Moonbase Alpha

Operations Manual
March 5, 2011

Moonbase Alpha
Storage Area B-7
Storage Area J-3
Nuclear Disposal Area 1
Nuclear Disposal Area 2
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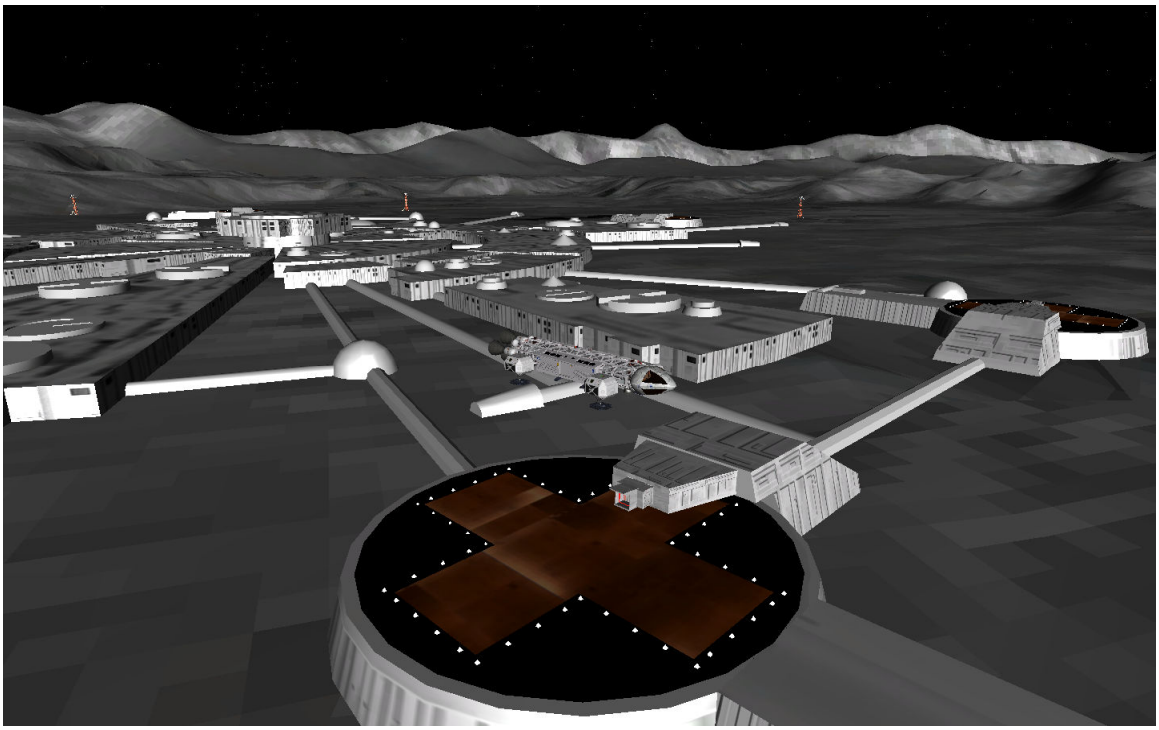
Eagle 3
Mark IX Hawk
Centuri Space Docks
Ultra Probe
Meta Probe
Falcon Shuttle
Moonbuggy
Alpha Construction Tank 1

Introduction

Constructed out of quarried rock and ores, Moonbase Alpha is 4 kilometers (2.5 miles) in diameter and extends up to 1 kilometer (0.6 miles) in areas below the lunar surface. Construction began in the mid 1980's.[2] External construction of Alpha was largely completed in 1994. Moonbase Alpha was planned to be totally self-sustaining. Power is generated through nuclear reactors and the accumulation of solar energy. Some 48 nations have contributed to the Moonbase Alpha project, and the entire world has benefited from their investment. Over 300 people of all nationalities now reside on the Moon, using the latest facilities to advance the frontiers of science. The base serves as both a deep space exploration station and a monitoring site for the nuclear waste areas on the Moon's far side.[3]



A re-envisioned add-on for Orbiter 2010 that faithfully recreates the world of **Space: 1999**. Displacement booths, Transporter utility, UCGO, and UMmu allow a new level of immersion. In this iteration, previously static structures are modeled as vessels, allowing the Orbinaut to interact with the environment.

