

# Mir-2 Space Station

## user manual

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### Disclaimer

This software is provided as it is without any warranty of any kind.

The project has been developed to be used as an add-on for Orbiter Space Flight Simulator by Martin Schweiger ([www.orbitersim.com](http://www.orbitersim.com)). **Designed for Orbiter 2006 Edition, patch 1 (build 060929).**

### Introduction

**Mir-2** is a hypothetical orbital station of block type, the descendant of Mir station. The station has no real prototype. It has been virtually designed to demonstrate cargo carrying capacity of the Energia rocket from *ENERGY project*.

### Requirements and limits

Be sure that *ScnEditor* module is activated at *Modules* tab in Orbiter *Launch pad* dialog. The Scenario Editor is required for configuring Mir-2 station.

The *Limited fuel* checkbox in *Parameters* tab in *Orbiter Launchpad* dialog should be switched on.

Some scenarios requires the following addons:

1. *Space Tugs*. Can be downloaded from here:  
<http://kulch.spb.ru/Eng/downloads.shtml>  
and from here:  
<http://www.orbithangar.com/searchid.php?ID=1292>
2. *ENERGY project*. Can be downloaded from here:  
<http://kulch.spb.ru/Eng/downloads.shtml>  
and from here:  
<http://www.orbithangar.com/searchid.php?ID=1036>
3. *Space Tankers*. Can be downloaded from here:  
<http://www.orbithangar.com/searchauth.php?search=yury%20kulchitsky>
4. *URMS*. Can be downloaded from here:  
<http://www.orbithangar.com/searchid.php?ID=3373>
5. *UMMU* by Dan Steph. Can be downloaded from here:  
<http://orbiter.dansteph.com/index.php?disp=d>

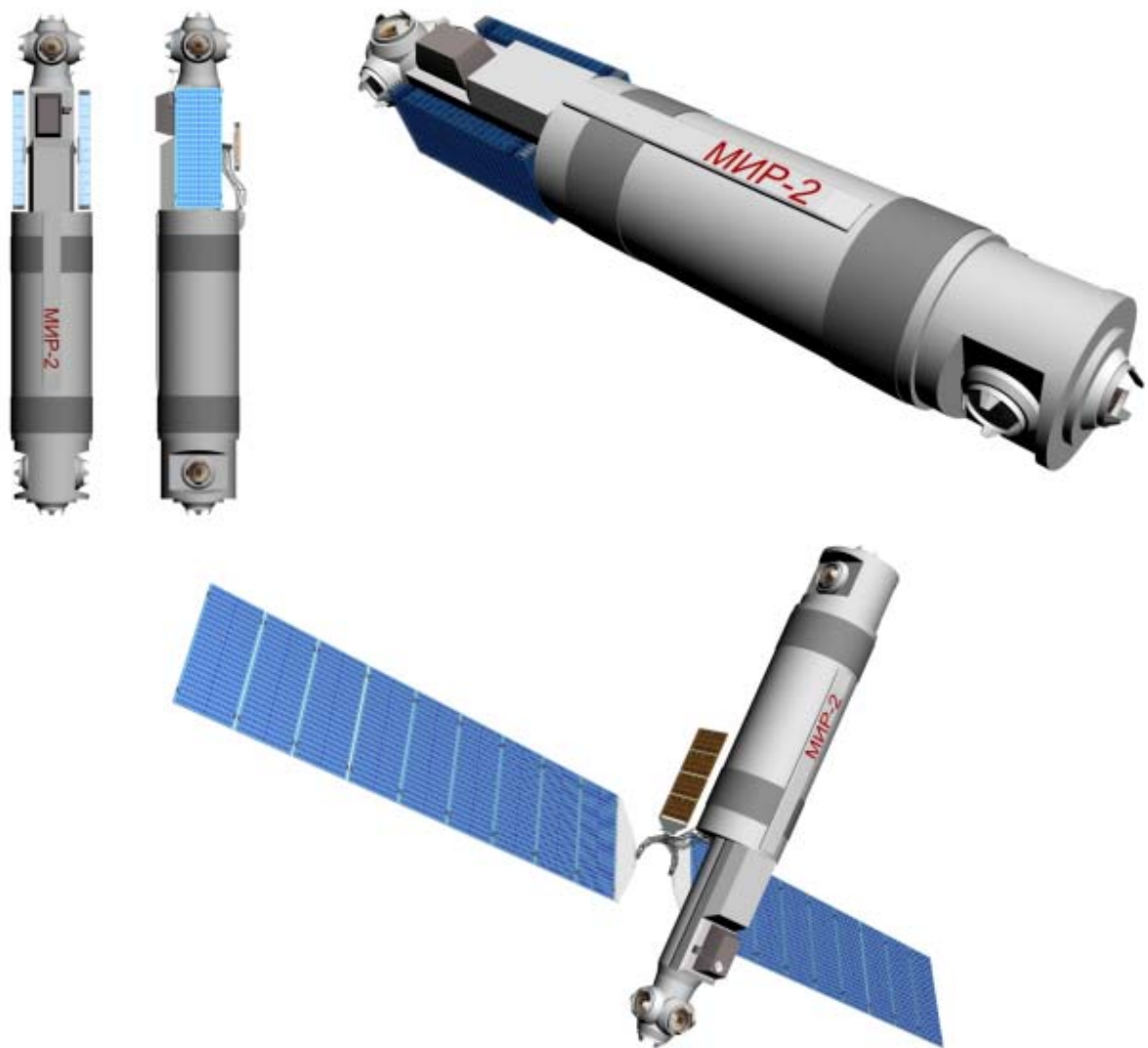
### Mir-2 space station core module

The station has no own engines. A specialized module will be docked to the station in the future in order to provide orientation and stabilization (see *Titan service module* topic). In 60 seconds time after its separation from a space tug the station is deployed. The panels of solar batteries, the radiator panel and the aerial are opened.

### Technical Specifications

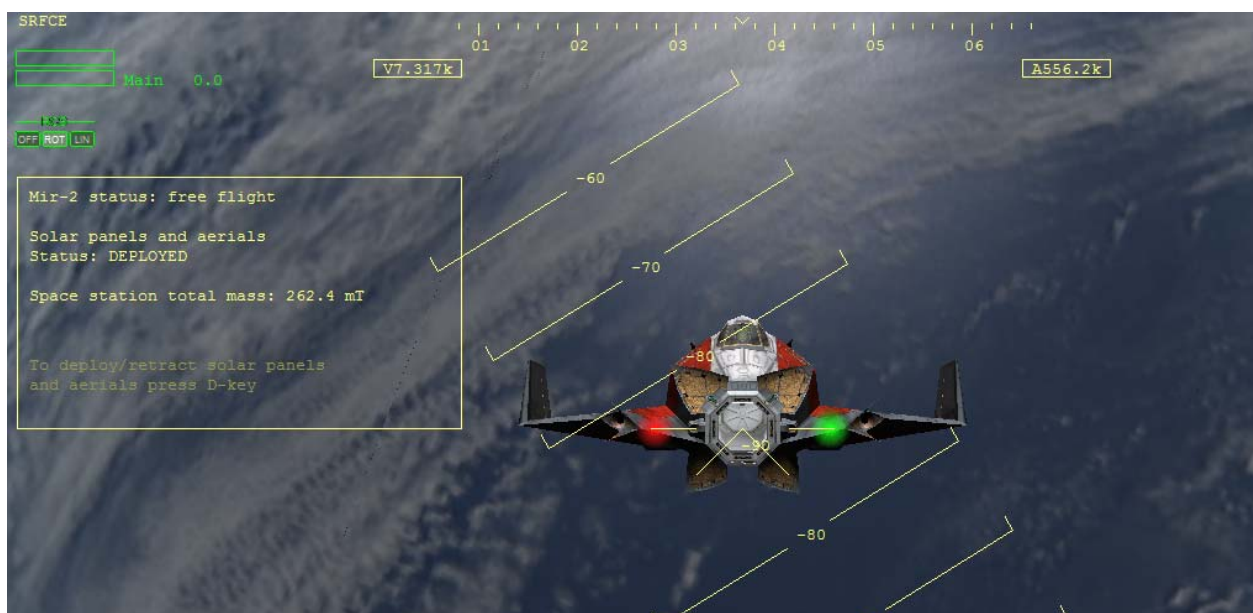
Length	34 m
Diameter	5.6 m
Mass	80.5 mT
Cross size in deployed state	66 m

The station solar batteries always have an optimum orientation towards the Sun. The full orientation of solar panels to the Sun is possible only in case of the controlled stabilized flight.



