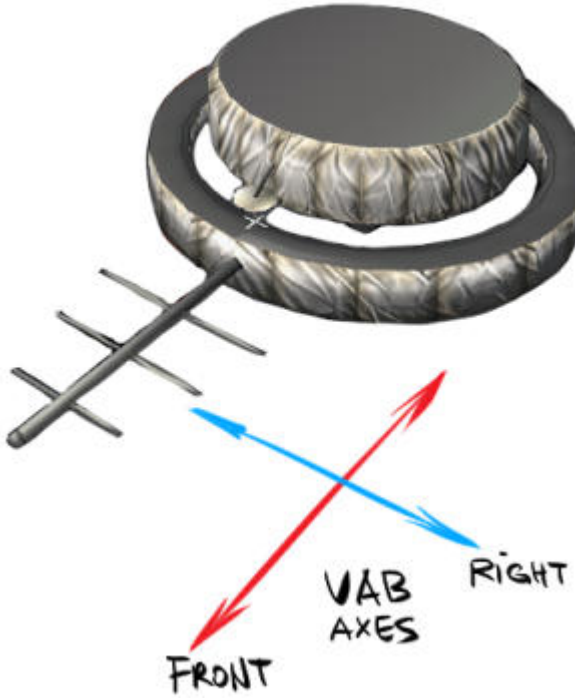
SPEKTR




- 4 solar panels
- Radial switchable ASAS
- 4 blocks docking and orientation engines - two on the left and right side
- Active docking device
- An unmanned control module

**ВНИМАНИЕ!**

Взаимное положение активного стыковочного устройства и беспилотного модуля управления должно быть таким, как на картинке ниже.

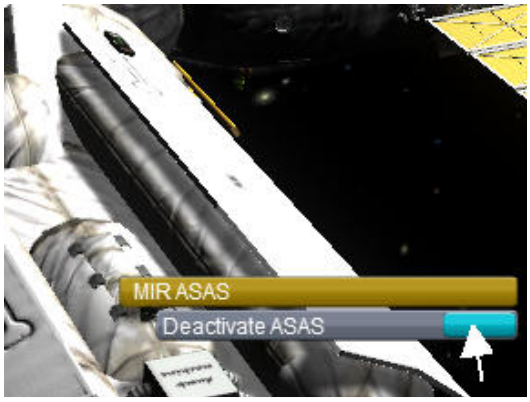



To deliver the modules in orbit use the "Proton" launch vehicle.

## OPERATION

### ASAS

After each new module or dock the spacecraft with a Core Module, deactivate the module ASAS. Leave checked only ASAS at the basic unit. This will reduce the fluctuation of the orbital complex.

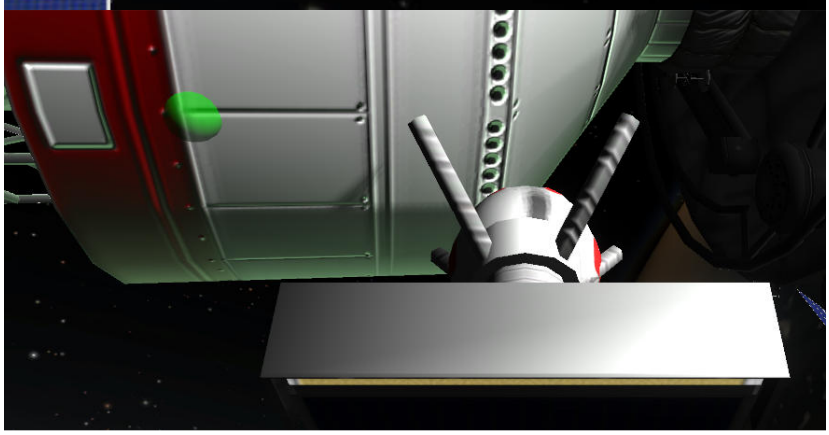




### THE INSTALLATION OF SOLAR PANELS

In any way, take the solar panels Kvant-1 Solar Panel into orbit. Then send it to a panel of the astronaut. When he is close enough, the panel menu button appears Grab | Drop. Click this button or press the [G] key. The panel is on the back of the astronaut.


Fly to the place where going to install the panel. Hold down the [H]. Possible installation takes the form of the green circle. Specify the exact location of the mouse.



## FAQ

| | |
|---|---|
| What are the parts of this package can be used in EVA? | Solar Panels **Mir Core Top Solar Panel** und **Kvant-1 Solar Panel** |
| Docking ports are compatible with the stock? | Yes, all and all. |
| Is there a Core Module interiors and other station modules Mir? How to get inside? | Yes. Fly around the modules until you are prompted to press a button [F]. Some modules hatches are distinctively marked. |

## АВТОРЫ

## CREDITS

**3D modeling and texturing** - BobCat

**Programming** – CrashnBurn

**Documentation, Testing and Tuning** – CCCP

**Testing** -- BlazingAngel665

Used information from websites:
http://www.energia.ru/
http://en.wikisource.org/wiki/Mir_Hardware_Heritage

## DISCLAIMER