User Guide

Mars Simulation Project

Version 3.06

http://mars-sim.sourceforge.net

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The Mars Simulation Project is a free software Java project to create a simulation of future human settlement of Mars.

User Interface

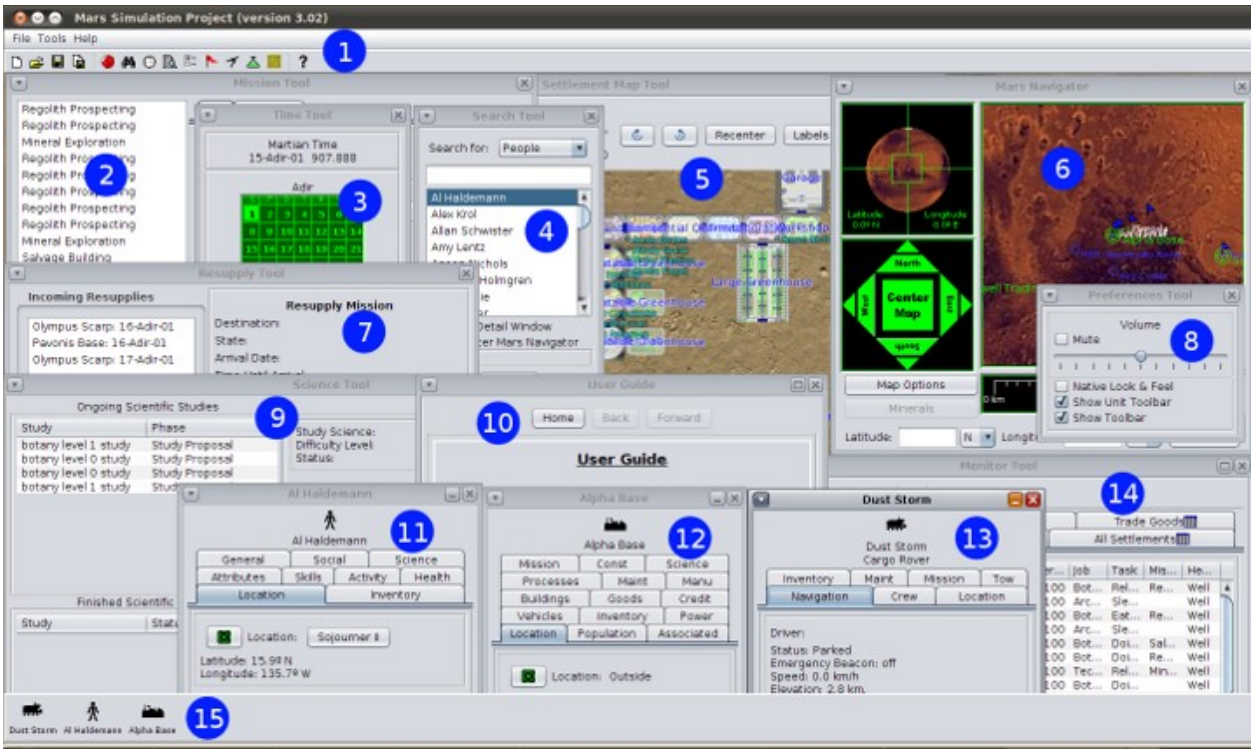


Illustration 1: Main Window

1. Menu Bar
2. Mission Tool
3. Time Tool
4. Search Tool
5. Settlement Map Tool
6. Mars Navigator Tool
7. Resupply Tool
8. Preferences Tool
9. Science Tool
10. User Guide
11. Person Info Window
12. Settlement Info Window
13. Vehicle Info Window
14. Monitor Tool
15. Unit Bar

Menu Bar

Illustration 2: Menu Bar

The menu bar has the following commands:

File

New - Creates and starts a new simulation. Opens the Simulation Configuration Editor dialog.
Load - Loads a simulation from a save file chosen by the user.
Save - Saves the current simulation to the default save file.

Save As - Saves the current simulation to a save file chosen by the user.

Exit - Closes the Mars Simulation Project.

Tools

Mars Navigator – Check box opens or closes the Mars Navigator tool.

Search Tool – Check box opens or closes the Search tool.

Time Tool – Check box opens and closes the Time tool.

Monitor Tool – Check box opens and closes the Monitor tool.

Preferences Tool – Check box opens and closes the Preferences tool.

Mission Tool – Check box opens and closes the Mission tool.

Settlement Map Tool – Check box opens and closes the Settlement Map tool.

Science Tool – Check box opens and closes the Science tool.

Resupply Tool – Check box opens and closes the Resupply tool.

Help

About - Opens a dialog window with information about the project, credits and license info.

Tutorial - Shows a step-by-step tutorial for first time users.

User Guide - Opens this User Guide window.

The buttons on the menu bar perform the following actions:

File Buttons

New - Creates and starts a new simulation. Opens the Simulation Configuration Editor dialog.

Load - Loads a simulation from a save file chosen by the user.

Save - Saves the current simulation to the default save file.

Save As - Saves the current simulation to a save file chosen by the user.

Tool Buttons

Mars Navigator Tool - Opens the Mars Navigator tool.

Search Tool - Opens the Search tool.

Time Tool - Opens the Time tool.

Monitor Tool - Opens the Monitor tool.

Preferences Tool – Opens the Preferences tool.

Mission Tool - Opens the Mission tool.

Settlement Map Tool – Opens the Settlement Map tool.

Science Tool – Opens the Science tool.

Resupply Tool – Opens the Resupply tool.

Other Buttons

User Guide - Opens this User Guide window.

Simulation Configuration Editor

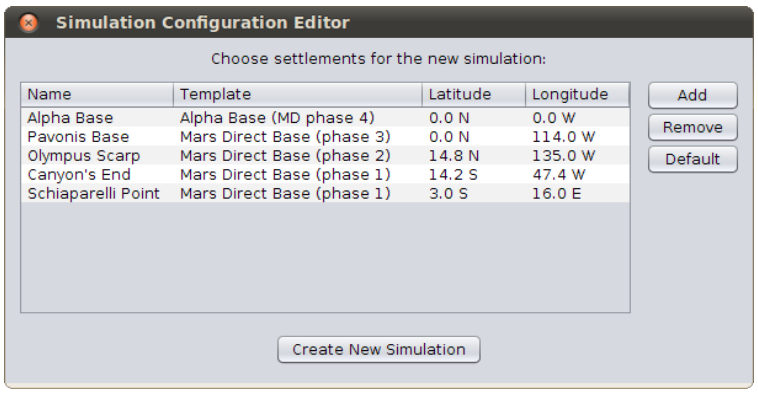


Illustration 3: Simulation Configuration Editor

The Simulation Configuration Editor allows you to configure a new simulation before it's created and started.

The dialog has a table of settlements to be created in the new simulation. The table is initially populated with a default set of settlements.

The settlement table shows the settlement's name, template, latitude and longitude. Each of these fields can edited by clicking or double clicking on them.

If a field is changed to an invalid value, a red error message appears below the table and the Create New Simulation button is disabled until it is fixed.

The Add button will add a new settlement with a random configuration to the table.

The Remove button will remove any selected settlements from the table.

The Default button will reset the default settlements on the table, clearing any changes.

The Create New Simulation button will close the dialog, create and start a new simulation with the configured settlements.

Mission Tool

The Mission tool displays information about current missions and allows the user to create, modify and delete missions.

The left mission list shows all current missions in the simulation. The user can select a mission and its information will be displayed in the right panel.

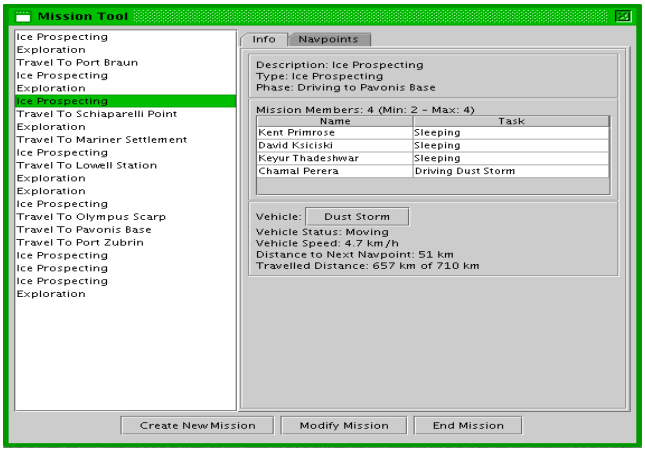


Illustration 4: Mission Tool - Info Tab

The Info tab panel shows text information about the selected mission.

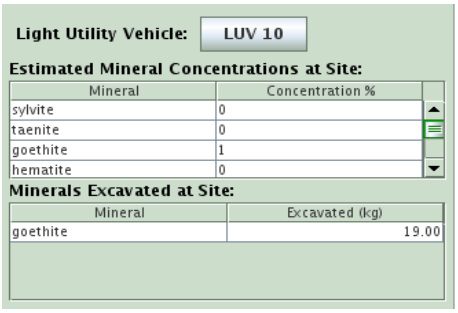
The top box shows the mission description, type, and current phase.

The middle box shows the current number of mission members, as well as the minimum and maximum allowed for the mission. There's a list of the names of mission members and the tasks they're currently performing. If the user clicks on a member in the list, the person's info window will open.

The bottom box shows a button name of the vehicle used in the mission. If the user clicks on the button, the vehicle info window will open. Below that the vehicle's current status and speed are displayed as well as the distance to the next NAV point as well as the total distance traveled.

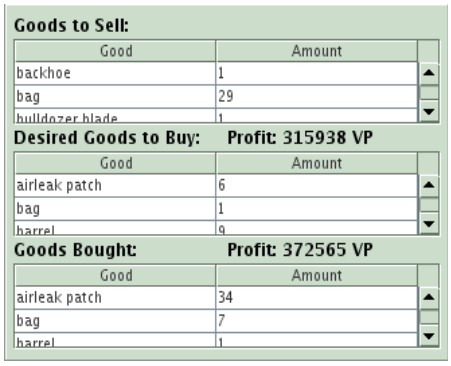
Some types of missions will display additional information when selected.

The mining mission displays the a button for the light utility vehicle used for excavation on the mission. It displays a table showing the estimated minerals at the mining site, and a table showing the minerals that have been collected during the mission.



The trade mission displays tables showing the goods that are taken to be sold to the trading settlement, the goods that trader hopes to buy, and the goods that are actually bought from the trading settlement once the trade is negotiated.

The estimated trade profit for the starting settlement, as well as its actual negotiated trade profit, are displayed above the relevant tables in units of value points.



The construction mission displays the current construction stage with a progress bar showing its progress towards completion.

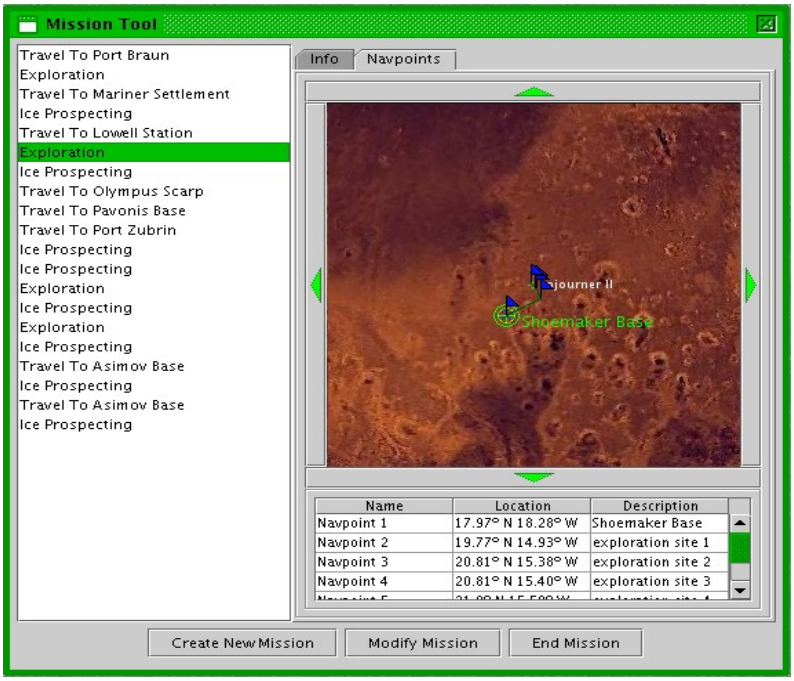


Illustration 5: Mission Tool - NAV points tab

The Navpoints tab panel shows information about the mission's NAV point destinations.

The mission NAV points are marked by blue flags on the map. Directional arrow buttons on the edges of the map will recenter the map to their respective direction. Below the map is a list of the mission's NAV points. If a mission on the list is selected, the map is re centered on that NAV point.

The buttons at the bottom of the mission tool:

Create New Mission - This button will pause the simulation and open the create new mission wizard.

Modify Mission - This button will pause the simulation and open the edit mission dialog (see below) for the selected mission.

End Mission - This button will end the selected mission. If the mission is currently outside a settlement, the vehicle's emergency beacon will bet turned on.

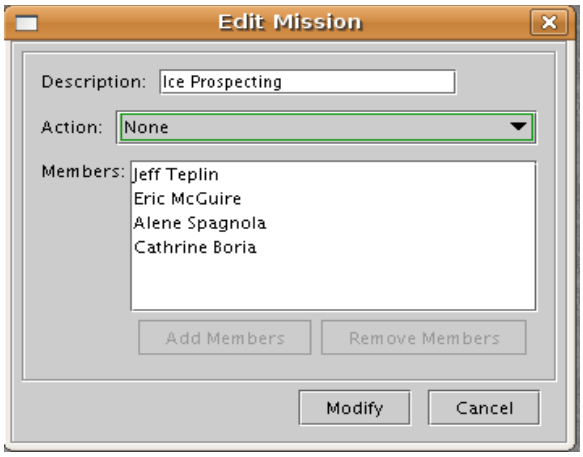


Illustration 6: Edit Mission Dialog

The Edit Mission dialog allows the user to edit a current mission.

The mission description text can be edited at the top.

The action drop down has one or more of the following actions that can be taken, based on the mission's current situation:

- None - No action will be taken (default).
- End EVA and Continue to Next Site - The mission will end the current extra vehicular activity and, once all the mission members are back on-board the rover, continue on to the next NAV point site.
- Return to Home Settlement and End Mission - The mission will return back to its home settlement and disembark.
- Go to Nearest Settlement and End Mission - The mission will travel to the nearest settlement and disembark.

The members table lists all current mission members.

If there are people at the mission's current location who can be added as members, the Add Members button is enabled. Pressing the Add Members button will open a dialog listing available people to add to the mission. One or more can be selected from the list and added to the mission.

The Remove Members button will remove any members selected in the members list from the mission. If the mission is currently at a settlement, the removed members will remain at the settlement. If the mission is currently away from a settlement, the removed members will remain in the rover, but will not be a part of the mission. If all mission members are removed, the mission will end and the rover emergency beacon will be turned on if the mission is away from a settlement.

The Modify button at the bottom of the Edit Mission dialog will close the dialog,

commit any changes made to the mission and unpause the simulation.

The Cancel button at the bottom of the Edit Mission dialog will close the dialog, not make any changes to the mission and unpause the simulation.

Create Mission Wizard

The create new mission wizard allows the user to create new missions.