Required Programs

Orbiter 2010 P1
Orbiter Sound 3.5
Displacement booths
UCGO 2.0
UMmu 2.0

Installation

To install Moonbase Alpha, create a clean Orbiter 2010 P1 (100830). Add:

Displacement booths (http://www.orbithangar.com/searchid.php?ID=4386)
Discard the scenarios folder.

Orbiter Sound 3.5
UCGO 2.0
UMmu 2.0
(All available at http://orbiter.dansteph.com/index.php?disp=d).

Unzip Moonbase Alpha to the location of your Orbiter 2010 P1 folder. Be sure to preserve the directory structure of the package (for example, in WinZip this re-quires activating the "Use Folder Names" option).

The following programs are optional, but enhance the functionality and visual presentation of the simulation:

CameraMFD v0.12 (http://www.orbithangar.com/searchid.php?ID=2645)
Realistic Background (http://www.orbithangar.com/searchid.php?ID=4799)

Moonbase Alpha is placed in the same location used in earlier iterations. Crater meshes and textures have been included from Moonbase Alpha beta 5a (by Santanas). Edit the Base.cfg by adding the following lines:

plato1
plato
plato_lres

From the Orbiter Launchpad, open Modules and select displacement to activate the Moonbase Alpha T Car system.

Orbiter does not modify the Windows registry or any system resources, so no complicated de-installation process is required. Simply delete the Orbiter folder with all contents and subdirectories. This will uninstall Orbiter completely.

Change Log

Moonbase Alpha 101027

- Initial release

Moonbase Alpha 101027v1.0 (can be installed over Moonbase Alpha 101027)

- Corrects Silo and Receiving Well canister release issue
- Corrects Waste Processor camera view issue
- Adds UCGO capability to Freighter and Laboratory Module
- Correctly places texture in ConeE T Car
- Adds Moonbase Alpha specific cargo containers
- Adds Moonbase Alpha, B-7, NDA1, and NDA2 to scenarios starting on Earth
- Updates Operations Manual

Moonbase Alpha 101027v1.1 (can be installed over Moonbase Alpha 101027 or 101027v1.0)

- Resolves program freezes with Winch grappling
- Allows Winch grappling of Silo Caps
- Adds information for non-Moonbase Alpha vessel pad attachment
- Updates Operations Manual

Moonbase Alpha 101027v1.2 (created by installing Moonbase Alpha Expansion Pack 1 over Moonbase Alpha 101027v1.1, requires Moonbase Alpha 101027v1.1)