## HUD

The core module has a special HUD, see the picture:



The HUD shows the current solar panels, aerals state and total mass of whole orbital station.

## Keyboard interface

In addition to the usual keyboard Orbiter combinations you can use:

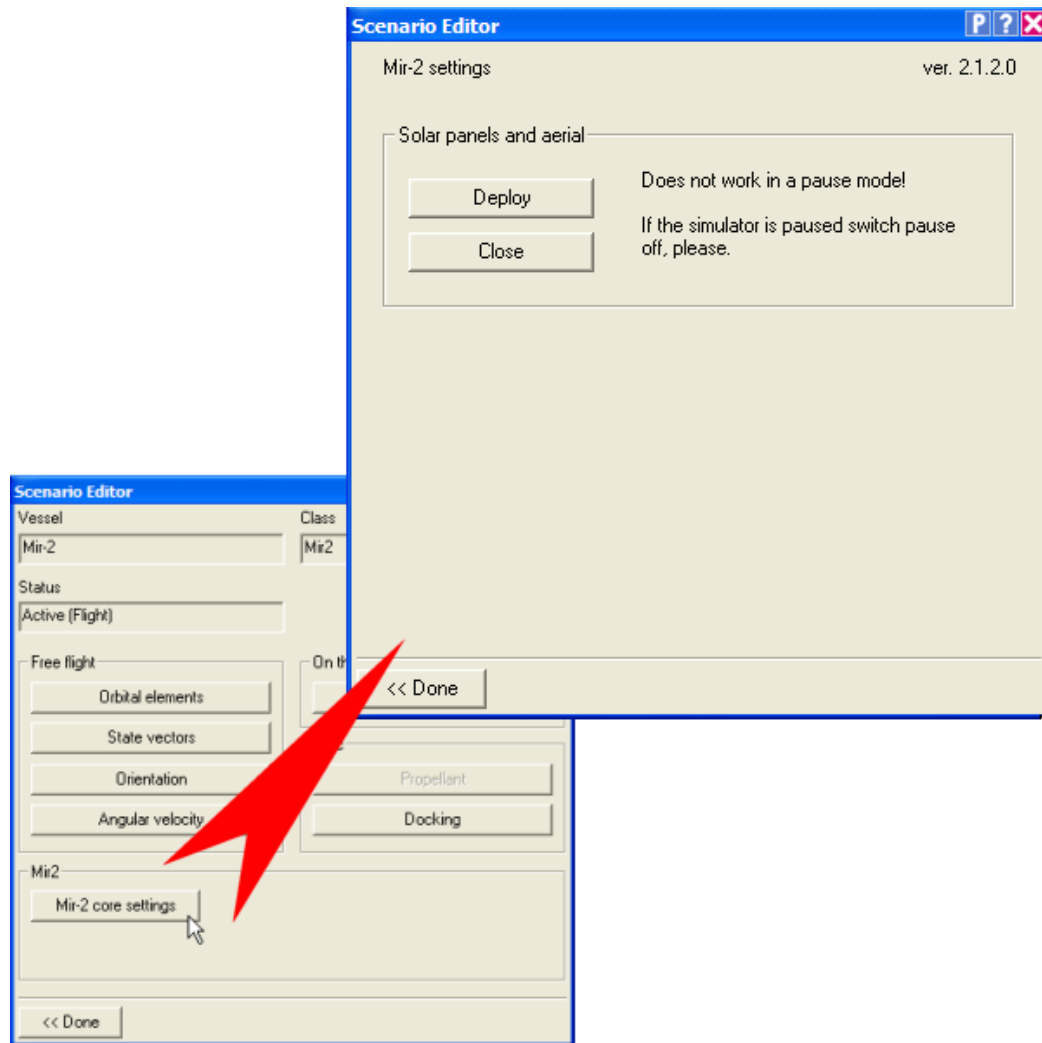


Close / deploy the station

## Configuring

Mir-2 core module can be configured with Orbiter's *Scenario Editor* (read more about Scenario Editor in *Doc\ScenarioEditor.pdf* manual).

The Mir-2 vessel has a special configuration page in Scenario Editor, see the picture:



Here you can set the solar panels and aerals state – to deploy click the *Deploy* button, to retract click the *Close* button.



You can change the settings instantly only if the Orbiter is not in the pause mode.

## Titan service module

**Titan** is an unmanned service module intended to provide the orientation and stabilization of Mir-2 station and for correcting the working orbit.

### Technical Specifications

Length (transportation state)	29 m
Length (deployed state)	329 m
Diameter	5.6 m
Dry mass	15 t
Fuel mass	50 t
Main engine thrust	25 kN

The main engine is automatically gimballed to provide alignment of the thrust vector with center of gravity of whole station. The main engine can be used for correcting of station orbit.

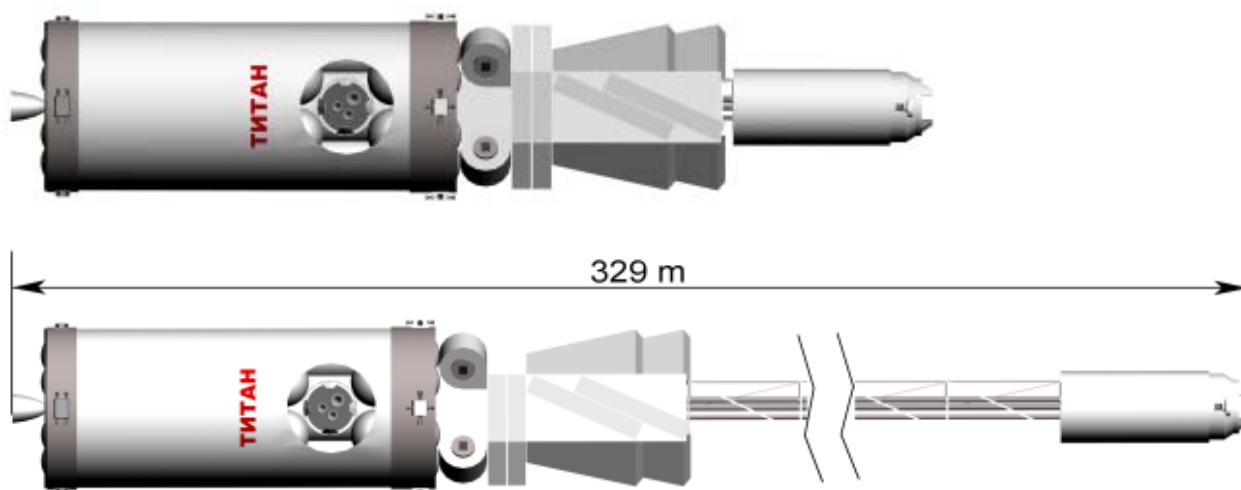
After docking to the core Mir-2 module the Titan starts to deploy (not immediately but in 30 seconds). When deployed Titan reaches the 329 meters in length and the whole station can be self-aligned with the local vertical by the gravity-gradient torque.