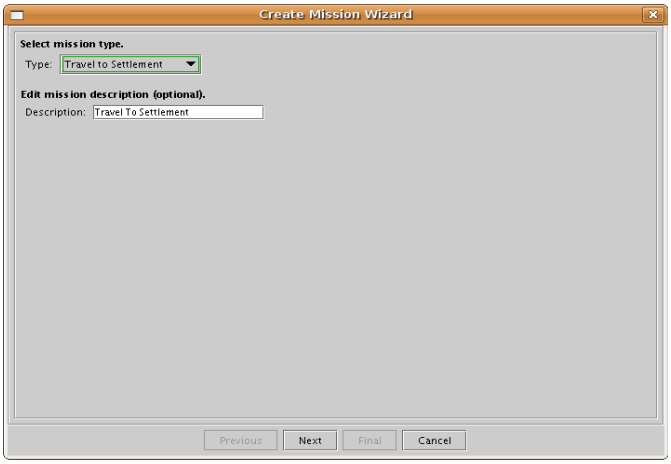


Illustration 7: Create Mission Wizard - First Panel

The first panel allows the user to select the type of mission from the following options:

- **Travel To Settlement** - A rover mission to travel from one settlement to another.
- **Mineral Exploration** - A rover mission to travel to and explore one or more sites and collect rock samples.
- **Ice Prospecting** - A rover mission to travel to a site and collect permafrost ice.
- **Regolith Prospecting** - A rover mission to travel to a site and collect mineral-rich regolith.
- **Areology Study Field Mission** - A rover mission to study a field site for areology research on a specific scientific study.
- **Biology Study Field Mission** - A rover mission to study a field site for biology research on a specific scientific study.
- **Rescue/Salvage Vehicle** - A rover mission to rescue or salvage a vehicle with its emergency beacon activated.
- **Trade** - A rover mission to travel to a nearby settlement and trade goods.
- **Mining** - A rover mission to mine at a nearby explored site.

- **Building Construction** – A mission to construct a stage of a building.
- **Building Salvage** – A mission to salvage a stage of a building.
- **Emergency Supply Mission** – A mission to deliver emergency supplies to a settlement.

The mission description defaults to the selected mission type, but can be edited by the user.

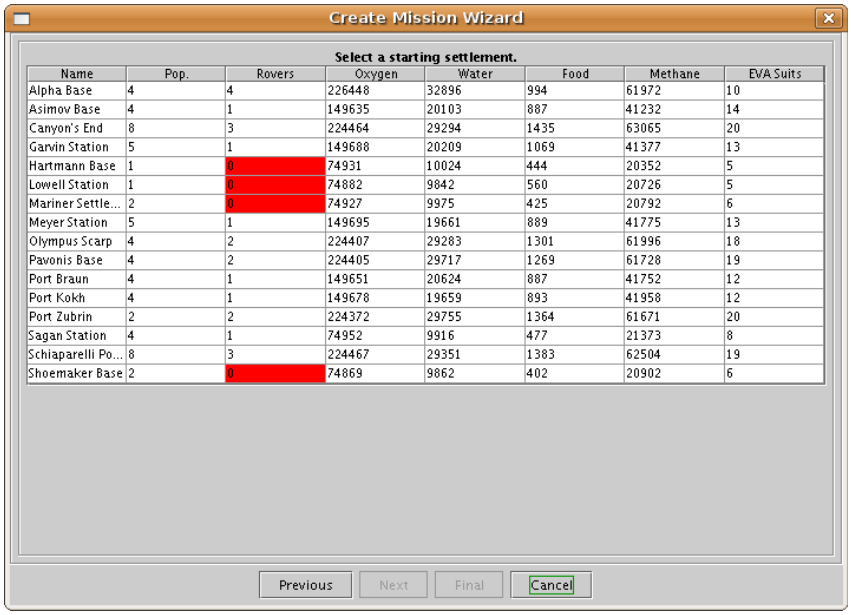


Illustration 8: Create Mission Wizard - Select a Starting Settlement

The select starting settlement panel allows the user to select a starting settlement for the mission from a list of all the settlements in the simulation. Settlement rows with one or more red cells cannot be selected as starting settlements.

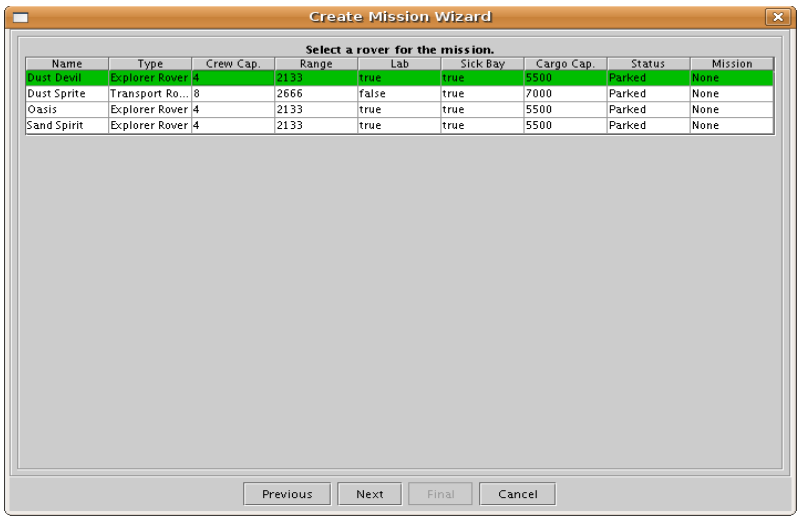


Illustration 9: Create Mission Wizard - Select a Rover

The select rover panel allows the user to select a rover for the mission from a list of rovers at the starting settlement. Rover rows with one or more red cells cannot be selected for the mission.

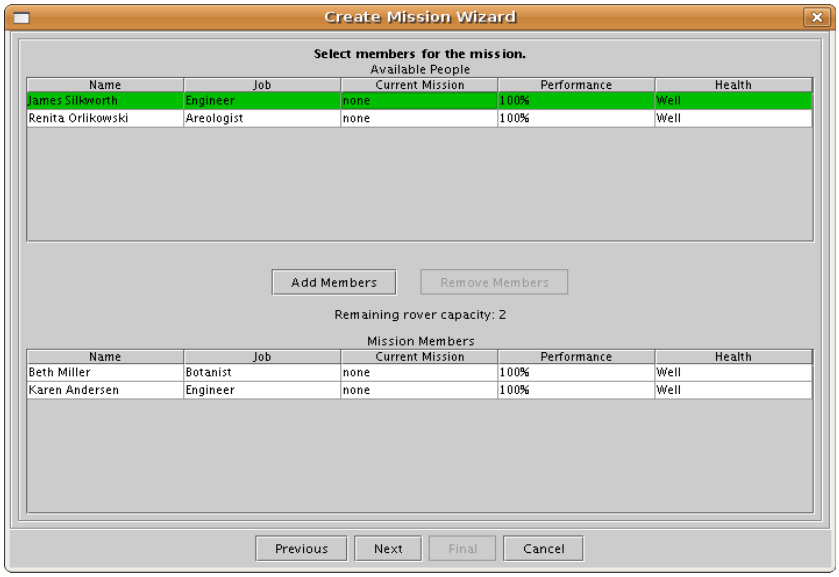


Illustration 10: Create Mission Wizard - Select Mission Members

The select members panel allows the user to select a group of members participating in the mission from a list of people at the starting settlement.

One or more people can be selected from the Available People list and added to the Mission Members list by clicking the Add Members button. Any people rows in the Available People list with red cells cannot be added to the mission.

Remaining rover capacity is displayed above the Mission Members list. This capacity limits the number of available people who can be added to the mission.

One or more people in the Mission Members can be selected and removed as members by clicking the Remove Members button.

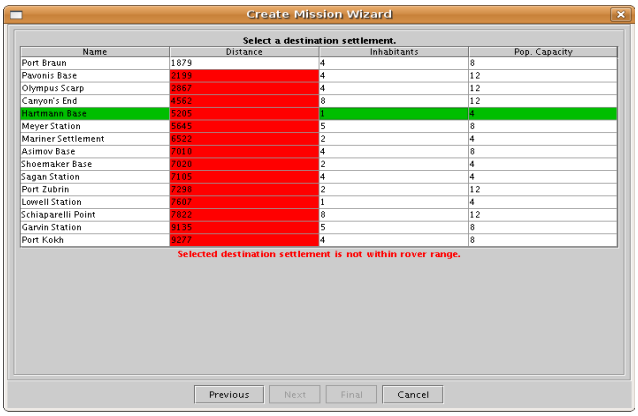


Illustration 11: Create Mission Wizard - Select a Destination Settlement

The select destination settlement panel is the final panel when creating a Travel to Settlement mission or a Trade mission. It allows the user to select a destination settlement for the mission.

The user can select a destination settlement from the list of settlements that are ordered by distance from the mission's starting settlement. Settlement rows with red cells cannot be selected as destination settlements.

If no settlements are selectable as a destination, the user may wish to go back and select if different starting settlement or a mission rover with greater range.

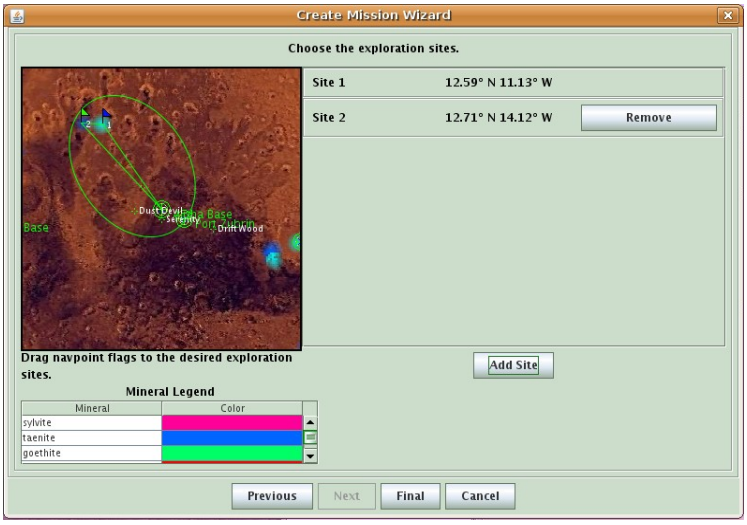


Illustration 12: Create Mission Wizard - Choose Exploration Sites

The choose exploration sites panel is the final panel when creating an Exploration mission. It allows the user to choose one or more exploration sites for the mission.

The user can click on the blue NAV point flag at an exploration site and drag it to move the location of the site. A green ellipse shows the range boundary of where the NAV point can be dragged.

The Add Site button will add a new exploration site to the mission at a default location. The new site will be added to the list of exploration sites and a blue NAV point flag will be added to the map.

Additional exploration sites can be removed from the exploration site list with the Remove button.

Mineral concentrations are displayed as colored patches on the map. The mineral legend below the map shows what color represents which mineral.

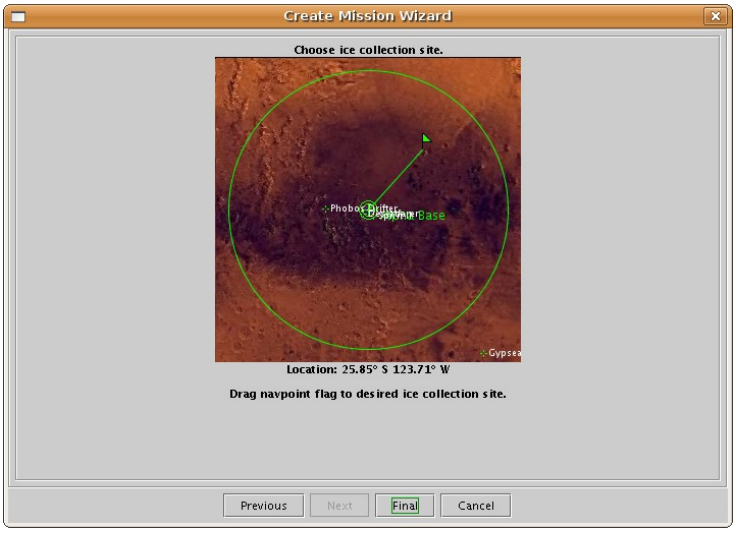


Illustration 13: Create Mission Wizard - Choose Prospecting Site

The choose prospecting sites panel is the final panel when creating an Ice Prospecting mission or a Regolith Prospecting mission. It allows the user to choose an ice prospecting site for the mission.

An ice prospecting site is created at a default location. The user can click on the blue NAV point flag and drag it to move the location of the site. A green circle shows the range boundary of where the NAV point can be dragged.

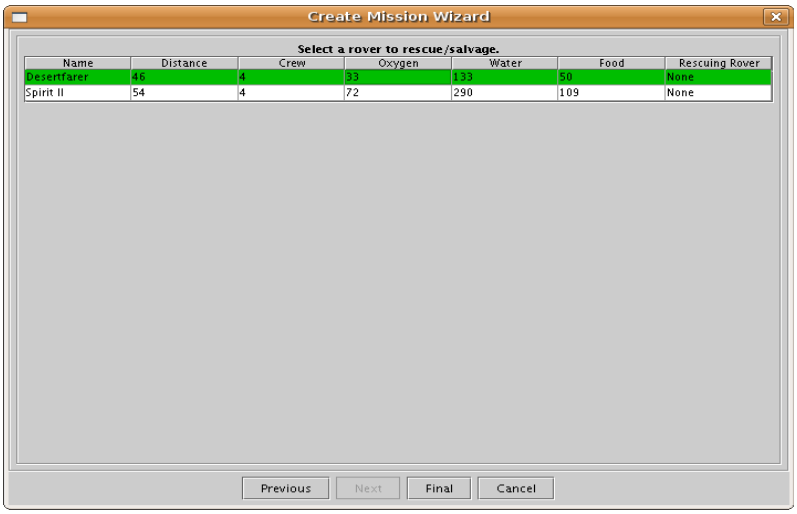


Illustration 14: Create Mission Wizard - Select Rescue/Salvage Rover

The select rover to rescue/salvage panel is the final panel when creating a Rescue/Salvage Vehicle mission. It allows the user to select a rover to be rescued/salvaged for the mission.

The user can select the rover from the list of rovers in the simulation that have their emergency beacons activated. Rover rows with red cells cannot be selected.

If there are no rescue/salvage rovers available, the user may wish to go back and select a different starting settlement or a mission rover with greater range. If there are no rescue/salvage rovers at all in the simulation, the user may wish to end a nearby mission in the Mission tool so that it can be rescued.

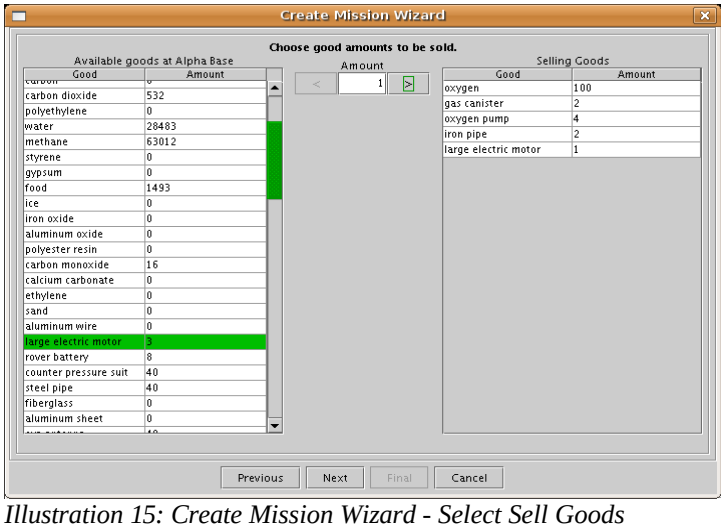


Illustration 15: Create Mission Wizard - Select Sell Goods

The select goods to sell panel lets the user determine what trade goods to sell to the destination settlement.

The user can select the trade good from the list of available goods on the left, type the number of goods in the center text field, and click the right button to add a number of goods to the sell list. The user can also select a trade good from the sell list to remove a number of them from the sell list.