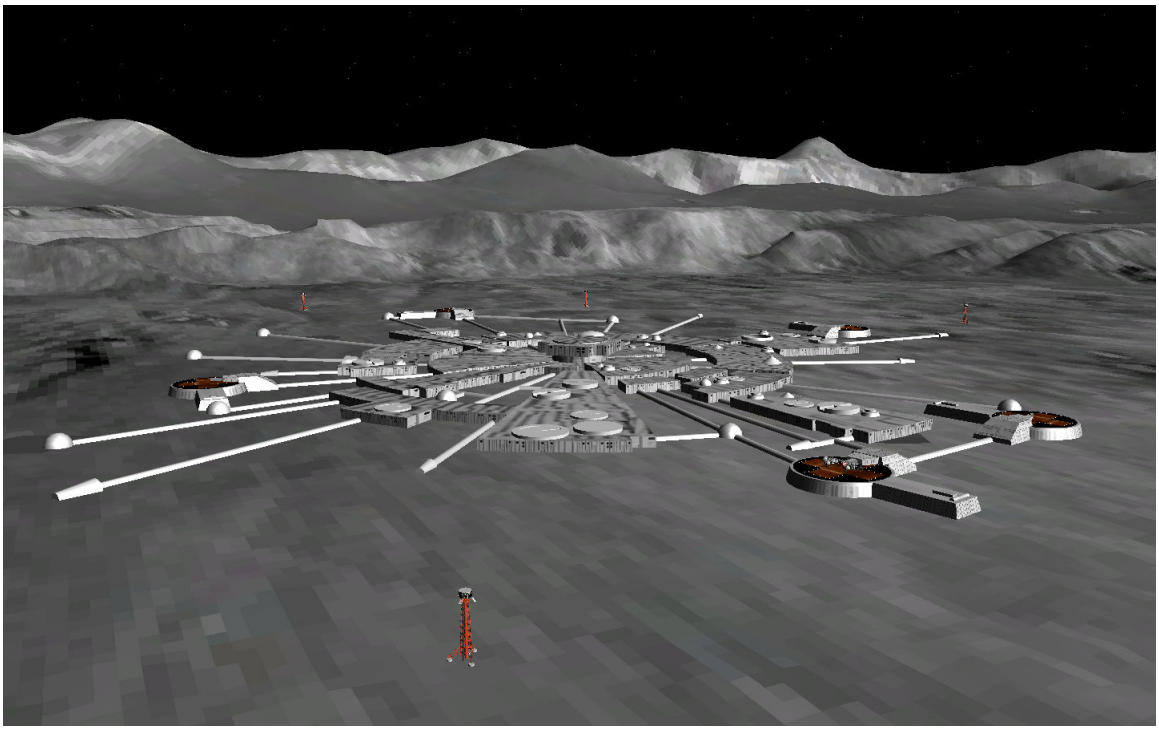
- Adds Centuri Space Docks, Mark IX Hawk, Ultra Probe, and Meta Probe
- Adds Storage Area J-3
- Upgrades Moonbuggy to UCGO capability
- Creates additional Space: 1999 specific cargo
- Corrects scenario dates to occur prior to September 13, 1999
- Resolves UMmu bounce
- Updates Operations Manual

Moonbase Alpha 101027v1.3 (created by installing Moonbase Alpha Expansion Pack 2 over Moonbase Alpha 101027v1.2, requires Moonbase Alpha 101027v1.2)

- Adds a VOR to Moonbase Alpha
- Adds Nuclear Generation Area 3
- Adds Falcon Shuttle
- Updates Operations Manual

Structures Modeled

Moonbase Alpha has active travel tubes, retractable docking lodges, moveable landing pads, and hangar areas beneath the landing pads. UMmu permits travel within and around the moonbase. A Pads and T Pads are landing pads with integrated travel tube stations. Cone Stations serve as travel tube stations and as a storage hangar. Each is modified through UMmu be habitable space. Storage Area B-7, Storage Area J-3, Nuclear Disposal Areas 1, and 2 are also modeled.