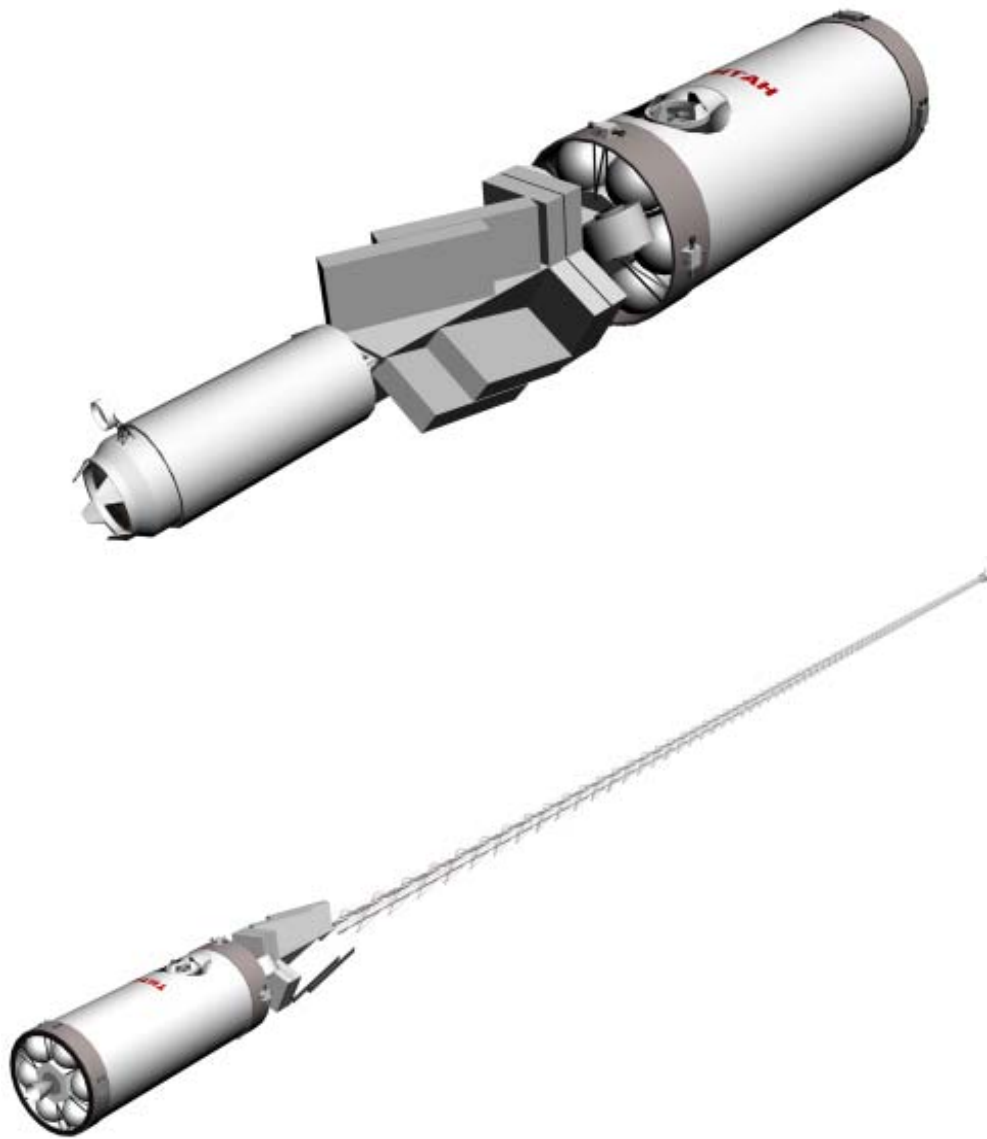
Simultaneously with deploying the autopilot starts its work. Autopilot provides the vertical orientation and alignment of the solar batteries of the core module with the Sun.



1. The gravity-gradient self-orientation is possible only if *Gravity-gradient torque* checkbox in *Parameters* tab of *Orbiter Launchpad dialog* is switched on.
2. The Titan module makes the right orientation only if it docked to Mir-2 core module dock unit #2 (it is the rear dock unit).
3. After docking the RCS of the Titan works only in rotation mode.

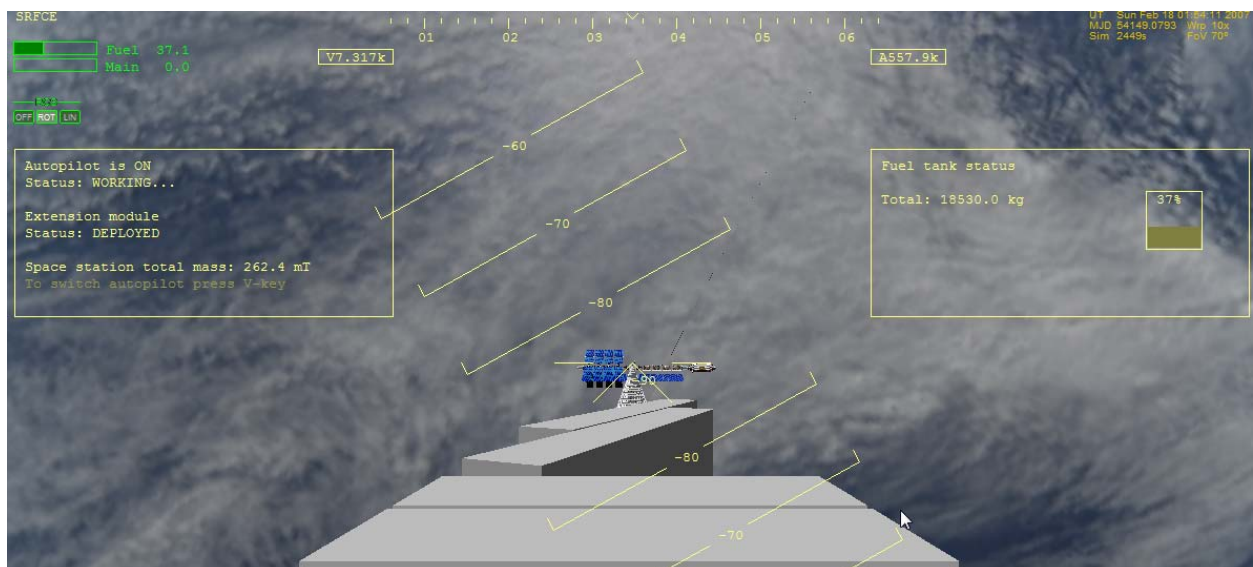
In future the Titan module will be refuelled with the space tanker using the special side docking unit.





## HUD

The Titan has a special HUD, see the picture:



On the left side the HUD shows the autopilot status, the state of module extension and total mass of whole orbital station. On the right side – the fuel tank state.

### **Keyboard interface**

In addition to the usual keyboard Orbiter combinations you can use:



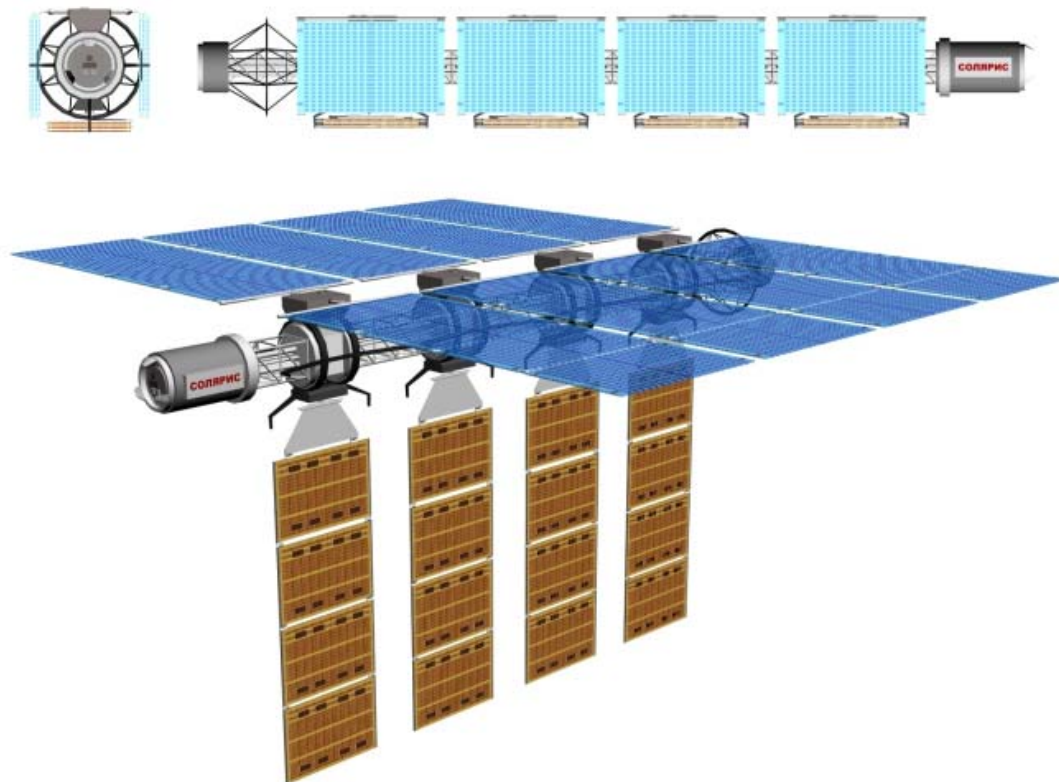
Switch the autopilot on/off

## new ! Solaris energetic module

**Solaris** is an unmanned energetic module equipped with solar arrays and radiators. Solaris has two docking port so you can build the big solar station using several modules. After deploying solar panels automatically tracks the Sun.