Red text will display at the bottom of the panel if there is an error in the trade goods the user selected.

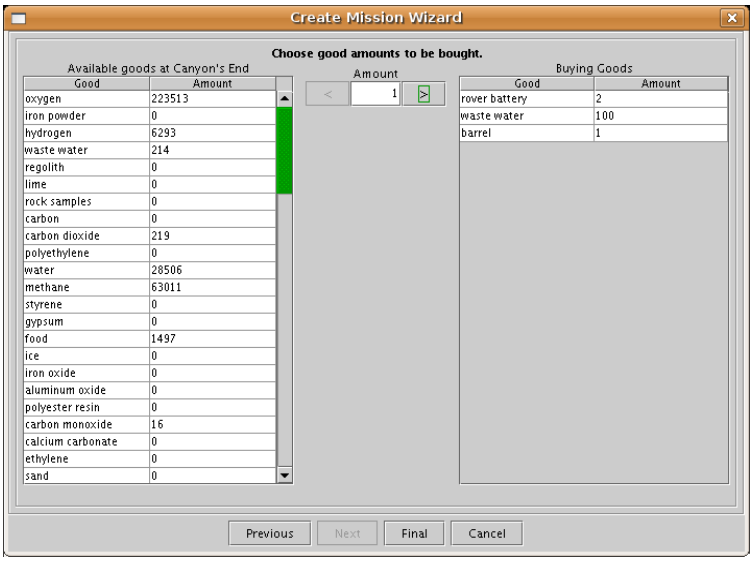


Illustration 16: Create Mission Wizard - Select Buy Goods

The select goods to buy panel lets the user determine what trade goods to buy from the destination settlement.

The user can select the trade good from the list of available goods on the left, type the number of goods in the center text field, and click the right button to add a number of goods to the buy list. The user can also select a trade good from the buy list to remove a number of them from the buy list.

Red text will display at the bottom of the panel if there is an error in the trade goods the user selected.

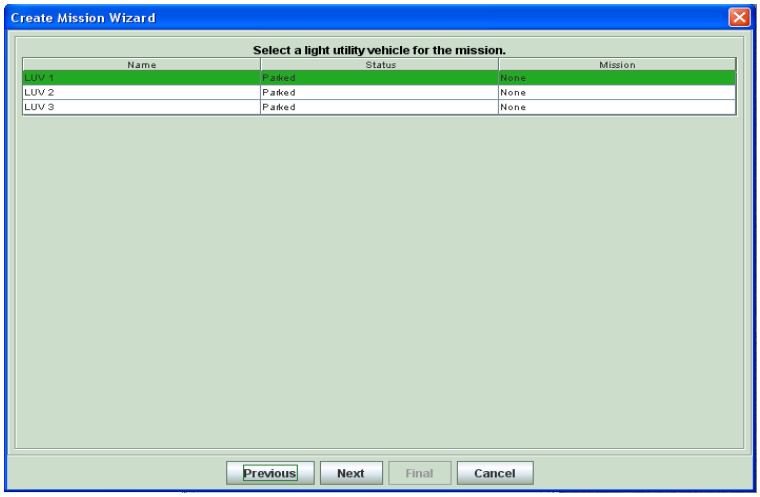


Illustration 17: Create Mission Wizard - Select Light Utility Vehicle

The select a light utility vehicle panel allows you to select a light utility for missions that require one from a list of vehicles at the starting settlement. Vehicle rows with one or more red cells cannot be selected for the mission.

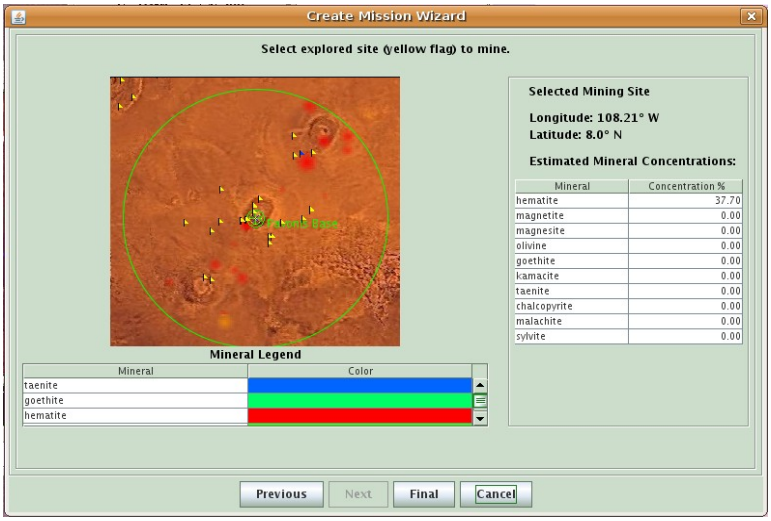


Illustration 18: Select Explored Site to Mine

The select explore site to mine panel is the final panel when creating a Mining mission. It allows you to choose an explored site near the starting settlement to mine.

You can select one of the explored sites (marked by yellow flags) within the rover's range (indicated by the green circle). When an explored site is selected, information about the site is displayed on the right, including its coordinate location and the

estimated mineral concentrations at the site.

Mineral concentrations are displayed as colored patches on the map. The mineral legend below the map shows what color represents which mineral.

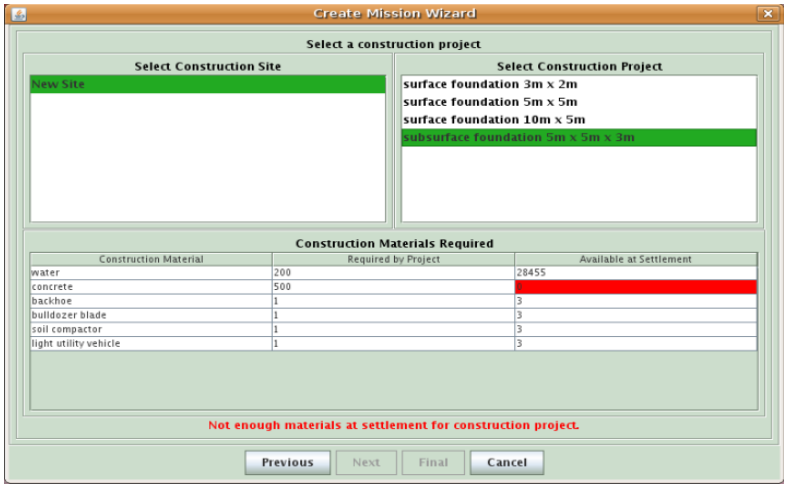


Illustration 19: Select a Construction Project

The select a construction project panel is the used for building construction missions and allows you to select a building construction stage project for the mission.

The "Select Construction Site" list at the top left allows you to select either a new or an existing construction site at the settlement. A construction site that is already being worked on is marked red and cannot be selected.

The "Select Construction Project" list in the top right allows you to select a construction project for the site. Selecting a project will provide a tool tip showing all next possible stages for the selected stage.

The "Construction Materials Required" list at the bottom shows all resources, parts and vehicles required for the construction project. If the settlement doesn't have enough of a construction material, it will show up as a red and the project cannot be selected.

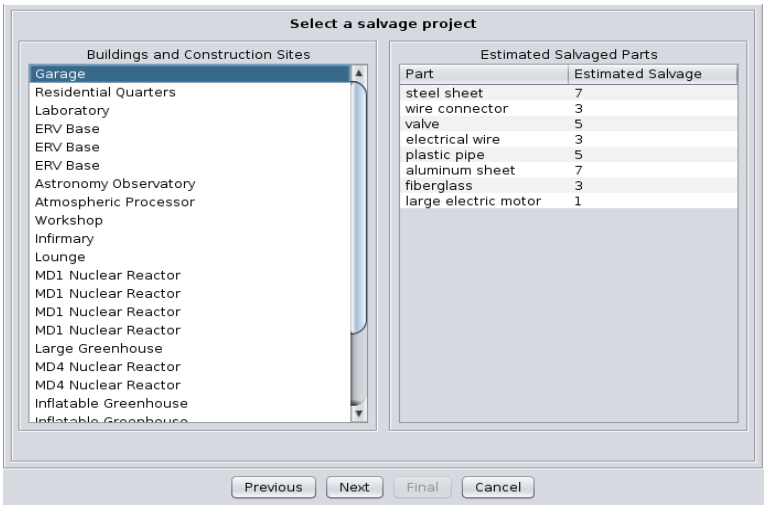


Illustration 20: Create Mission Wizard: Select A Salvage Project

The select a salvage project panel is the used for building salvage missions and allows you to select a building or a building construction stage to use as the salvage project for the mission.

The "Buildings and Construction Sites" list at the left allows you to select either a building or an existing construction site at the settlement. A construction site that is already being worked on is marked red and cannot be selected.

The "Estimated Salvaged Parts" list at the right shows the parts that are estimated to be salvaged from the stage when it is completed.

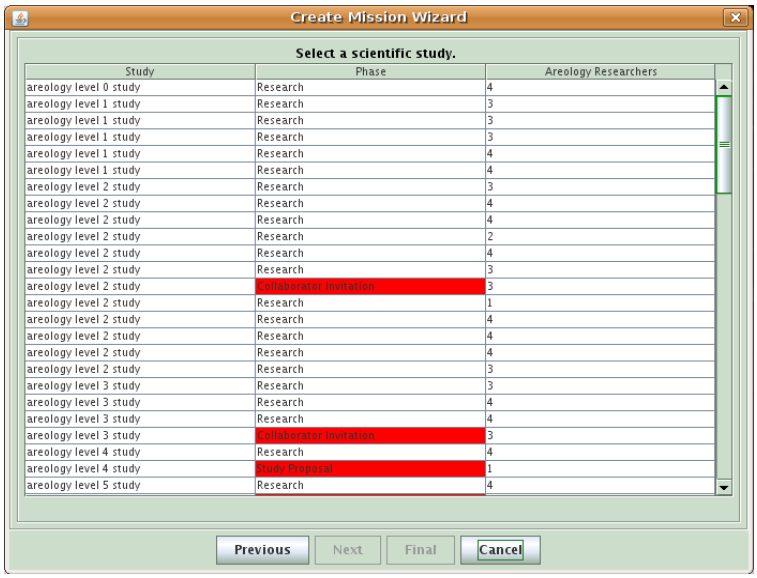


Illustration 21: Select a scientific study

The select a scientific study panel allows the user to select a scientific study for a research mission from a list of all the ongoing studies in the simulation. Studies need to be in the research phase and have a researcher in the specified scientific field of the mission to be selectable. Scientific studies with one or more red cells cannot be selected.

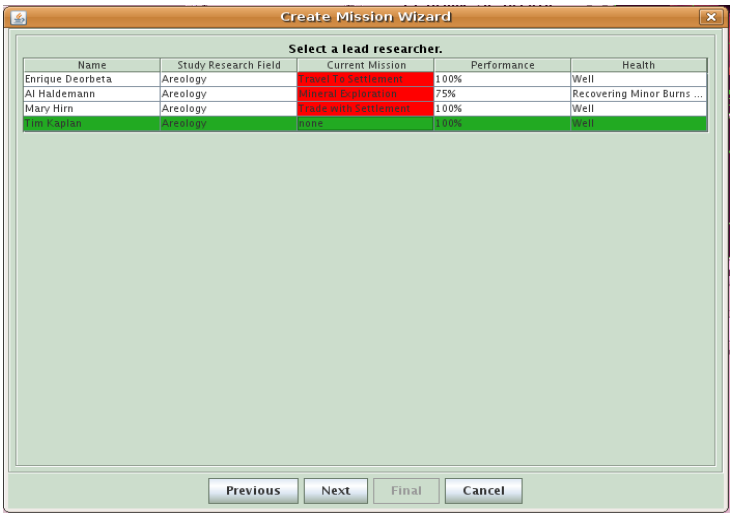


Illustration 22: Select a Lead Researcher

The select a lead researcher panel allows the user to select a lead researcher for the mission from a list of all researchers collaborating on the scientific study. Selectable lead researchers must collaborating in the field of science related to the mission and must not be already on a mission. Researchers in the table with one or more red cells cannot be selected.

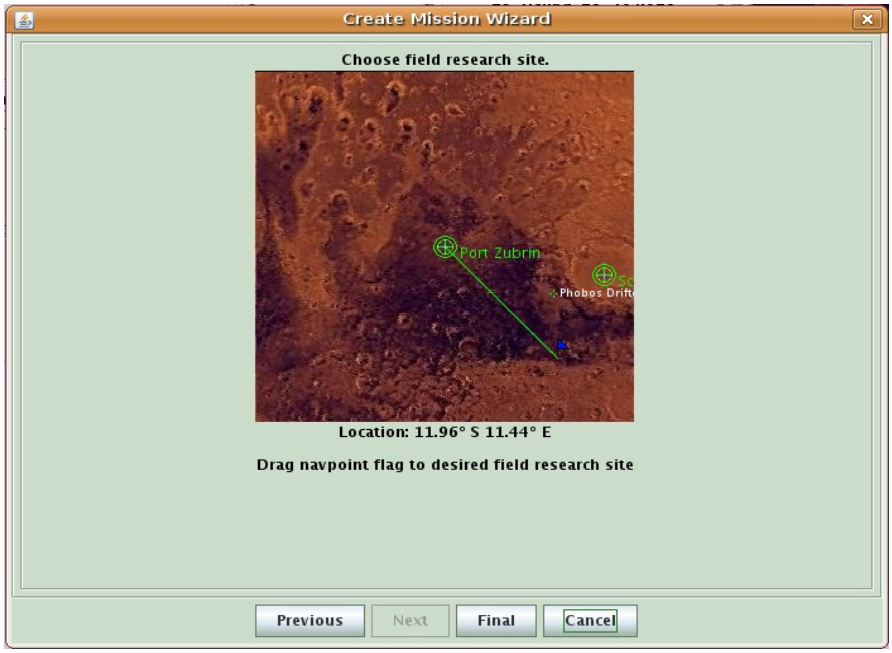


Illustration 23: Choose Field Research Site

The choose field research site panel is the final panel when creating an areology or biology field research mission. It allows the user to choose a field research site for the mission.

An field research site is created at a default location. The user can click on the blue navpoint flag and drag it to move the location of the site. A green circle shows the range boundary of where the navpoint can be dragged.

Science Tool

The Science tool displays information about ongoing and finished scientific studies.

The top left list shows all ongoing studies and their current phase of completion. Phases for a study are "Study Proposal", "Collaborator Invitation", "Research", "Writing Paper", and "Peer Review" in chronological order. You can select a study and its information will be displayed in the study details panel on the right.

The bottom left list shows all finished studies and their completion status. A study can have "Successful Completion", "Failed Completion", or "Canceled" status. Successful Completion means that the study was fully completed and passed peer review. Failed Completion means that the study was fully completed but failed peer review. Canceled means that the study was canceled before completion, perhaps due to death of the primary researcher. You can select a study and its information will be displayed in the

study details panel on the right.

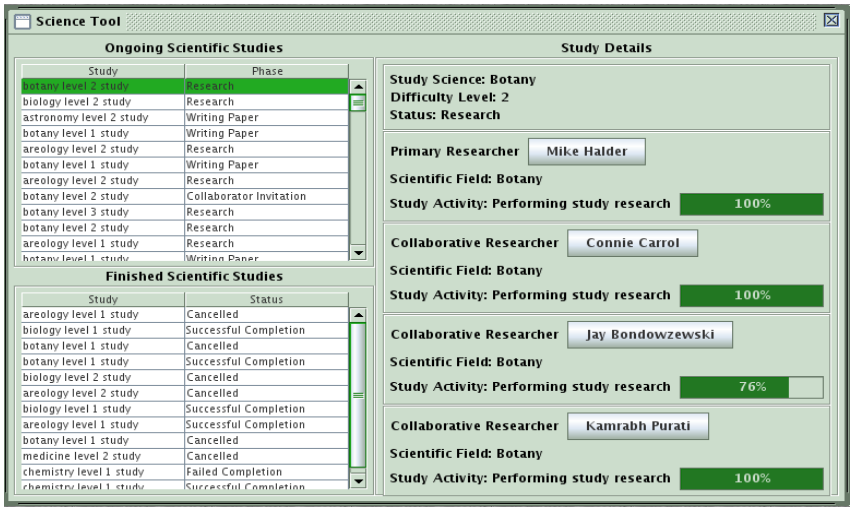


Illustration 24: Science Tool

The Study Details panel shows information about the selected scientific study.