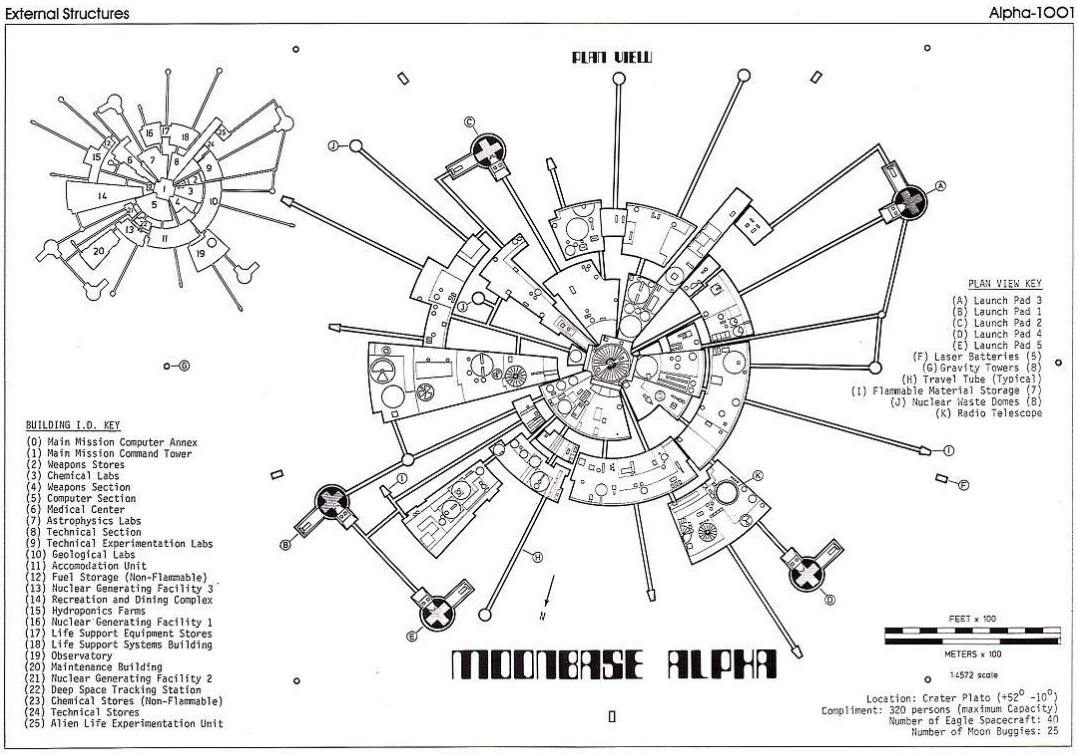


Please note: The following standard Orbiter keystrokes do not perform their usual function in the Moonbase Alpha environment:

1. Shift + "S" no longer calls up Surface MFD. "S" now brings up the vessels' crew manifest
2. Shift + "C"/"C" no longer calls up Comm MFD, this key combination is nonfunctional
3. Shift + "J" no longer calls up TransX, this key combination is nonfunctional

These MFD's and utilities can be activated via cursor from the on-screen menu (Shift + "F1").

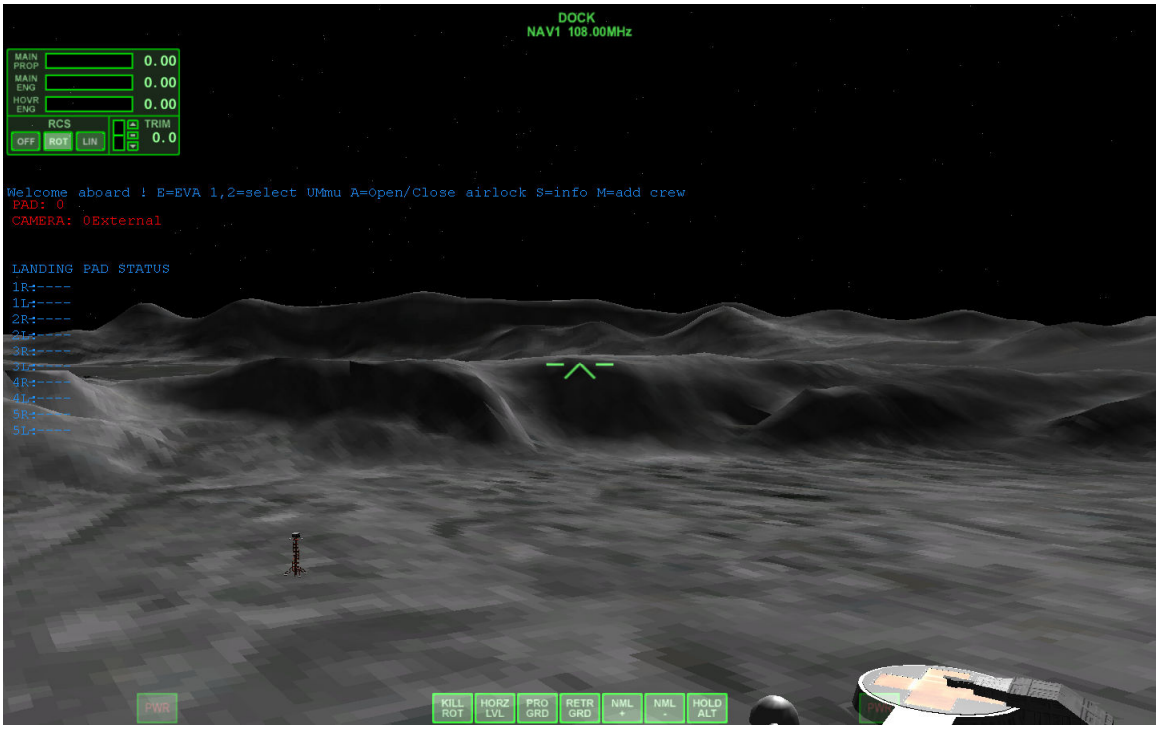
Moonbase Alpha



The operation of Moonbase is controlled from Main Mission Tower, located at the hub of the wheel-shaped base. In emergency situations, Moonbase can be operated from the Command Center, located directly beneath Main Mission on Alpha's lowest construction level.[2]