### Technical Specifications

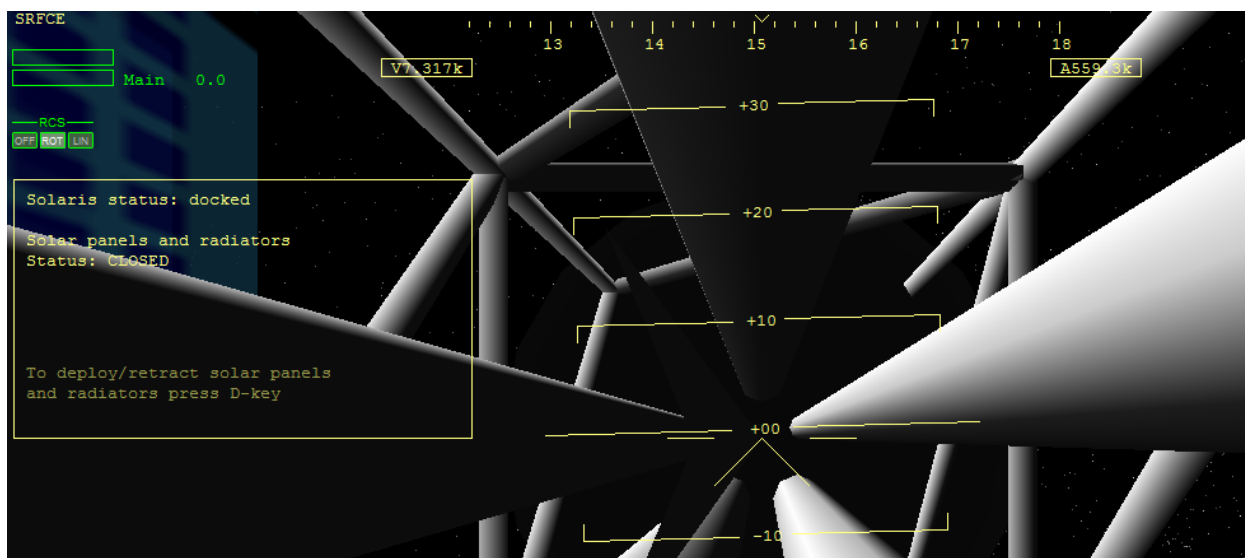
Length	32 m
Diameter	4.75 m
Diameter (deployed state)	33 m
Mass	52 mT





## HUD

The Solaris has a special HUD, see the picture:



The HUD shows the current state of solar panels and radiators.

## Keyboard interface

In addition to the usual keyboard Orbiter combinations you can use:



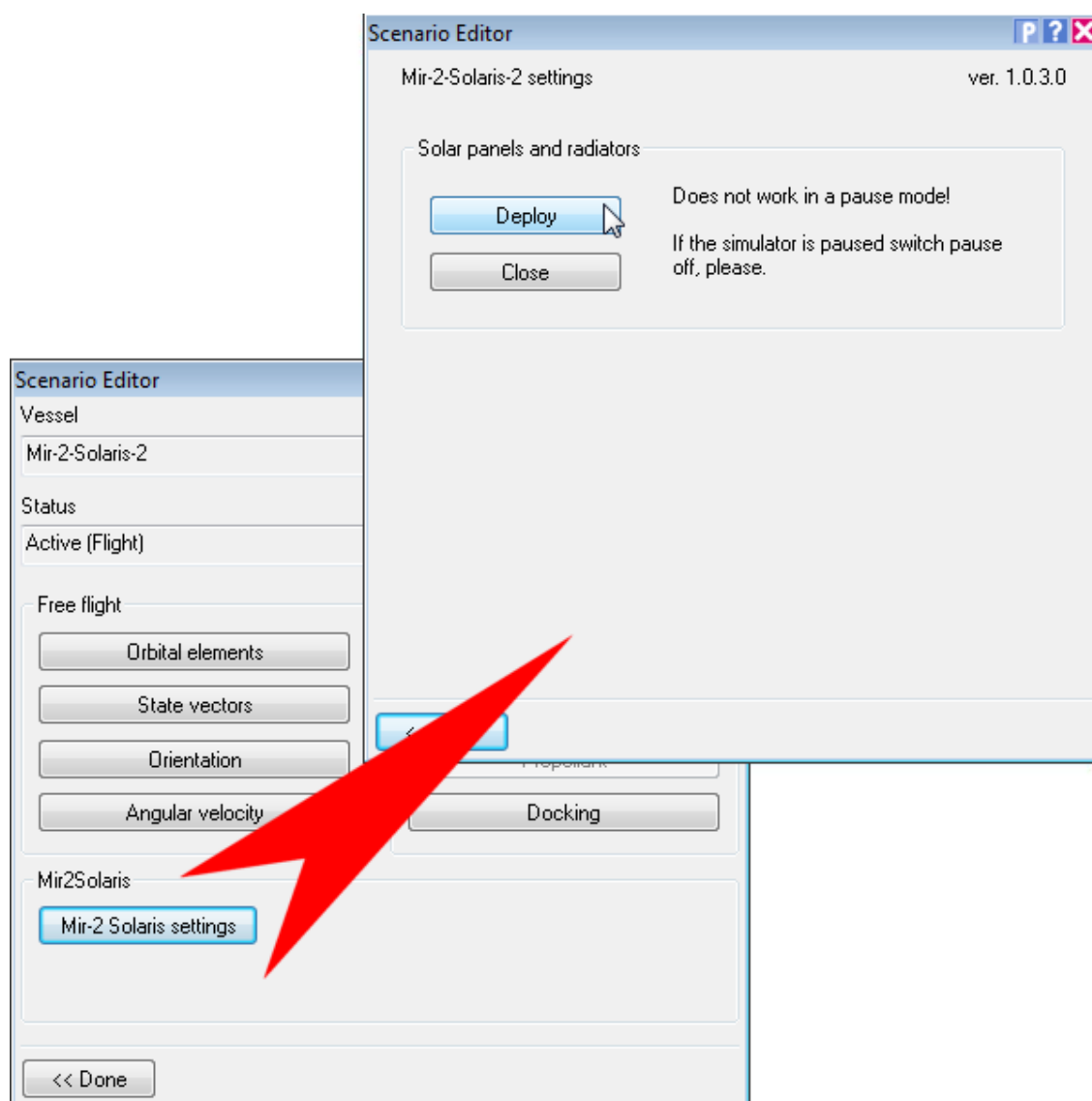
Deploy/retract solar panels and radiators



## Configuring

Solaris module can be configured with Orbiter's *Scenario Editor* (read more about Scenario Editor in *Doc\ScenarioEditor.pdf* manual).

The Solaris vessel has a special configuration page in Scenario Editor, see the picture:



Here you can set the solar panels and radiators state – to deploy click the *Deploy* button, to retract click the *Close* button.



You can change the settings instantly only if the Orbiter is not in the pause mode.