The top panel displays general information about the study. Study Science shows the scientific field that the study primarily focuses on. The Difficulty Level shows the difficulty and importance of the study. It is determined by the primary researcher's skill level in the study science at the time the study is proposed. The Status line shows the studies current phase or completion status.

The primary researcher panel shows a button with the study's primary researcher's name. Clicking on it opens an information dialog for the researcher. The Scientific Field line shows what scientific field the researcher is focused on for the study. If the study is ongoing, the next line shows the researchers current study activity with a progress bar showing the current progress in work or time for that activity. If the study is finished, the line shows the scientific achievement credit earned by the researcher for the study. Only successfully completed studies will earn scientific achievement credit for researchers.

A scientific study may have up to three collaborating researchers, each displayed in a panel below the primary researcher's panel. A collaborative researcher panel shows a button with the collaborator's name. Clicking on it opens an information dialog for the researcher. The Scientific Field line shows what scientific field the researcher is focused on for the study. If the study is ongoing, the next line shows the researchers current study activity with a progress bar showing the current progress in work or time for that activity. If the study is finished, the line shows the scientific achievement credit earned by the researcher for the study. Only successfully completed studies will earn scientific

achievement credit for researchers.

Settlement Map Tool

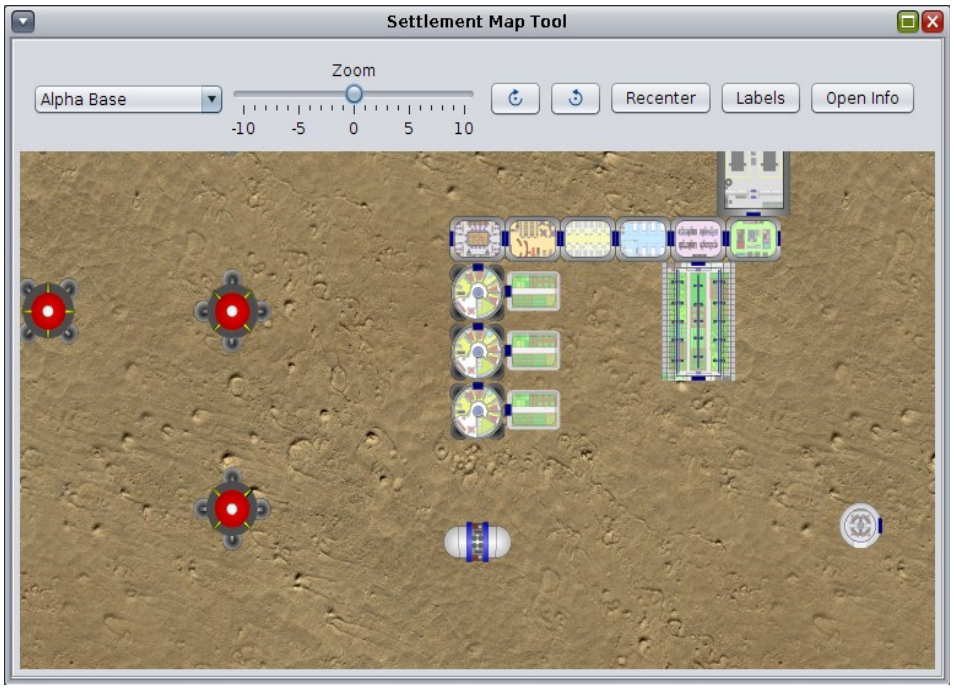


Illustration 25: Settlement Map Tool

The Settlement Map Tool displays a top-down view of settlements with the layout of their buildings, parked vehicles, and people.

You can select which settlement you want to view from the drop-down list. The map can be zoomed in and out with the zoom slider, and rotated right or left with the rotate buttons. The settlement map can moved around by mouse dragging. The Recenter button will reset the map at the settlement's center, default zoom, and rotation.

The Open Info button opens up the settlement info window for the currently selected settlement.

The Labels button will show a drop down when pressed that allows the user to select which types of labels to display. The types of labels include buildings, construction sites, vehicles, and people.

Clicking on a person's icon will display their icon and name in white, along with their current activity.

Monitor Tool

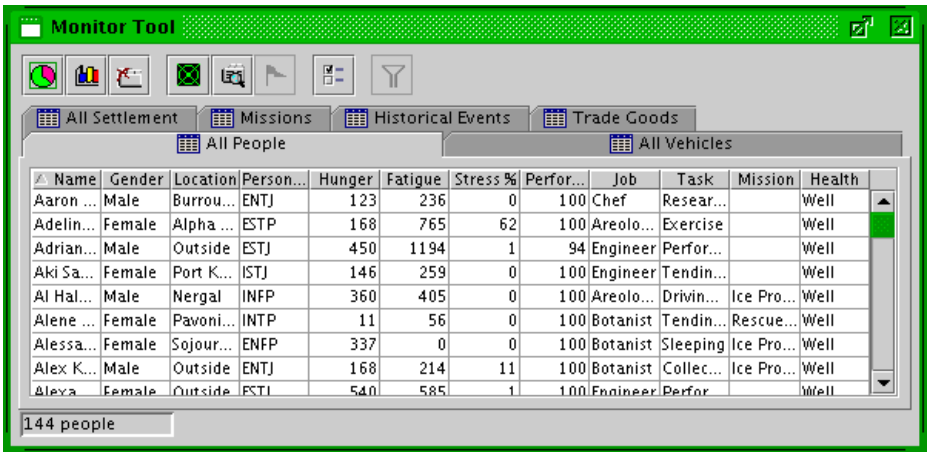


Illustration 26: Monitor Tool

The Monitor tool displays information in a table layout of all the people, vehicles, settlements and missions in the simulation. It also displays historical events and trade goods.

Top Buttons - The Monitor tool has the following top buttons:

- **Pie Chart** - Creates a tab with a pie chart of one column from the table.
- **Bar Chart** - Creates a tab with a bar chart of multiple columns from the table.
- **Remove Tab** - Removes the currently selected custom tab.
- **Center Map On Selected Unit** - Centers the map and globe in the Mars Navigator tool on the selected unit.
- **Show Details Dialog** - Opens a information window on the selected unit.
- **Open Mission** - Opens the selected mission in the mission tool. Only enabled when the mission tab is selected.
- **Change The Displayed Columns** - Lets the user modify what information is displayed in the Monitor tool.
- **Filter Events** - Lets the user filter what category of events are displayed in the historical events tab.

Preferences Tool

The Preferences Tool allows you to adjust general settings in the Mars Simulation Project.

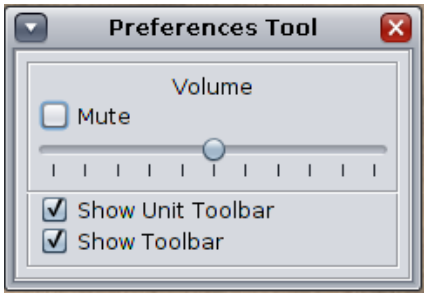


Illustration 27: Preferences Tool

Adjust the sound volume of the user interface with the volume slider.

The mute check box will mute the user interface regardless of the slider setting.

Mars Navigator Tool

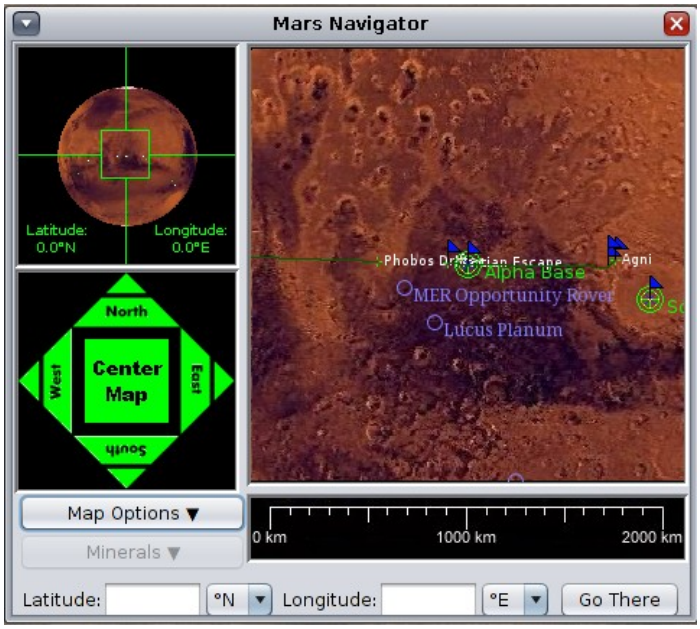


Illustration 28: Mars Navigator Tool

The Mars Navigator displays the virtual Mars through generated maps and a globe.

The Mars globe shows a cross hair box that marks the area covered by the generated map. Green dots on the globe represent settlements and white dots represent rovers not parked at settlements. The latitude and longitude of the center point of the globe is also displayed. The globe can be rotated by clicking and dragging the mouse on it.

The navigation arrows can be mouse clicked to rotate the globe. The far arrow points are

for rough control with 30 degree rotations while the near arrows are for fine control with 5 degree rotations. The globe will not rotate North or South past 90 degrees. Clicking on the "Center Map" button in the middle will generate a map for the center point the globe is at.

The map is the primary means of viewing the virtual Mars. It displays a surface or topographical (depending on mode) map of Mars rendered at a given center point. The map is at a scale of 7.4km/pixel. Settlements and rovers are displayed on the map and it is updated approximately every second to reflect positional changes in rovers. Mouse clicking on the map will recenter it and the globe at the position clicked. Clicking on a settlement or rover icon will open up a info window for that unit instead of recentering the map. The map doesn't currently support mouse-drag operations.

Directly below the map is a legend displaying distances for the surface map and topographical scale for the topographical map.

To the left of the legend is the "Options" button. Clicking this will show a drop down set of check boxes with the following options:

- **Topographical Mode** - switches the map and globe to topographical viewing and back.
- **Show Unit Labels** - shows settlement and rover labels (default) or not.
- **Day/Night Tracking** - enables the shading of nighttime on the globe and map.
- **Vehicle Trails** - enables dark green trails to be displayed behind vehicles.
- **Show Landmarks** - enables blue landmark indicators to show up on the map.
- **Show Mission Navpoints** - enables rover mission NAV point flags to show up on the map.
- **Show Explored Sites** - enables the explored sites to show up on the map.
- **Show Minerals** - enables the mineral layers to show up on the map.

Latitude and longitude can be typed in as integers or decimals. The "Go There" button will recenter the map and globe at the specified latitude and longitude if they are valid.

Time Tool

The Time Tool displays the current time in the simulation.

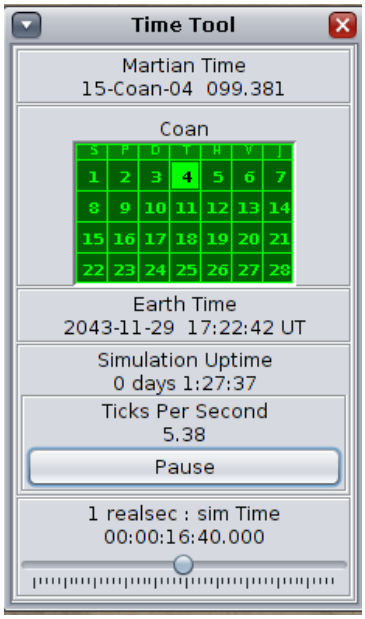


Illustration 29: Time Tool

The top-most panel shows the current Martian time. It is in the following format: Orbit-Month-Sol Millisol.

The second panel shows the month and the sol of the month in a calendar format. The one letter abbreviation for the week sols are also given.

The third panel shows the current season in the northern and southern hemispheres.

The fourth panel shows the current Earth time in GMT.

The fifth panel shows the amount of time the simulation has been running in true Earth time.

The sixth panel has a slider bar that allows the user to change the time compression ratio of the simulation.

The Martian calendar used in this simulation is based on Shaun Moss's "Areosynchronous Calendar".
http://pweb.jps.net/~gangale3/moss/Virtual_Mars/Calendar.asp

The Areosynchronous Calendar is heavily derived from Tom Gangale's Darian Calendar.
http://pweb.jps.net/!tgangale/mars/mst/darifrm.htm

The Martian year is referred to as an "orbit". It is 668.5921 Martian days ("Sols") long. In the calendar, about half of the orbits are 668 Sols long, and the other half are "leap-orbits" with 669 Sols. See the Areosynchronous Calendar for complete details on leap-orbits.

The orbit has 24 months with either 27 or 28 Sols:

Month Name	Number of Sols
Adir	28
Bora	28

Coan	28
Deti	28
Edal	28
Flo	27
Geor	28
Heliba	28
Idanon	28
Jowani	28
Kireal	28
Larno	27
Medior	28
Neturima	28
Ozulikan	28
Pasurabi	28
Rudiakel	28
Safundo	27
Tiunor	28
Ulasja	28
Vadeun	28
Wakumi	28
Xetual	28
Zungo	27 or 28 if a leap-orbit

The month names are based on Frans Blok's "The Rotterdam System".
http://www.geocities.com/fra_nl/rotmonth.html

There are seven sols in a Martian week with the following week names:

1. Heliosol
2. Neriosol
3. Libersol
4. Terrasol
5. Venusol
6. Mercusol
7. Jovisol

Every Martian month has 4 weeks. On months with 27 Sols, the last week only has six Sols and Jovisol is clipped. This allows the first Sol of every month and every orbit to be Heliosol.

The calendar uses metric time for Mars with the Sol broken up into the following common units:

decasol = 1/10 Sol = 2.46 Earth hours
centisol = 1/100 Sol = 14.8 Earth minutes
millisol = 1/1000 Sol = 1.48 Earth minutes

Martian time of the Sol is usually written in three-digit millisol format to three decimal points. ex. from "000.000" to "999.999".

The common timstamp format for Mars date/time is orbit-month-sol:millisols. ex. "17-Adir-03:523.234"

The time of the day is based on Bruce Mackenzie's "Metric Time for Mars". http://pweb.jps.net/~tgangale/mars/other/mcknzfrm.htm

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Search Tool

The Search Tool allows the user to select a person, settlement or vehicle and either open a unit info window for the unit and/or center the Mars Navigator map on the unit.

The user must select a category of units (person, settlement or vehicle) and select from the list of available units. A unit's name can be typed in the field above the list and the closest pick from that category will be selected on the list.

Illustration 30: Search Tool

Resupply Tool

The Resupply Tool displays information about incoming and arrived resupply missions

from Earth, and allows you to modify resupply missions or create new ones. It also displays new settlements arriving (or arrived) from Earth and provides for creating and editing of arriving settlements.

The Incoming Transport Items list shows all incoming resupply missions and settlements that have not arrived from Earth yet. The destination settlement name and arrival time are shown for each item. Selecting an item on the list will display the its details in the information panel.

The Arrived Transport Items list shows all resupply missions and settlements that have already arrived from Earth. The destination settlement name and arrival time are shown for each item. Selecting an item on the list will display the mission's details in the information panel.