## new ! Builder module

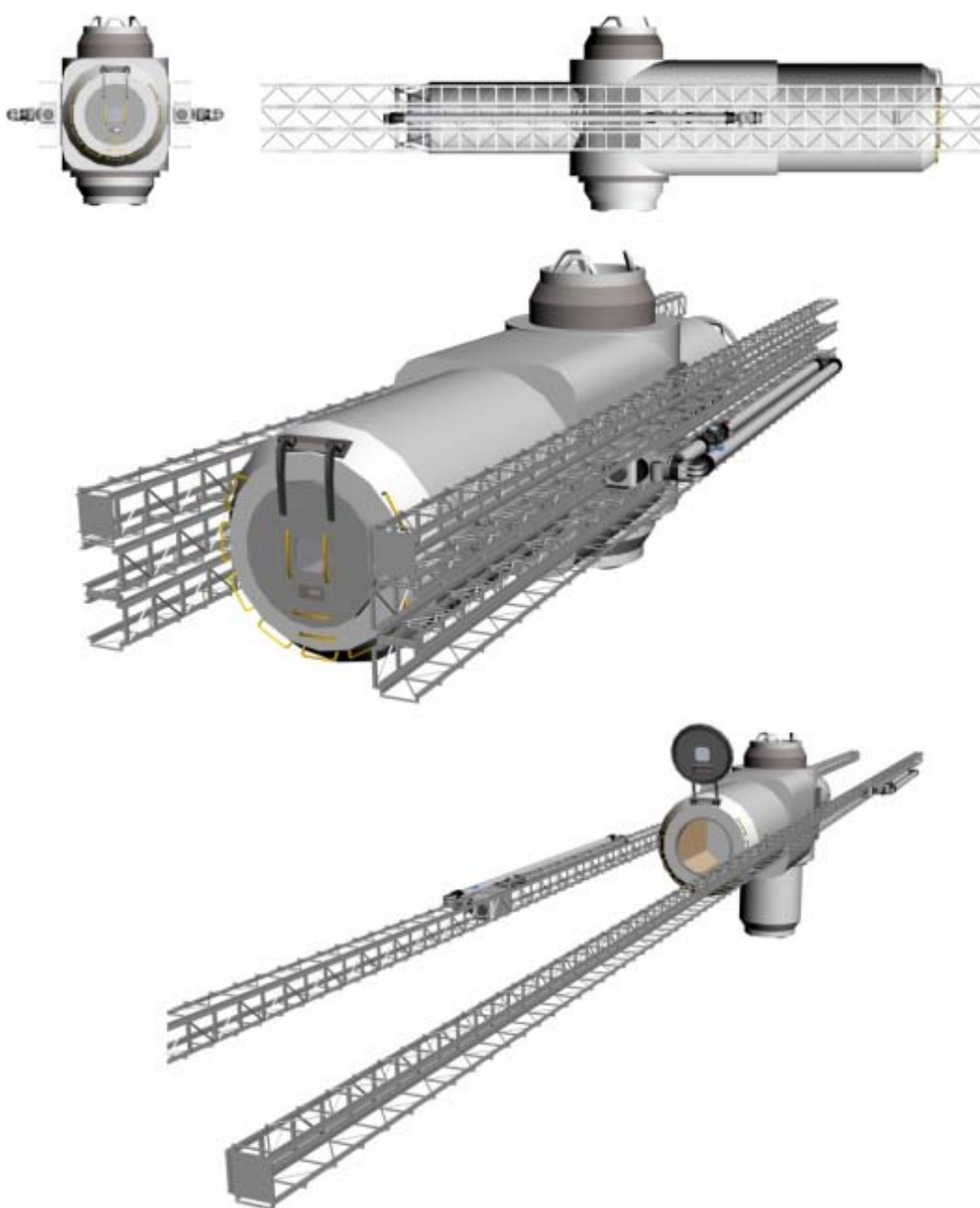
**Builder** is a special module for station building. This module has a *crane* – special rotating part with two rail-based manipulators. Using Builder you can grab and place another modules of orbital station.

The Builder module is UMMU-compatible (see about UMMU on Dan's Orbiter Page <http://orbiter.dansteph.com/index.php?news=149>). So you can do EVA missions.

### Technical Specifications

Length	20 m
Length (deployed state)	60 m
Diameter	5.56 m
Mass	43 mT

The RMS rails and docking port will be automatically deployed in 60 seconds after separating from last stage.



## UMMU and EVA

To start the EVA mission firstly open the airlock (**A**-key). Select the crew member for EVA (see on HUD and press **1** and **2** keys). Start EVA mission by pressing **E**-key.

## Using crane and RMS

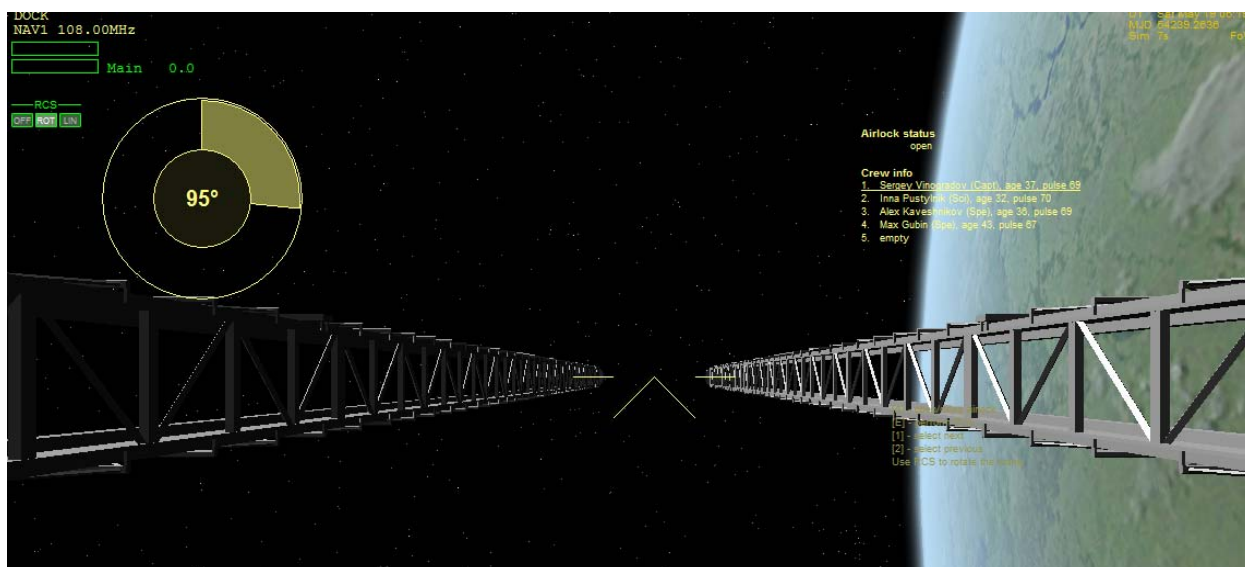
Builder has two RMS. Actually it are a URMS – the separate addon. You can download URMS from here: <http://www.orbithangar.com/searchid.php?ID=3373>

Each RMS is a separate vessel so you should switch focus to it to control it (use **F3**). How to control the manipulator see the manual for URMS addon.

To rotate the crane use the usual yaw-channel of RCS. Yaw-left rotates crane to left, yaw-right – to right. Use the numeric keypad (**1** and **3**) or joystick.

## HUD

The Builder has a special HUD, see the picture:



At left part you can see the crane state indicator, at right – airlock state and crew info.

## Keyboard interface

In addition to the usual keyboard Orbiter combinations you can use:

- A** Open/close the airlock
- E** Start EVA mission
- 1** Select next crew member for EVA
- 2** Select previous crew member for EVA

## Joystick interface

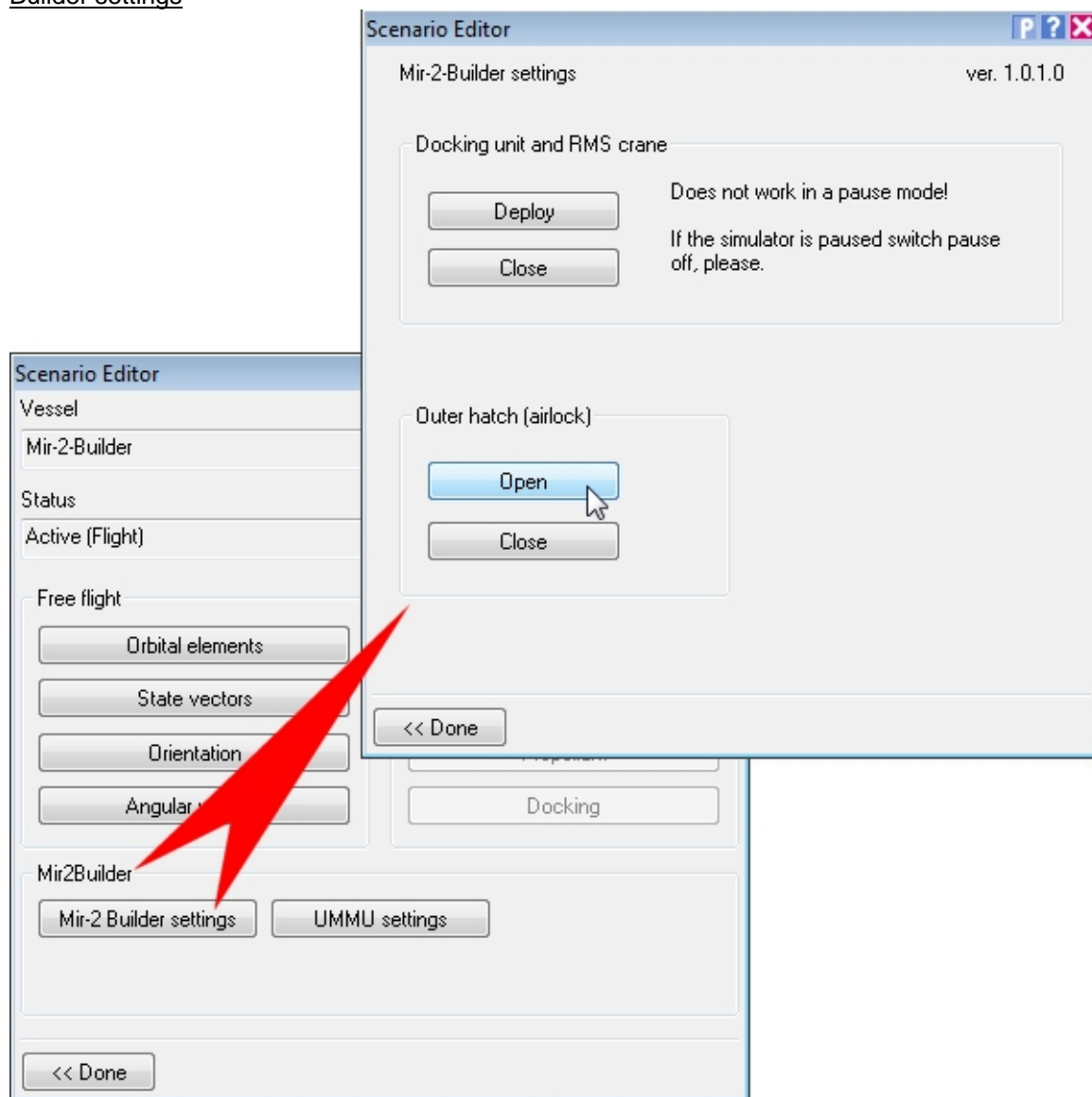
You can use joystick to rotate the crane (yaw-channel).

## Configuring

Builder module can be configured with Orbiter's *Scenario Editor* (read more about Scenario Editor in *Doc\ScenarioEditor.pdf* manual).

The Builder vessel has two special configuration pages in Scenario Editor:

### Builder settings



Here you can set the state of docking port and RMS crane – to deploy click the *Deploy* button, to retract click the *Close* button.

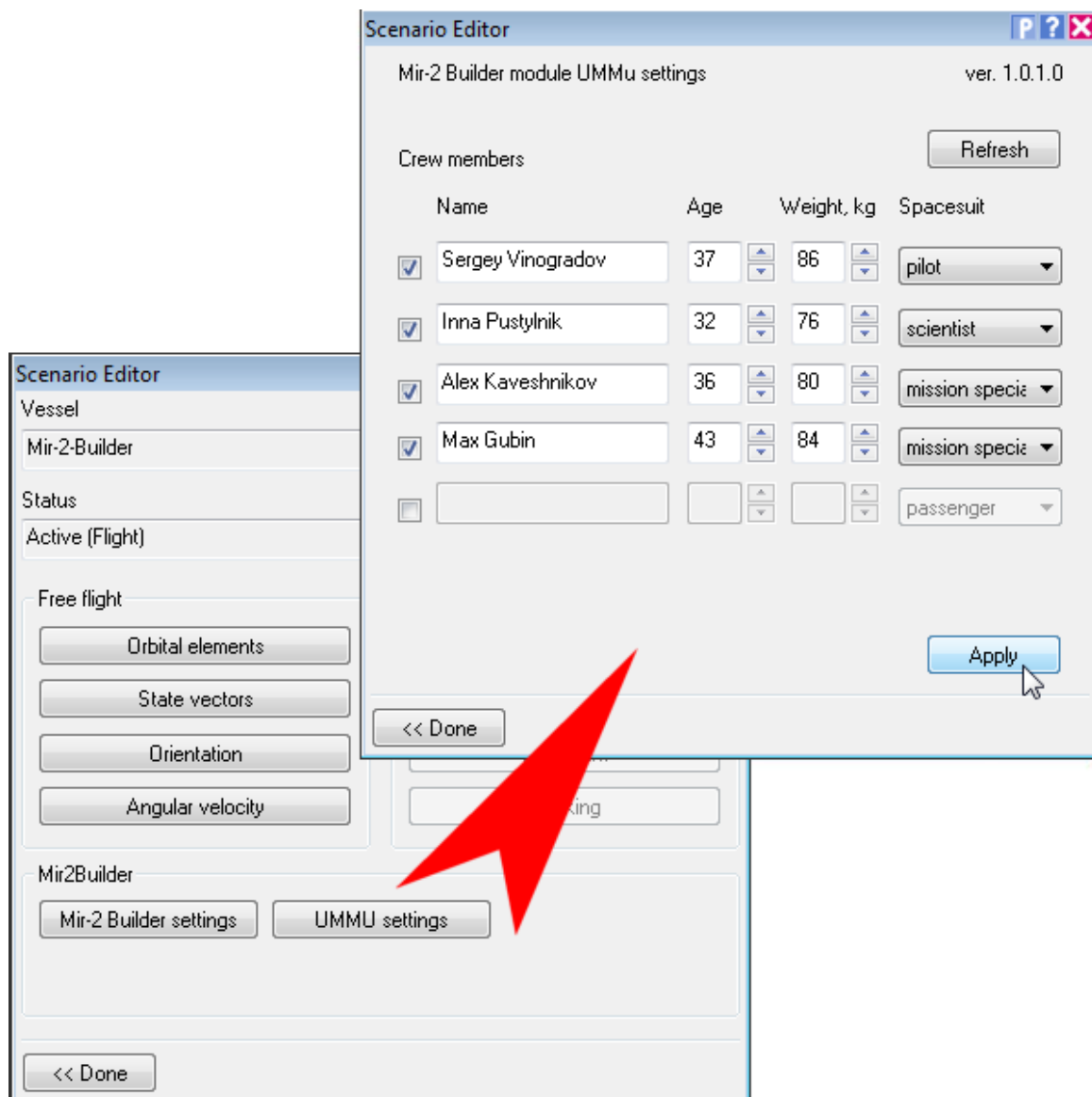


You can change the settings instantly only if the Orbiter is not in the pause mode.

Also you can set the state of outer hatch – click *Open* or *Close* button in *Outer hatch (airlock)* section.

### UMMU settings

Here you can define crew members for EVA missions. *Refresh* button allows you to take the current settings. If you change something click *Apply* button to send new settings into simulation.