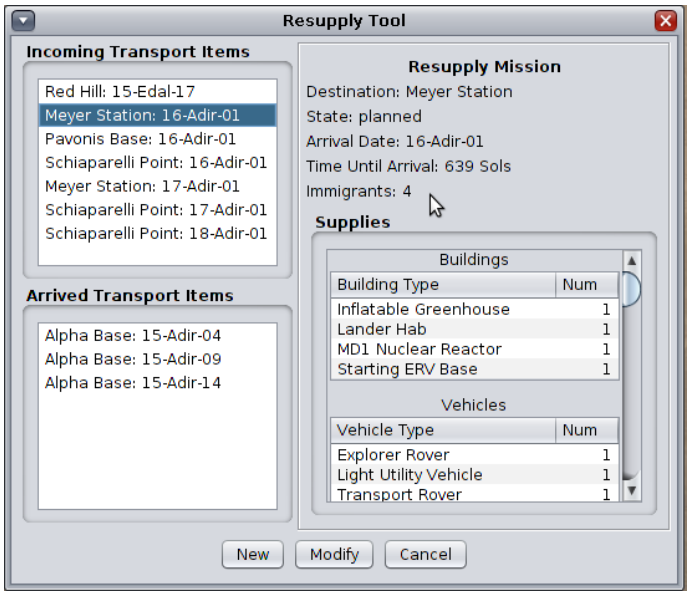

Illustration 31: Resupply Tool

The information panel on the right side shows information about the selected resupply mission or arriving settlement.

Resupply Mission - The top panel shows the mission's destination settlement, its current state ("planned", "in transit", "delivered", or "canceled"), its arrival date, the time until arrival, and the number of immigrants arriving with the supplies.

The Supplies panel shows tables of all buildings, vehicles, equipment, resources, and parts that are included in the resupply mission. The supply tables include the supply type and the number. The resource supply table shows the amount of each resource in kilograms.

Arriving Settlement – The information panel shows the arriving settlement's name, state, layout template, number of immigrants, arrival date, time until arrival, and location.

The buttons at the bottom of the resupply tool include:

- **New** - Opens a dialog to create a new resupply mission or arriving settlement.
- **Modify** - Opens a dialog to modify the selected resupply mission or arriving settlement. This is only available for incoming resupply missions and arriving settlements, not ones that have already arrived at their destinations.
- **Cancel** - Cancels the selected resupply mission or arriving settlements. This is only available for incoming resupply missions and arriving settlements, not ones that have already arrived at their destinations.

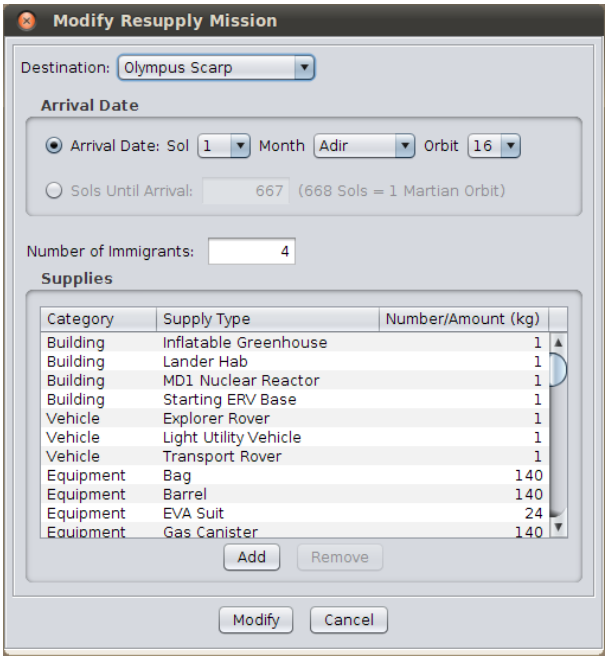

Illustration 32: Modify Resupply Mission Dialog

The "Modify Transport Item" dialog appears when you press the "Modify" button at the bottom of the resupply tool.

The Destination combo box allows you to select a destination settlement that the mission will arrive at.

The Arrival Date panel allows you to select when the resupply mission is targeted to arrive. The Arrival Date radio button allows you to select the arrival date from a list of Sol, Month, and Orbit combo boxes. The Sols Until Arrival radio button allows you to enter the number of Sols until the mission arrives.

The Number of Immigrants text field lets you enter the number of new people arriving from Earth with the resupply mission.

The Supplies panel contains a table of all supplies in the mission. The table shows the category, type, and number/amount of each supply. The Add button at the bottom will

add a new supply item to the table. The Remove button will remove a selected supply item from the table. Any of the table fields can be edited to change a supply items values.

The Modify button at the bottom of the dialog will commit the modifications to the transport item and close the dialog.

The Cancel button at the bottom of the dialog will cancel the modifications to the transport item and close the dialog.

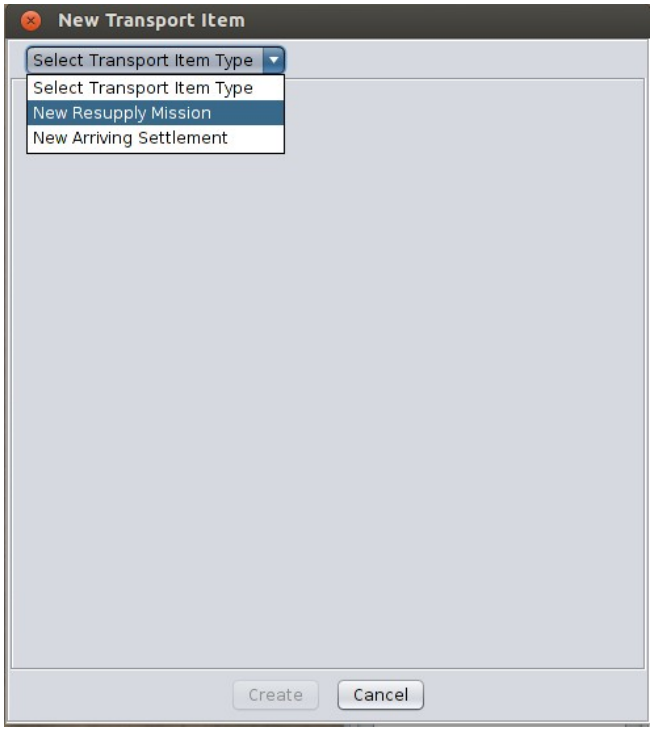

Illustration 33: New Transport Item Dialog

The "New Transport Item" dialog appears when you press the "New" button at the bottom of the resupply tool.

This dialog includes a combo box the allows you to select either a "New Resupply Mission" or "New Arriving Settlement" and populates the dialog with the selected option.

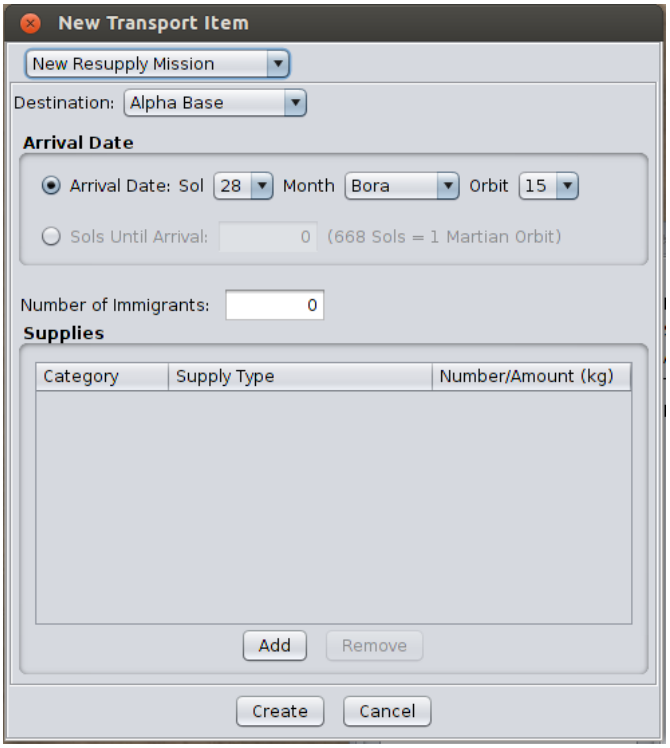

Illustration 34: New Resupply Mission Dialog

The "New Resupply Mission" option of the "New Transport Item" dialog provides input fields for creating a new resupply mission to an existing settlement.

The Destination combo box allows you to select a destination settlement that the mission will arrive at.

The Arrival Date panel allows you to select when the resupply mission is targeted to arrive. The Arrival Date radio button allows you to select the arrival date from a list of Sol, Month, and Orbit combo boxes. The Sols Until Arrival radio button allows you to enter the number of Sols until the mission arrives.

The Number of Immigrants text field lets you enter the number of new people arriving from Earth with the resupply mission.

The Supplies panel contains a table of all supplies in the mission. The table shows the category, type, and number/amount of each supply. The Add button at the bottom will add a new supply item to the table. The Remove button will remove a selected supply item from the table. Any of the table fields can be edited to change a supply items values.

The Create button at the bottom of the dialog will create the new resupply mission and close the dialog.

The Cancel button at the bottom of the dialog will cancel the new resupply mission and close the dialog.

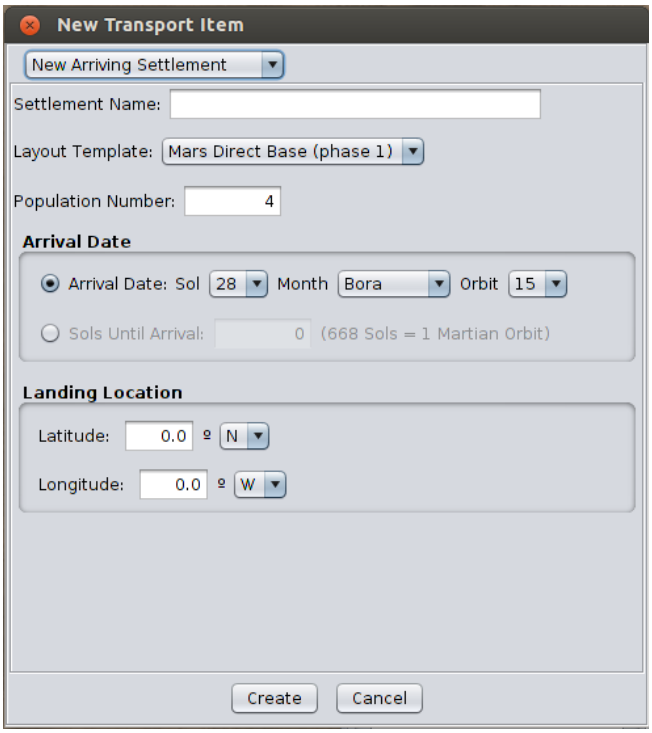

Illustration 35: New Arriving Settlement Dialog

The "New Arriving Settlement" option of the "New Transport Item" dialog provides input fields for creating a new arriving settlement.

The Settlement Name text field allows you to enter the new settlement's name.

The Layout Template combo box lets you select the layout template for the new settlement from a list of available settlement templates.

The Population Number text field allows you to enter the starting population of the new settlement. When a new layout template is selected, the population number is updated to the appropriate number for that layout template.

The Arrival Date panel allows you to select when the new settlement is targeted to arrive. The Arrival Date radio button allows you to select the arrival date from a list of Sol, Month, and Orbit combo boxes. The Sols Until Arrival radio button allows you to enter the number of Sols until the settlement arrives.

The Landing Location panel lets you enter the latitude and longitude location that the new settlement will arrive at.

The Create button at the bottom of the dialog will create the new arriving settlement and close the dialog.

The Cancel button at the bottom of the dialog will cancel the new arriving settlement and close the dialog.

Person Information Window

The person info window displays information about an individual person. A number of tab panels are available for viewing particular information.

The top of the info window shows the person's location in latitude and longitude coordinates, along with a button for displaying the Mars Navigator tool centered on the person's location. The next button to the right displays the settlement or vehicle the person is currently located within. If the person is outside, no button is displayed.

The person's name is displayed at the top right of the window.

The inventory tab panel displays information about the resources and equipment the person is carrying.

The resources table shows the mass of particular resources the person is carrying along with the person's storage capacity for that resource.

The equipment table shows each piece of equipment the person is carrying and if the equipment is empty or not. Left clicking the mouse on an equipment will open that equipment's info window.

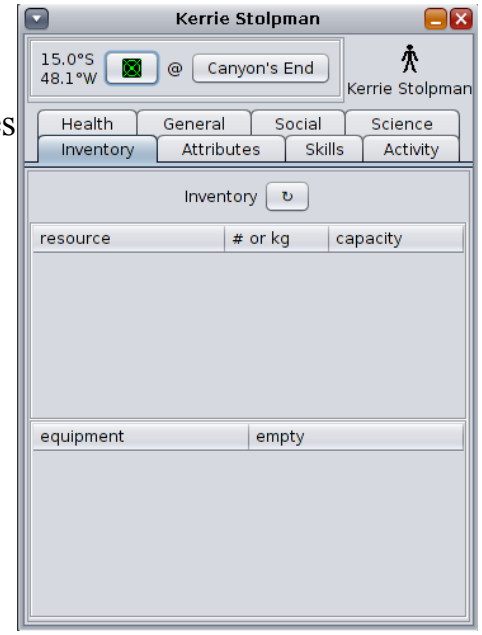

Illustration 36: Person Information Window - Inventory Tab

The skills tab panel displays information about the person's skills.

The main box shows a list of the person's skills and his/her skill level for each one.

Skills may effect a person's ability to perform particular tasks.

A person starts with a random set of skills (possibly none). When a person performs a task, he/she gains experience in the skill(s) associated with the task. When the experience in a skill passes a threshold, the skill level increases. The threshold for each skill doubles for each successive skill level, making it more difficult to reach higher levels.

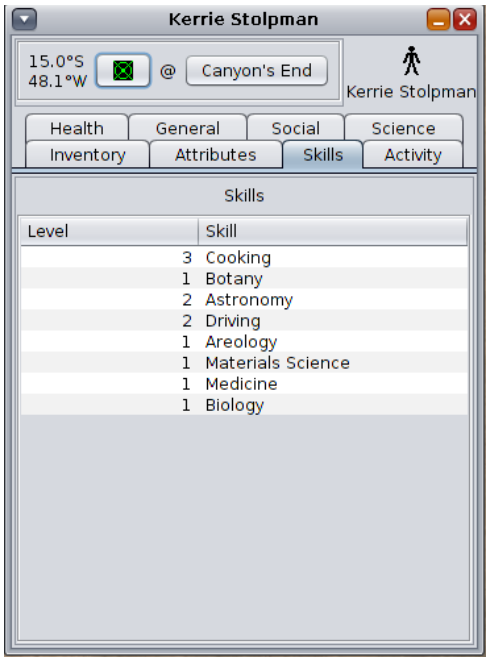

Illustration 37: Person Information Window - Skills Tab

The attributes tab panel shows the person's natural attributes.

Attributes are randomly determined and effect how well a person performs certain tasks.

Natural attribute definitions:

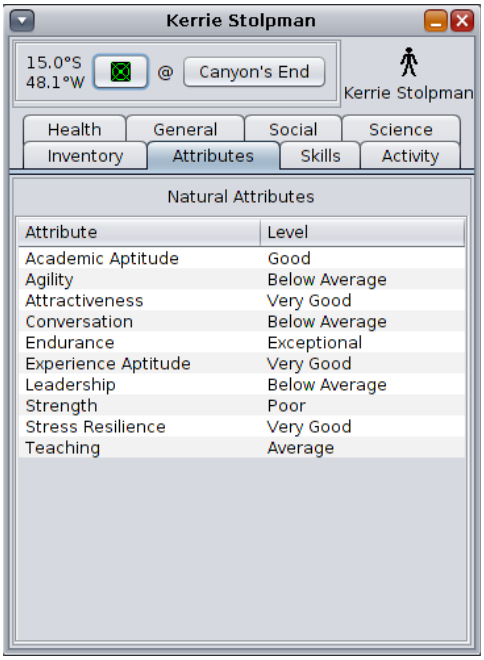

Illustration 38: Person Information Window - Attributes Tab

- Academic Aptitude - ability to learn easily in an academic environment (classroom, textbook, lecture, tutorial, etc)
- Agility - quickness and balance
- Attractiveness - general physical attractiveness
- Conversation - ability to leave a good impression when engaging in conversation
- Endurance - cardiovascular endurance
- Experience Aptitude - ability to learn from doing something
- Leadership - ability to get people to naturally follow the person

- Strength - upper-body strength
- Stress Resilience - ability to withstand mental stress
- Teaching - natural aptitude to teach others

The activity tab panel shows information about the person's current activity.

The person's current job specialty is shown at the top. The user can change the person's job with the drop-down menu. The person will remain in that job specialty in the simulation until the user changes it again.

The person's current task is displayed below, along with the task phase.

The person's current mission (if any) is displayed at the bottom, along with the mission phase.

At the right of the mission display are the mission and monitor icons. Clicking the mission icon will open the Mission tool and select the person's current mission. Clicking the monitor icon will create a custom tab in the monitor tool displaying all the people participating in the person's current mission.

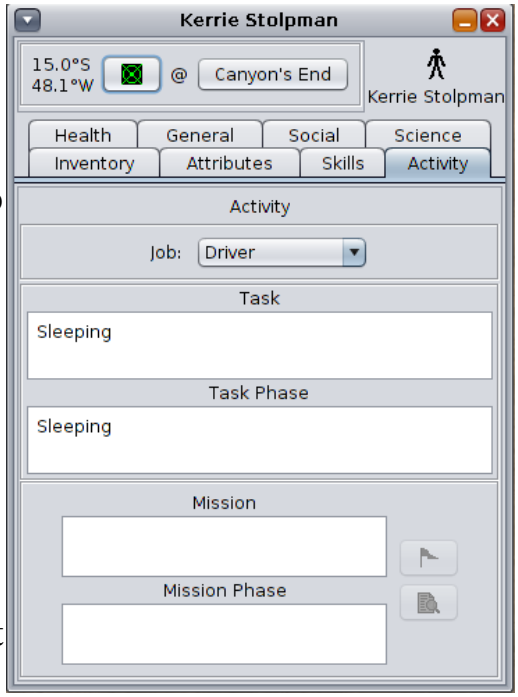

Illustration 39: Person Information Window - Activity Tab

The health tab panel shows the person's current physical condition.

Fatigue is the number of millisols since the person has last slept. Long periods without sleep will cause the person to perform tasks poorly.

Stress is the percentage of how stressed out the person is. 0% means no stress at all and 100% means completely stressed out. Stress can affect a person's performance in activities, and can be caused by crowding, stressful activities, and accidents.

Hunger is the number of millisols since the person has last ate a meal. Hunger can affect a person's performance in activities.

Performance is the person's percentage of optimal performance. Fatigue, hunger, stress, injury and illness can affect performance.

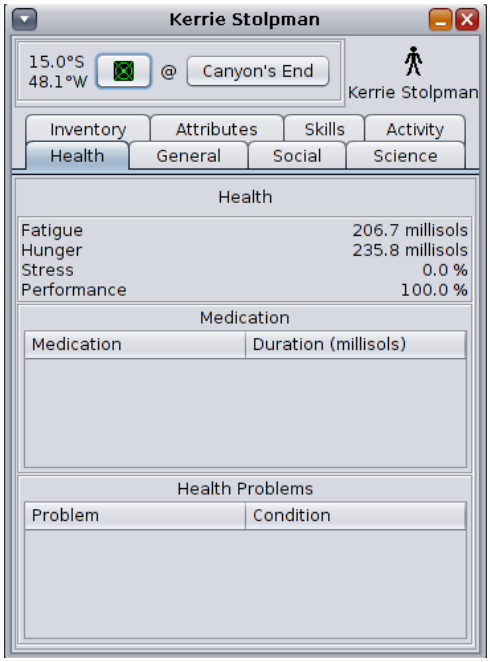

Illustration 40: Person Information Window - Health Tab

The medication table shows all medications the person is currently taking and the medication's duration of effect.

The health problems table shows a list of illnesses and injuries the person is currently suffering from. The percentage next to shows the progress to recovery.

The general tab panel shows general information about the person.

Gender is the person's gender (male or female).

Birth Date shows the person's date of birth and current age in Earth years.

Birth Location shows what planet the person was born on.

Weight shows the person's weight in kg.

Height shows the person's height in cm.

BMI shows the person body mass index.

Personality is the person's personality represented as Myers-Briggs Type Indicator (MBTI).

[Wikipedia Article on MBTI]

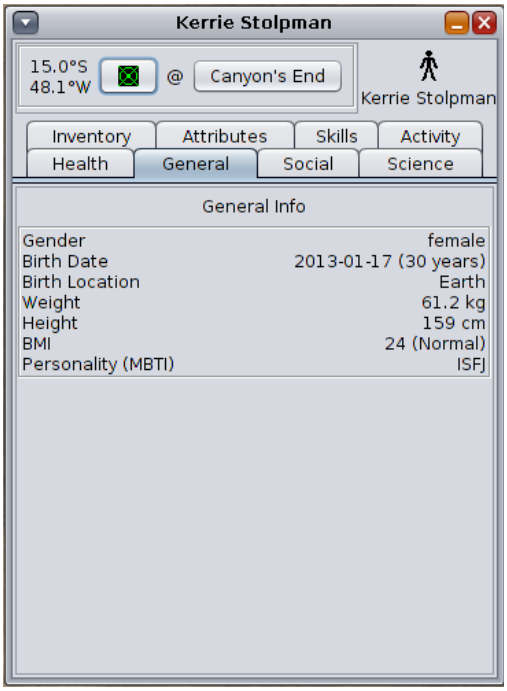

Illustration 41: Person Information Window - General Tab

The social tab panel shows the person's social relationships with other people.

The relationship values (in order from worst to best) are: Hatred, Antagonism, Unfriendly, Bothersome, Indifference, Cordial, Amicable, Friendly, and Devoted.

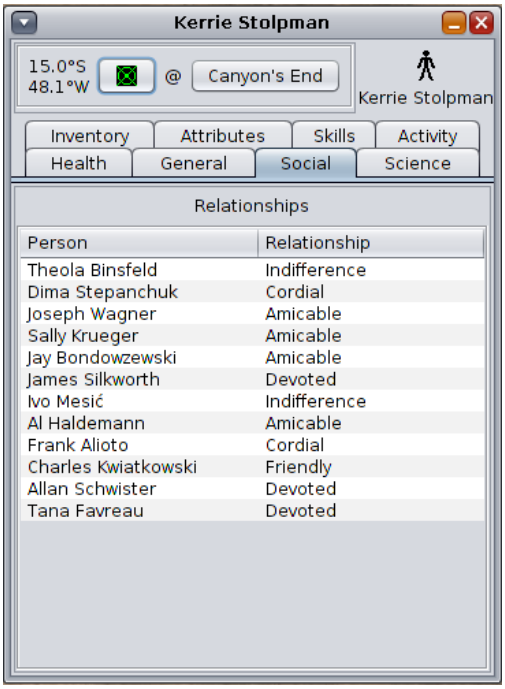

Illustration 42: Person Information Window - Social Tab

The science tab shows all the scientific studies the person is or has been involved with, as well as the person's scientific achievements.

The top panel shows a list of all scientific studies the person is or has participated in. The list shows the name, the person's researcher role, and the status of each study. The button below the list will display the study that is selected in the list in the science tool.

The bottom panel shows the person's scientific achievement. The total scientific achievement across all fields of science is displayed at the top, and a list of all scientific fields and the person's respective achievement in each is displayed at the bottom.

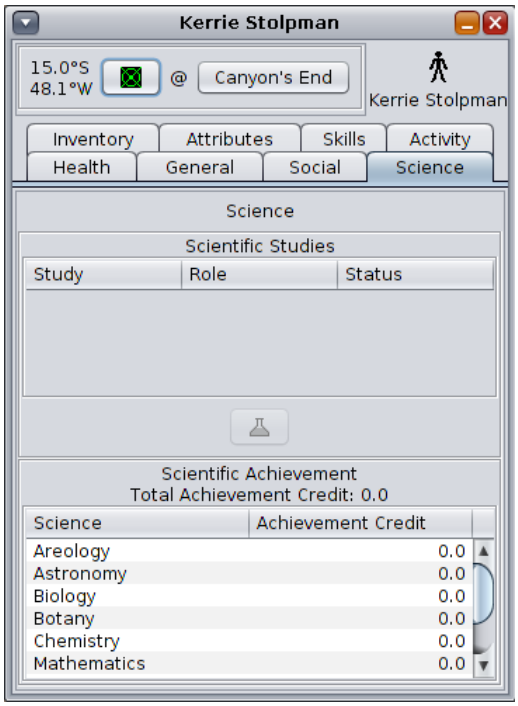

Illustration 43: Person Information Window - Science Tab

Vehicle Information Window

The vehicle info window displays information about an individual vehicle. A number of tab panels are available for viewing particular information.

The top of the info window shows the vehicle's location in latitude and longitude coordinates, along with a button for displaying the Mars Navigator tool centered on the vehicle's location. The next button to the right displays the settlement the vehicle is currently parked at. If the vehicle is outside, no button is displayed.

The vehicle's name and type are displayed at the top right of the window.

The navigation tab panel shows destination and movement information about the vehicle.

The current driver of the vehicle (if any) is displayed on a button at the top of this panel. Clicking the button will open a person info window for the driver.

The vehicle's general status information is displayed at the top. Status can be: moving, parked, broken down, stuck and undergoing periodic maintenance. The emergency beacon is turned on by the crew when a vehicle does not have enough fuel and supplies to reach a settlement. This panel also contains the vehicle's current speed and elevation.

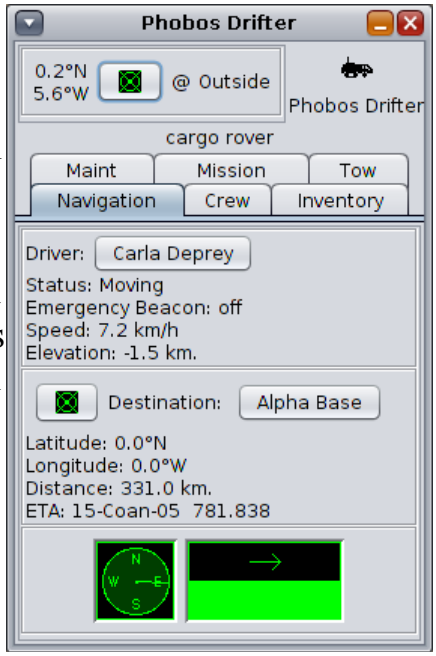

Illustration 44: Vehicle Information Window - Navigation Tab

The destination box displays information about the vehicle's destination if it is moving. If the destination is a settlement, a button with the settlement's name is displayed. Clicking on it will open the settlement's info window. The green target icon button at the left will recenter the Mars Navigator map on the vehicle's destination. The latitude and longitude of the destination is shown, as well as the ETA and current distance to the destination.

The bottom left box displays the current terrain grade if the vehicle were traveling to the right.

The bottom right box displays the direction the vehicle is currently traveling.

The crew tab panel contains information about the vehicle's crew.

The current crew number and the maximum crew capacity are displayed in the top box.

A list of the passengers of the vehicle are in the bottom box. Double clicking on any of them will open up their respective person info window. The monitor button to the right of the crew list will create custom tab in the monitor tool for the vehicle's crew.

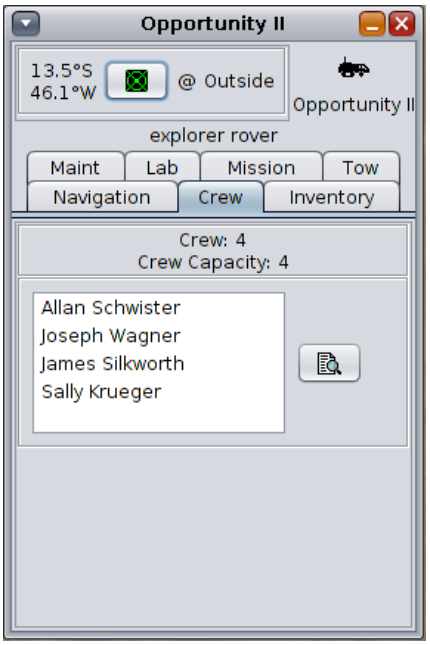

Illustration 45: Vehicle Information Window - Crew Tab

The maintenance tab panel contains information about the vehicle's condition.

The maintenance box shows the amount of time (in millisols) since the vehicle was last given periodic maintenance in a settlement garage. The longer a vehicle is operated between periodic maintenance, the more likely it is to malfunction. If periodic maintenance is underway, the bar below it displays the progress.

The Wear Condition shows the condition of the building due to wear and tear. The higher the percentage, the better condition the building is in.

The malfunction box shows any current malfunctions in the vehicle. Three bars below each malfunction show the progress in emergency, normal and EVA repairs for the malfunction. Repair progress bars with "n/a" on them do not apply for the particular malfunction.

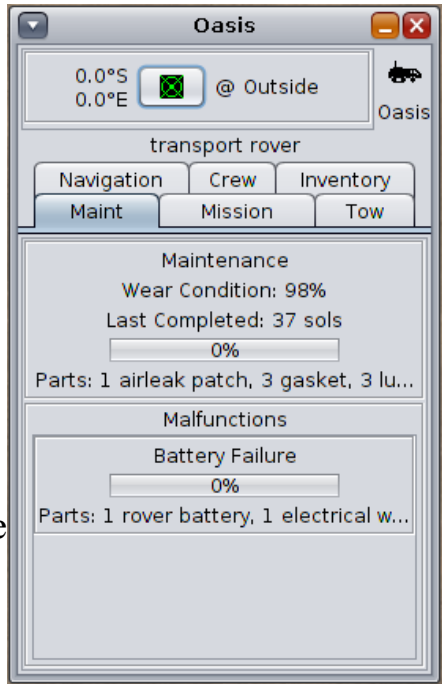

Illustration 46: Vehicle Information Window - Maintenance Tab

The inventory tab panel contains information about the vehicle's inventory of resources and equipment.

The resources table shows the mass of particular resources the vehicle is carrying along with the vehicle's storage capacity for that resource.

The equipment table shows each piece of equipment the vehicle is carrying and if the equipment is empty or not.

Left clicking the mouse on an equipment will open that equipment's info window.

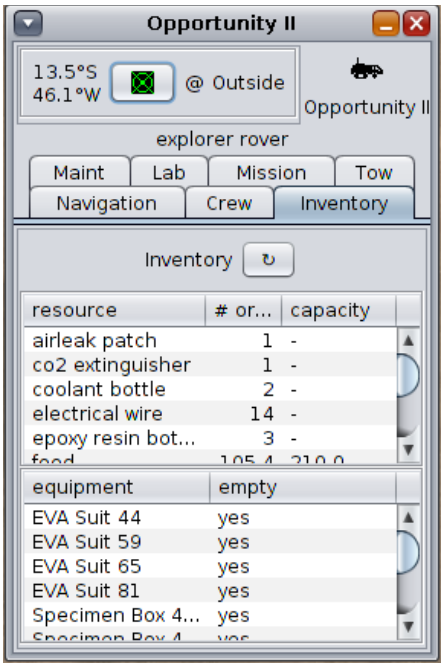

Illustration 47: Vehicle Information Window - Inventory Tab

The lab tab panel contains information about a vehicle's laboratory if it has one.