## new ! Node module

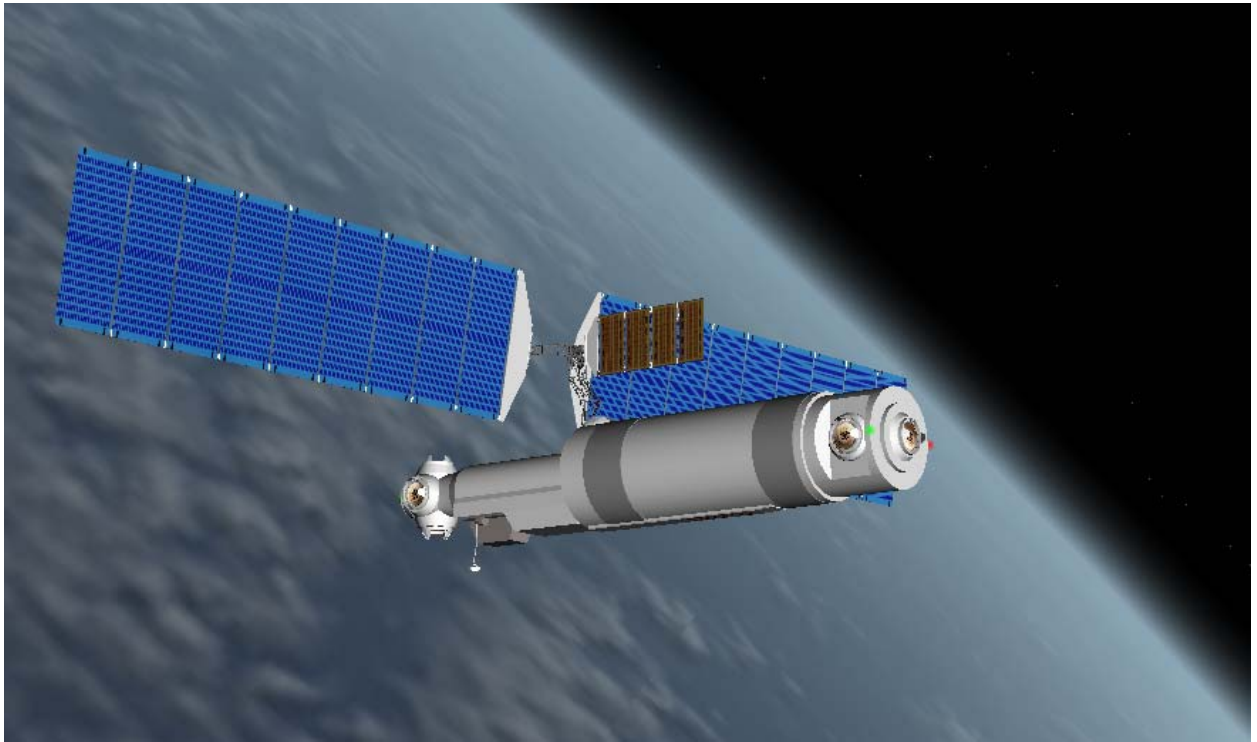
**Node** is a simple module with five docking ports. You can use it to build more complex structures.

### Technical Specifications

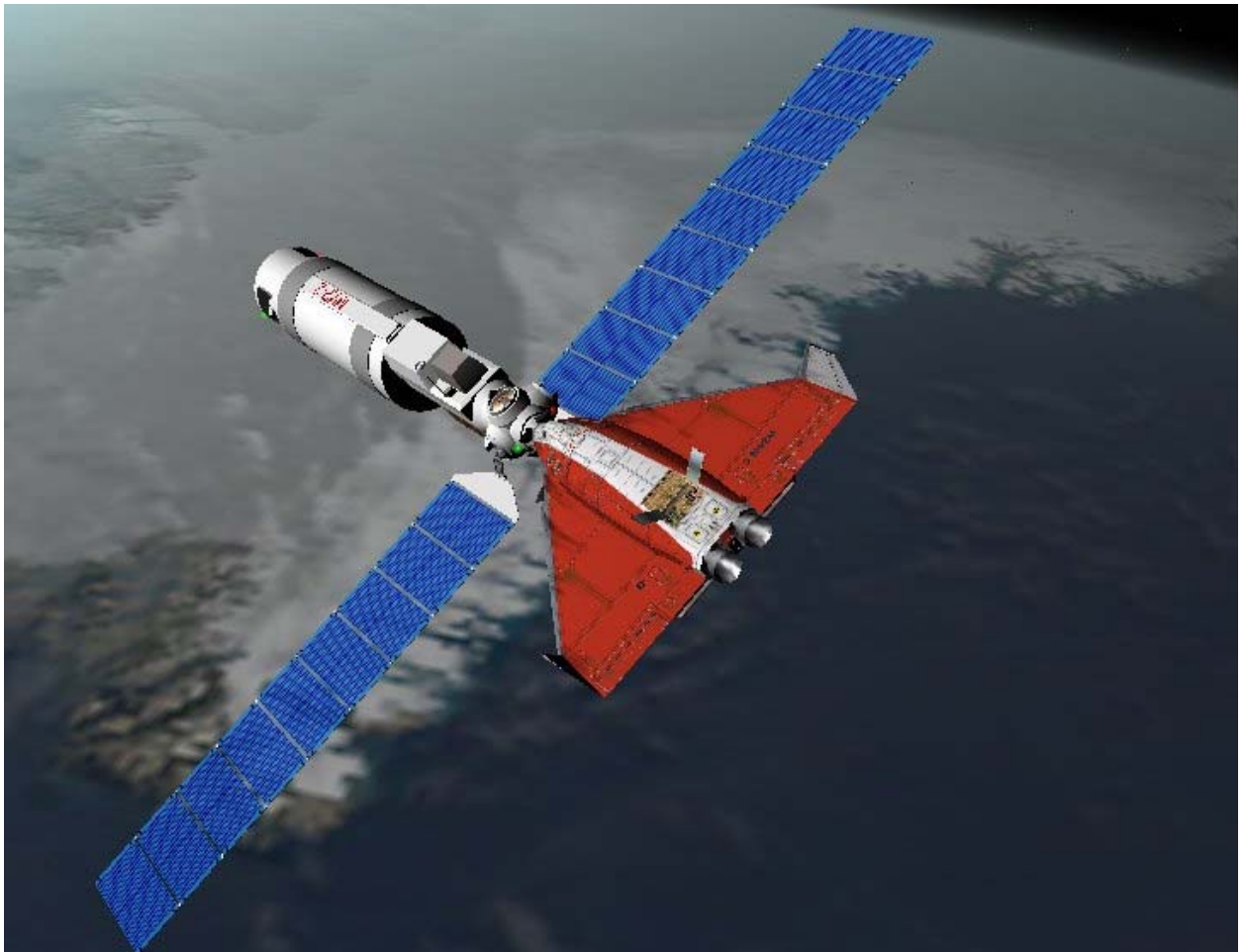
Length	14.9 m
Diameter	5.7 m
Mass	25.5 mT