The upper box displays the current number of researchers using the laboratory and the maximum number of researchers who can use the laboratory at any given time. It also shows the technology level of the laboratory.

The lower box shows the scientific specialties of the laboratory.

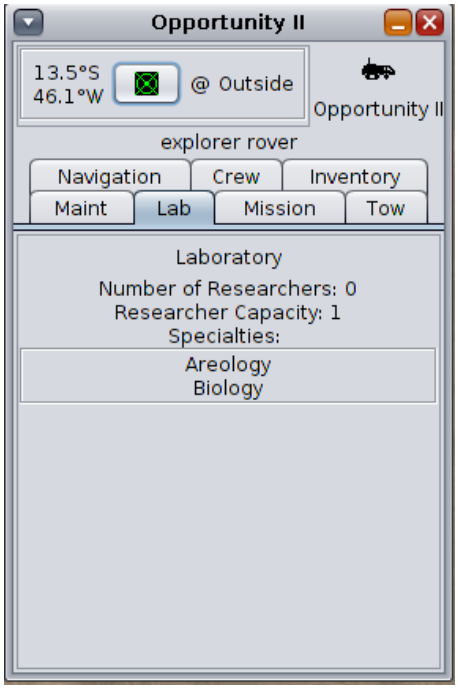

Illustration 48: Vehicle Information Window - Lab Tab

The mission tab panel contains information about the vehicle's current mission if any.

The top panel shows the name of the vehicle's current mission as well as it's current mission phase.

The bottom list shows the people on the mission, even if they are not currently on board the vehicle. On the right are the mission button, which will open the mission tool and select this mission, and the monitor button, which will open a tab on the monitor tool showing the people on the mission.

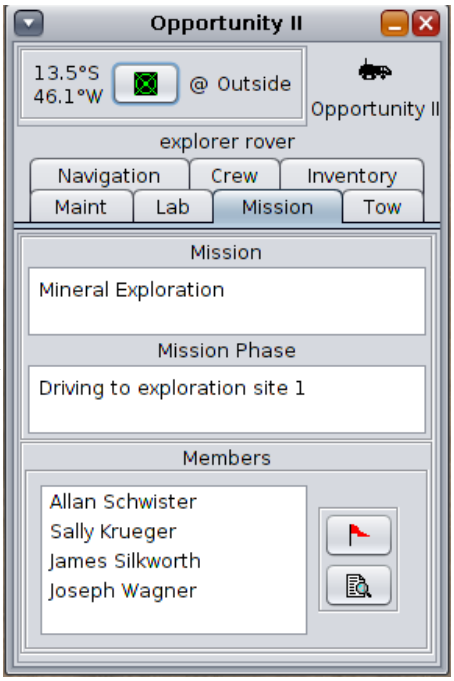

Illustration 49: Vehicle Information Window - Mission Tab

The tow tab panel contains information about what vehicle the vehicle is currently towing and/or being towed by.

The top panel shows what vehicle this vehicle is currently towing. Clicking on the vehicle button will open a vehicle info window for that vehicle.

The bottom panel shows what vehicle is currently towing this vehicle. Clicking on the vehicle button will open a vehicle info window for that vehicle.

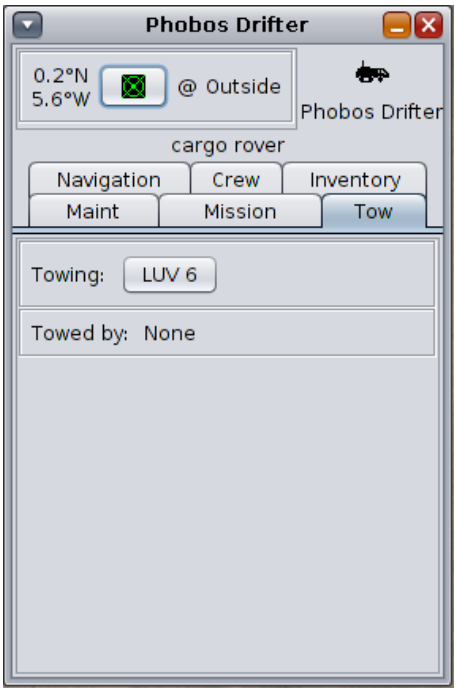

Illustration 50: Vehicle Information Window - Tow Tab

Settlement Information Window

The settlement info window displays information about an individual settlement. A number of tab panels are available for viewing particular information.

The top of the info window shows the settlement's location in latitude and longitude coordinates, along with a button for displaying the Mars Navigator tool centered on the settlement's location.

The settlement's name and type is displayed at the top right of the window.

The vehicles tab panel lists the vehicles currently parked at the settlement. Each vehicle can be double clicked to open up its info window.

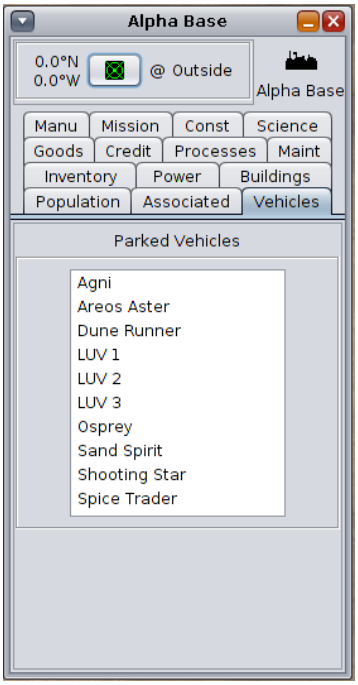

Illustration 51: Settlement Information Window - Vehicles Tab

The population tab panel displays information about the settlement's population.

The top box displays the current population and the normal capacity of the settlement. A settlement can have more inhabitants than its capacity, but it will then be crowded.

The list below contains the names of all people currently inhabiting the settlement. When any of the names is double clicked, the person's info window will open.

The monitor icon next to the resident list will open a custom tab in the monitor tool for the inhabitants of the settlement.

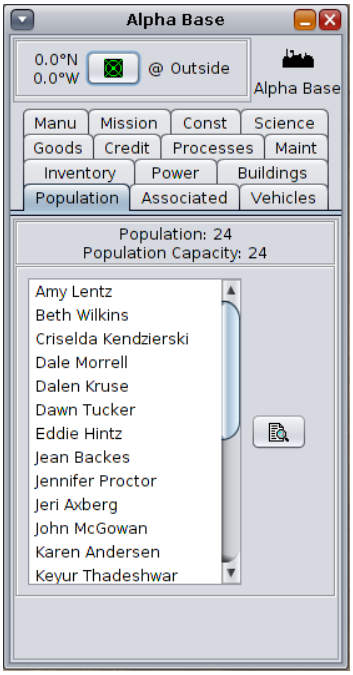

Illustration 52: Settlement Information Window - Population Tab

The associated population tab panel displays information about all people associated with the settlement.

The list displays all people currently inhabiting the settlement, working outside the settlement, or on a mission where the settlement is the mission's home.

The monitor icon next to the person list will open a custom tab in the monitor tool for associated people for this settlement.

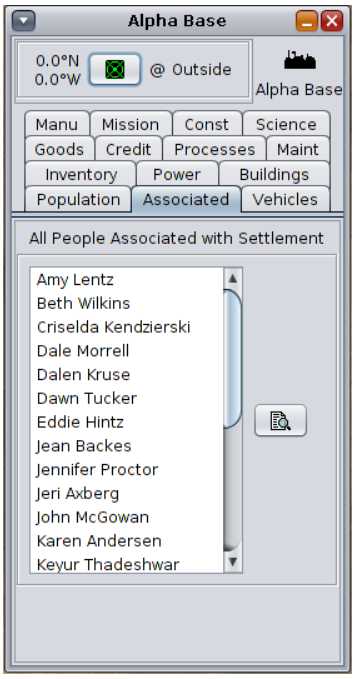

Illustration 53: Settlement Information Window - Associated Population Tab

The inventory tab panel displays information about the settlement's stores of resources and equipment.

The resources table shows the mass of particular resources stored in the settlement along with the settlement's storage capacity for that resource.

The equipment table shows each piece of equipment stored in the settlement and if the equipment is empty or not.

Left clicking the mouse on an equipment will open that equipment's info window.

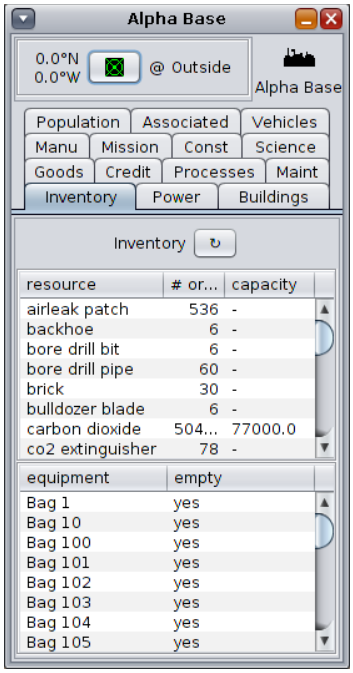

Illustration 54: Settlement Information Window - Inventory Panel

The Power Grid tab panel displays information about the settlement's power grid.

The top box shows the total power currently being generated by the settlement and the total power currently being used.

In the bottom box, there is a table showing the status of individual buildings in the settlement. The first column is a status square that is green if the building is powered up, yellow if it is powered down, and red if it has no power. The next column is the type of building. The next column is the power (kW) currently generated by the building. The last column is the power (kW) currently being used by the building.

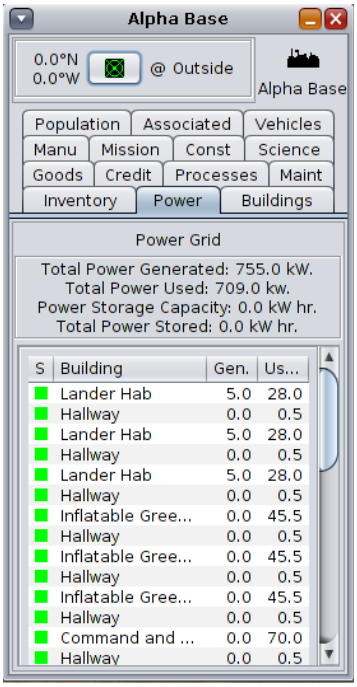

Illustration 55: Settlement Information Window - Power Tab

The Goods tab panel displays the value of trade goods at the settlement.

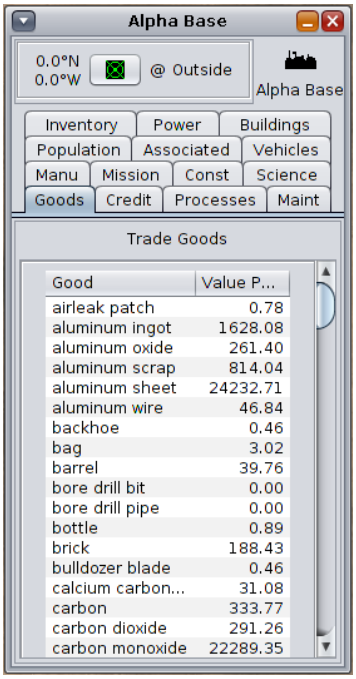

Illustration 56: Settlement Information Window - Goods Tab

The Credit tab panel displays the amount of trade credit or debt this settlement has with other settlements.

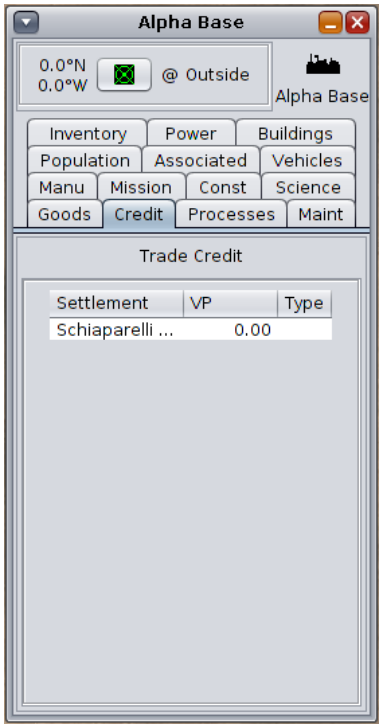

Illustration 57: Settlement Information Window - Credit Tab

The Processes tab panel displays all of the resource processes within the settlement. The button to the left of the process is green if the process is currently running, or red if it's not. You can toggle the process on or off by pressing the button.

At the bottom of the panel is an override check box. If it's checked, the settlement inhabitants won't toggle resource processes on or off on their own, but you still can manually.

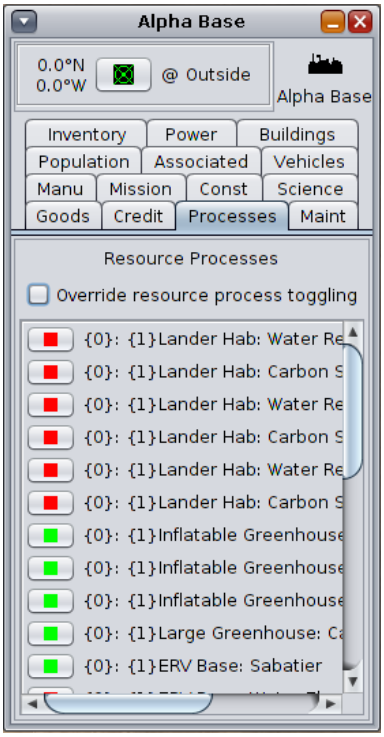

Illustration 58: Settlement Information Window - Processes Tab

The Maint tab panel displays the maintenance and malfunction status of all buildings in the settlement.

The top box on the panel shows the maintenance status of all buildings in the settlement. It shows the number of sols since the last periodic maintenance was completed. The progress bar shows the progress for next maintenance.

The bottom box shows any current malfunctions at the settlement. Each malfunction box shows the building location of the malfunction and the repair progress.

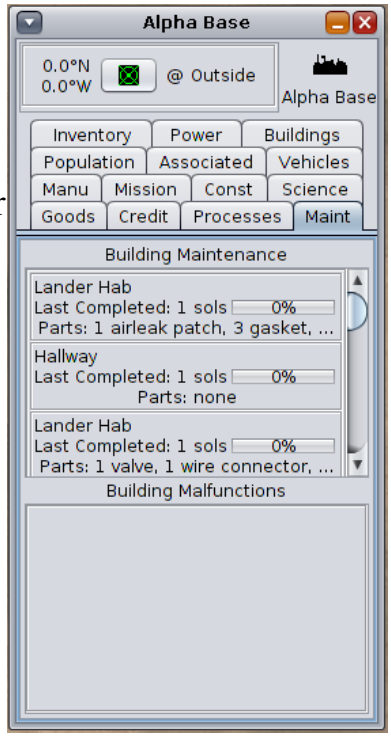

Illustration 59: Settlement Information Window - Maint Tab

The Manu tab panel displays the current manufacturing processes in the settlement.

The top drop down list allows the user to select a manufacturing building in which to create a new manufacturing process.

The second drop down list shows all of the manufacturing processes that can currently be created in the selected building. Note: this list is limited by the tech level of the selected building, the input materials available at the settlement, and if there is room for another process in the selected building. The user can select a manufacturing process to create.

The "Create New Process" button allows the user to create a new manufacturing process with the selected building and the selected process. This process will appear on the list, but the settlers will only be able to work on it if they have the minimum materials science skill level required.

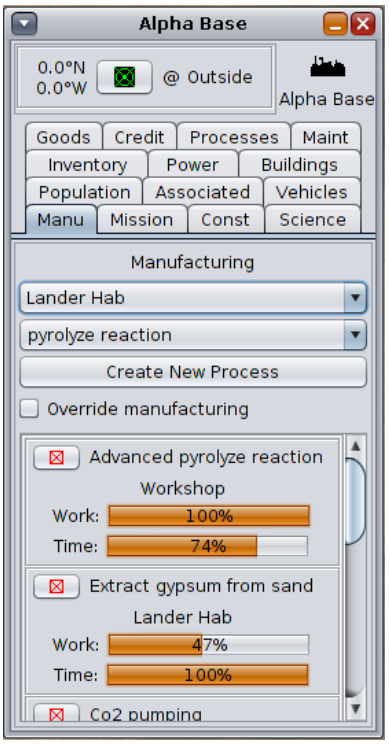

Illustration 60: Settlement Information Window - Manu Tab

The Override Manufacturing check box lets you override the settlement inhabitants from creating new manufacturing processes. You can still create new manufacturing processes yourself with the Create New Process button.

The bottom box on the panel shows a list of all the current manufacturing processes in the settlement. Each process has a panel that shows the process name, which building it is being performed in, a progress bar for work completed on the process, and a progress bar showing the process time completed for the process. Each process panel has a tool tip that displays additional information about the process.

The Mission tab panel displays all current missions associated with the settlement.

On the top of the panel is the "Override new mission creation" check box. If you check it, it prevents the inhabitants of the settlement from creating any new missions. You can still create new missions at the settlement through the mission creation wizard.

The left list shows current missions which you can select. The top button on the right allows you to open the mission tool, displaying the selected mission. The bottom button on the right allows you to open the monitor tool, displaying the crew of the mission in a monitor tab.

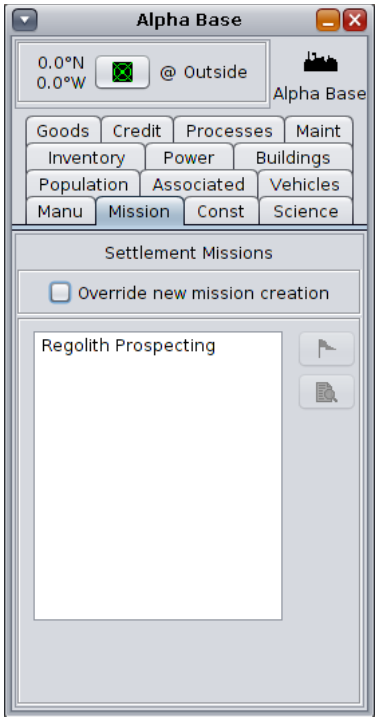

Illustration 61: Settlement Information Window - Mission Tab

The Const tab panel displays all construction sites at the settlement.

The top panel shows a panel for each construction site at the settlement. It shows the current stage under construction or completed at the site, and a progress bar showing the stage's progress toward completion. A tool tip shows additional information about the construction stage.

The bottom panel displays a list of all constructed buildings at the settlement and the date they were completed.

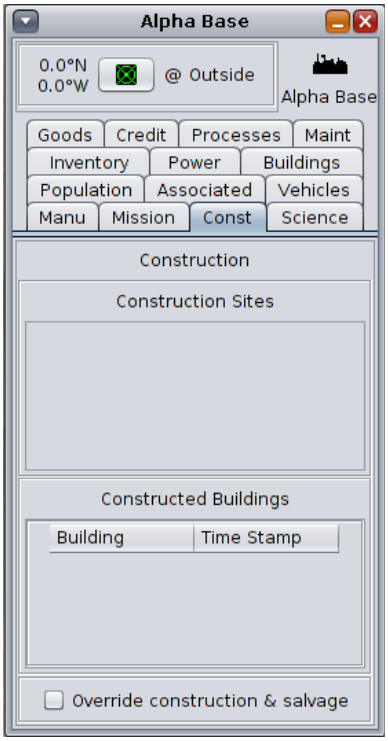

Illustration 62: Settlement Information Window - Const Tab

The Science tab shows all the scientific studies the settlement is involved with, as well as the settlement's scientific achievements.

The top panel shows a list of all scientific studies the settlement is or has participated in. The list shows the name and the status of each study. The button below the list will display the study that is selected in the list in the science tool.

The bottom panel shows the settlement's scientific achievement. The total scientific achievement across all fields of science is displayed at the top, and a list of all scientific fields and the settlement's respective achievement in each is displayed at the bottom.

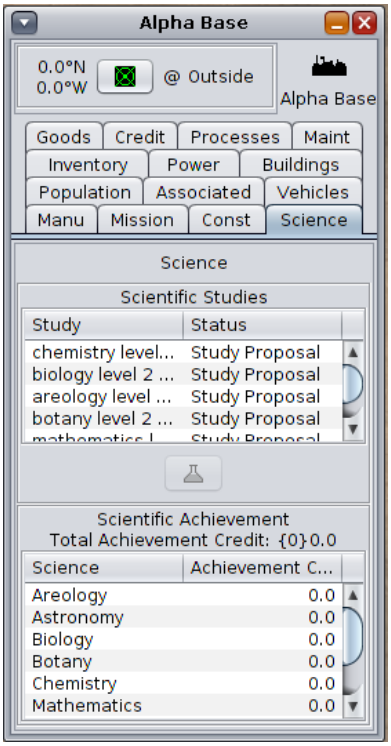

Illustration 63: Settlement Information Window - Science Tab

The building tab panel displays information about the settlement's buildings.

The top box on the panel has a drop-down building selector from which the user can select any of the settlement's buildings.

The bottom box has various panels showing the functionality of the building. The panels are function-specific and a panel will only show for the building if that building has the function it's for.

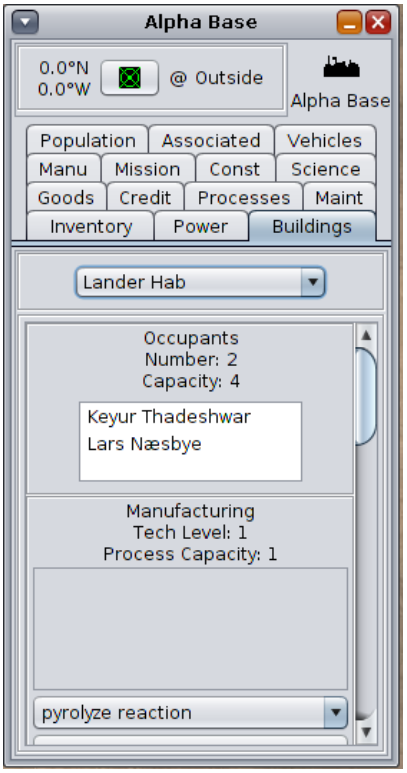

Illustration 64: Settlement Information Window - Buildings Tab

The life support building function panel shows the current number of people in the building and the capacity it was designed for. More people can be in a building than its capacity, but it will then be crowded and people prefer not to be in crowded buildings.

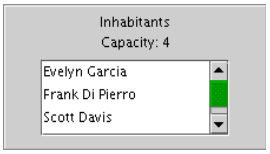

Illustration 65: Buildings Tab - Life Support

The medical care building function panel shows information about the building's infirmary.

The panel shows the number of sick beds in the infirmary, as well as the number of physicians currently treating patients in the building.

The bottom list displays the current patients in the infirmary and their condition.

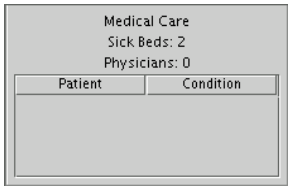

Illustration 66: Buildings Tab - Medical Care

The research building function panel shows information about the building's research laboratory.

The top of the panel shows the number of researchers currently using the laboratory and the number of researchers the laboratory can support.

The bottom panel shows a list of the science specialties the laboratory supports.

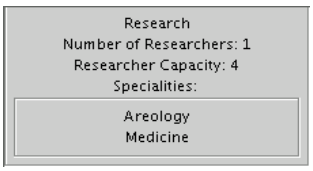

Illustration 67: Buildings Tab - Research

The power building function panel shows information about the building's power status.

The power status can either be "Full Power", "Power Down" or "No Power".

Illustration 68: Buildings Tab - Power

The power currently produced and used by the building are also displayed.

The resource processes building function panel shows a list of the resource processes the building performs.

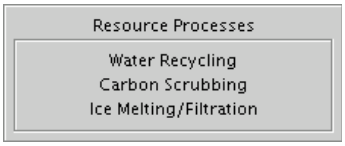

Illustration 69: Buildings Tab - Resource Processes

The malfunctions building function panel shows a list of malfunctions that are currently occurring in the building. Each malfunction has a progress bar that shows it's percentage of being repaired.

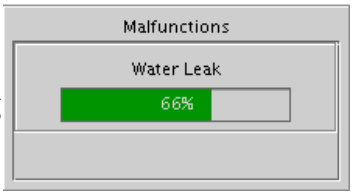

Illustration 70: Buildings Tab - Malfunctions

The maintenance building function panel shows how much time (Sols) has passed since the last periodic maintenance on the building. The progress bar shows the progress of maintenance on the building.

The Wear Condition shows the condition of the building due to wear and tear. The higher the percentage, the better condition the building is in.

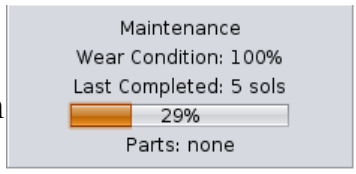

Illustration 71: Buildings Tab - Maintenance

The farming building function panel shows information on the building's greenhouse.

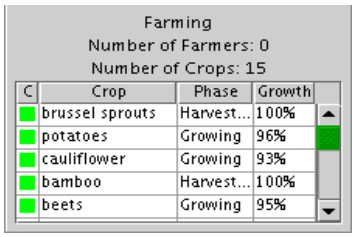

Illustration 72: Buildings Tab - Farming

The top of the panel shows the number of farmers currently working in the greenhouse and the number of crops in the greenhouse.

At the bottom of the panel is a list of the crops growing at the greenhouse. The first column shows the condition of the crop as a color square: green for excellent condition, yellow for average condition, and red for poor condition. The third column is the phase the crop is in, either "planting", "growing" or "harvesting". The last column shows the percentage of the growing phase for the crop. Some crops take longer to grow than others.

The manufacturing building function panel shows information on the building's manufacturing workshop.

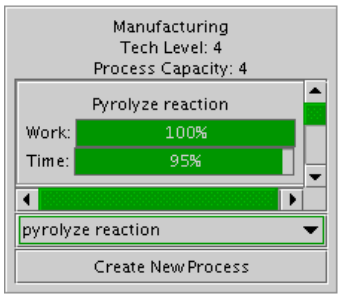

Illustration 73: Buildings Tab - Manufacturing

The second line shows the tech level of the building.

The third line shows the process capacity of the building. This is the number of active processes that the building can support at a time.

The next box on the panel shows a list of all the current manufacturing processes in the building. Each process has a panel that shows the process name, a progress bar for work completed on the process, and a progress bar showing the process time completed for the process. Each process panel has a tool tip that displays additional information about the process.

The drop down list shows all of the manufacturing processes that can currently be created in the building. Note: this list is limited by the tech level of the building, the input materials available at the settlement, and if there is room for another process in the building. The user can select a manufacturing process to create.

The "Create New Process" button at the bottom allows the user to create a new manufacturing process with the building and the selected process. This process will appear on the list, but the settlers will only be able to work on it if they have the minimum materials science skill level required.

The astronomy observation building function panel shows information about the building's astronomy observatory.

The panel shows the number of observers currently using the laboratory and the number of observers the observatory can support.

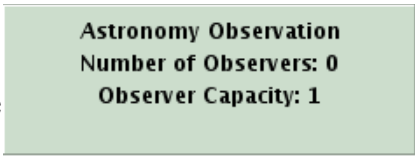

Illustration 74: Buildings Tab - Astronomy Observation

Unit Bar

Illustration 75: Unit Bar

The unit bar contains buttons to open reduced unit info windows or bring open unit info windows to the front of the desktop. Whenever a unit info window is opened, a corresponding unit button is created in the unit bar.

Every unit info window has a reduce button and a destroy button in the upper right. The reduce button will remove the window from the desktop but the unit button will stay in the unit bar. The destroy button will remove the window from the desktop and the unit button from the unit bar.

Tech Levels

Tech levels are used to measure the capability of laboratories and medical facilities in the configuration files.

Research Laboratories

- **tech level 1:** Field laboratory capable of basic research but doesn't have advanced instruments.
- **tech level 2:** Clinical laboratory with advanced instruments.
- **tech level 3:** Advanced laboratory with state of the art equipment.

Medical Facilities

- **tech level 1:** Medical pack for field dressing wounds and applying antibiotics.
- **tech level 2:** Simple medical station with capacity for the treatment of broken limbs with plaster casts.
- **tech level 3:** Basic medical facility with a operating table. Minor operations can be performed here as well as extended treatment of illnesses.
- **tech level 4:** Medical facility with capacity for advanced surgery. Major operations can be performed here.
- **tech level 5:** Medical facility capable of advanced treatment, such as treating severe burn patients with skin grafts.

Manufacturing Workshops

- **tech level 1:** Basic processing of regolith and ores to produce metals and other resources.
- **tech level 2:** Advanced metal working and simple glass production.
- **tech level 3:** Advanced glass production including fiberglass. Basic plastics production.
- **tech level 4:** Advanced plastics production. Fiberglass cloth weaving and reinforced fiberglass.

Time

The Martian calendar used in this simulation is based on Shaun Moss's "Areosynchronous Calendar".
http://pweb.jps.net/~gangale3/moss/Virtual_Mars/Calendar.asp

The Areosynchronous Calendar is heavily derived from Tom Gangale's Darian Calendar.
http://pweb.jps.net/!tgangale/mars/mst/darifrm.htm

The Martian year is referred to as an "orbit". It is 668.5921 Martian days ("Sols") long. In the calendar, about half of the orbits are 668 Sols long, and the other half are "leap-orbits" with 669 Sols. See the Areosynchronous Calendar for complete details on leap-orbits.

The orbit has 24 months with either 27 or 28 Sols:

Month Name Sols

Adir 28
Bora 28
Coan 28
Deti 28
Edal 28
Flo 27
Geor 28
Heliba 28
Idanon 28
Jowani 28
Kireal 28
Larno 27
Medior 28
Neturima 28
Ozulikan 28
Pasurabi 28
Rudiakel 28
Safundo 27
Tiunor 28
Ulasja 28
Vadeun 28
Wakumi 28
Xetual 28
Zungo 27 or 18 if a leap-orbit

The month names are based on Frans Blok's "The Rotterdam System".
http://www.geocities.com/fra_nl/rotmonth.html

There are seven sols in a Martian week with the following week names:

Heliosol
Neriosol
Libersol
Terrasol
Venusol
Mercusol
Jovisol

Every Martian month has 4 weeks. On months with 27 Sols, the last week only has six Sols and Jovisol is clipped. This allows the first Sol of every month and every orbit to be Heliosol.

The calendar uses metric time for Mars with the Sol broken up into the following common units:

decasol = 1/10 Sol = 2.46 Earth hours
centisol = 1/100 Sol = 14.8 Earth minutes
millisol = 1/1000 Sol = 1.48 Earth minutes

Martian time of the Sol is usually written in three-digit millisol format to three decimal points. ex. from "000.000" to "999.999".

The common time stamp format for Mars date/time is orbit-month-sol:millisols. ex. "17-Adir-03:523.234"

The time of the day is based on Bruce Mackenzie's "Metric Time for Mars".
http://pweb.jps.net/~tgangale/mars/other/mcknzfrm.htm