## Screenshots



Mir-2 core module deployed at the orbit



The first manned mission

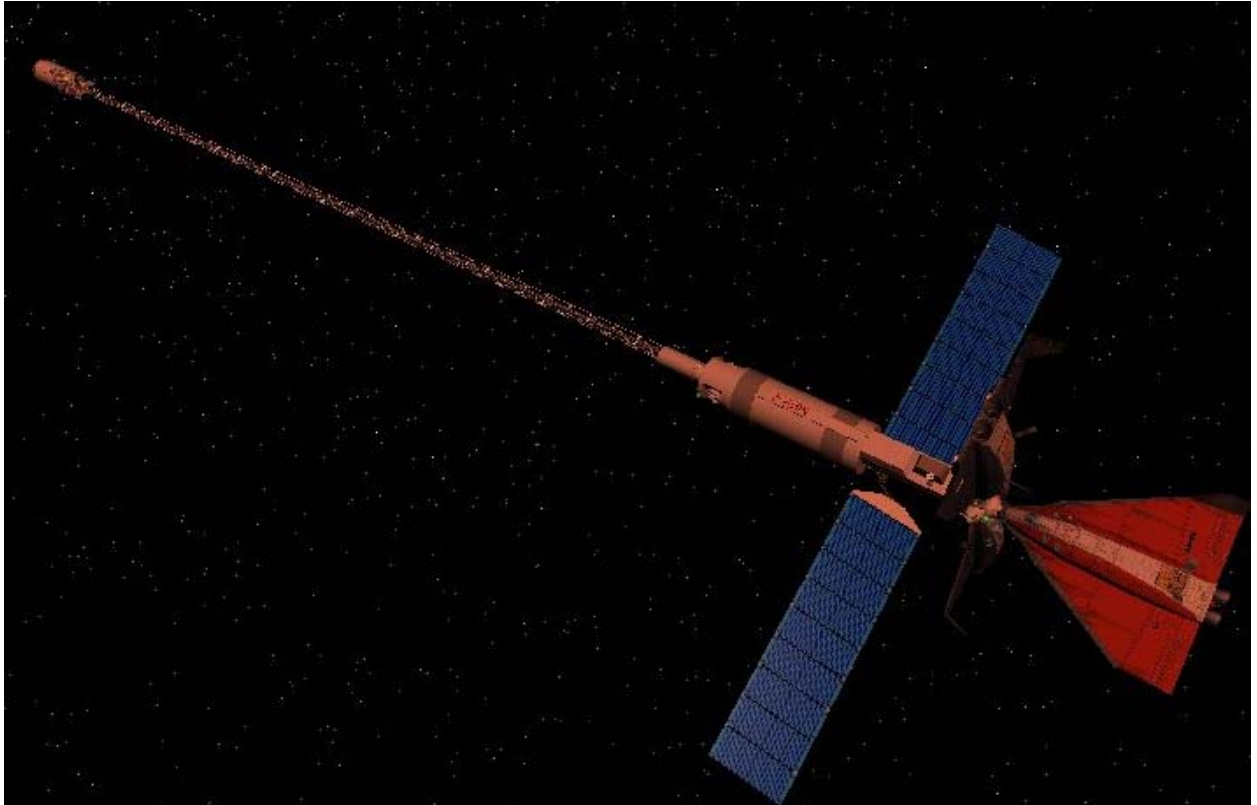




The first and second manned missions. Waiting for Titan module



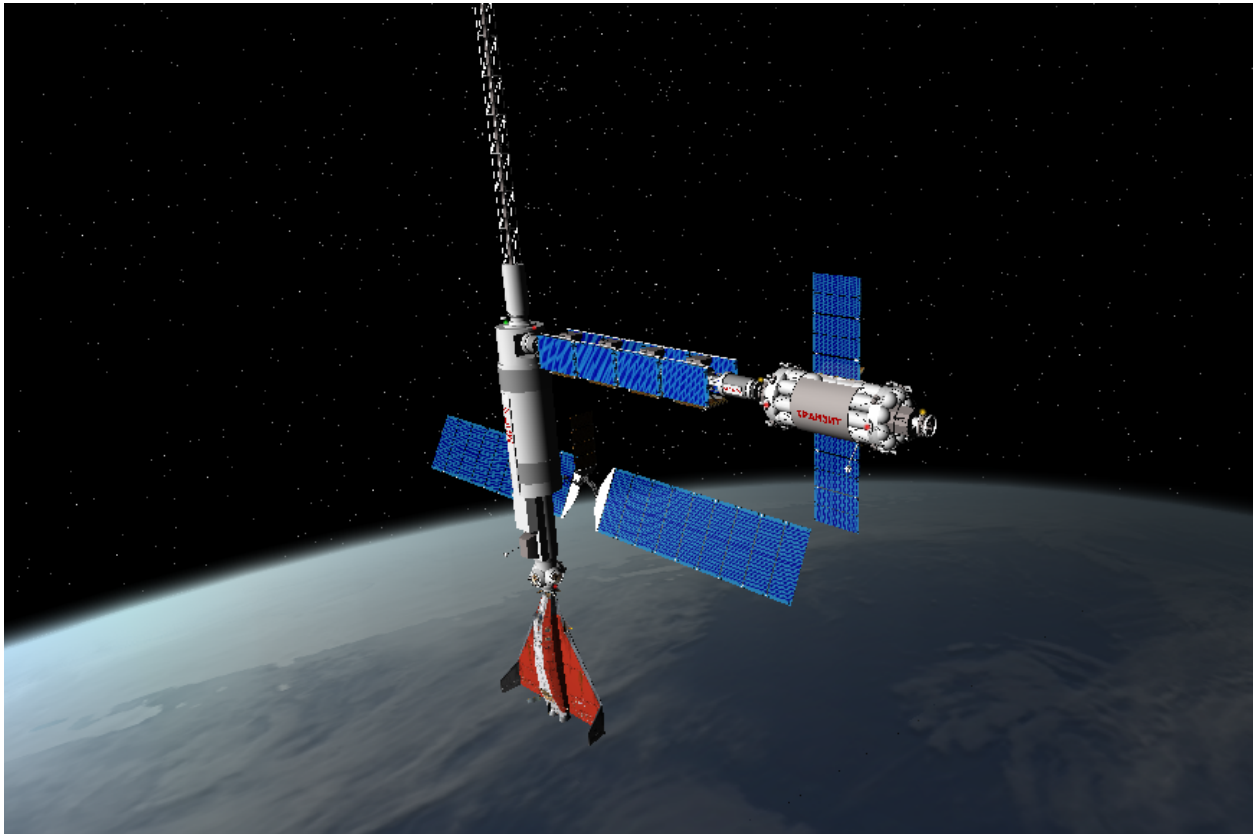
Launching the Titan module



Titan module is docked and deployed



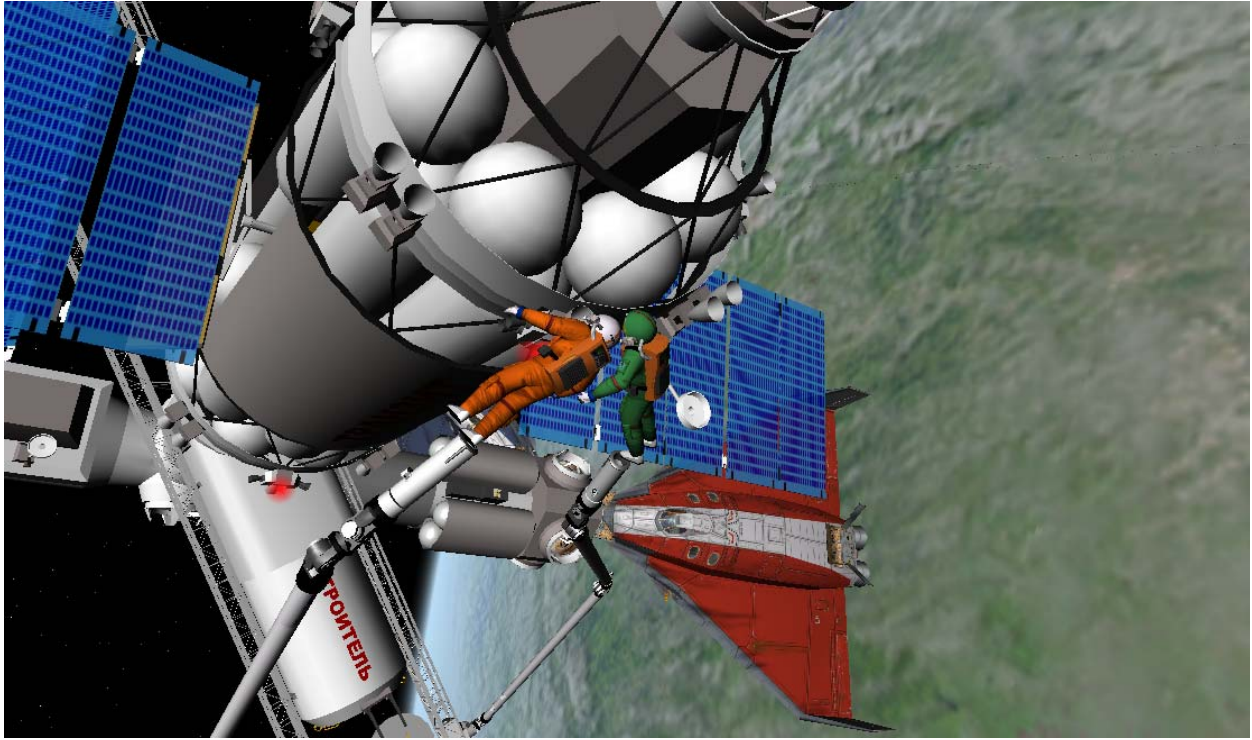
The Mir-2 station in automatically oriented flight



Soaris-1 docked by Tranzit



Mir-2 orbital station complete



EVA mission