Main Mission with T Car station off right access corridor

Flight operations are managed from Moonbase Alpha Tower (MBA). From this site, the entire complex can be monitored, the Docking lodges, and landing pads controlled. Spacecraft can be attached to or released from their pads and moved to the adjacent hangar space for servicing.



Select MBA as a focus (F3) then use key commands to monitor the pads and control flight operations at the moonbase. A flashing beacon on the landing pad indicates whether you are cleared for a right (green) or left (red) approach. The VOR frequencies for the five landing pads are available onscreen via “Ctrl + I”.

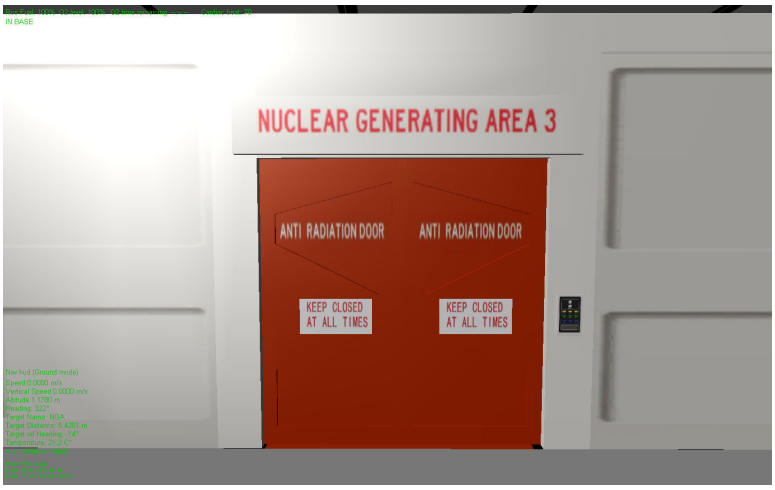
Key Commands

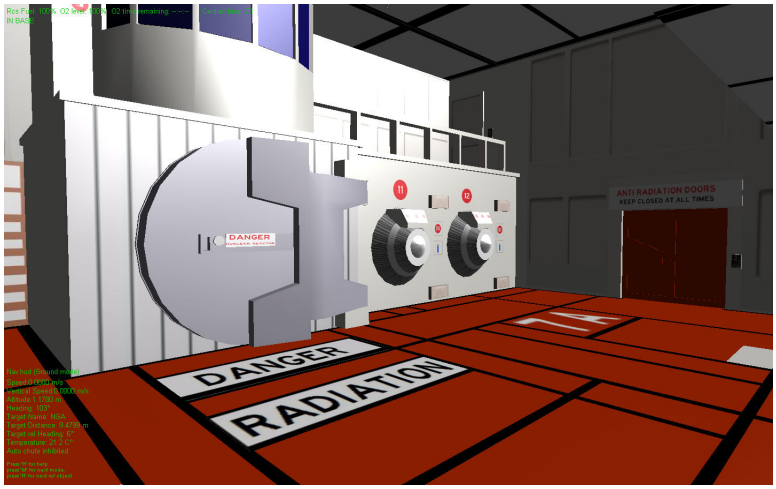
W	Select Landing Pad
9/0	Select Landing Pad Airlock (Pad 1 – 5, Cone E & W)
8	Select Docking Approach Left/Right
7	Lower/Raise Landing Pad
0	Extend/Retract Docking Lodges
G	Operate Outer Lodge Doors
V	Select Pad Camera Views Top/Oblique/Side
K	Attach to Landing Pad
J	Detach from Landing Pad
4	Extend/Retract Crane Rail
5	Extend/Retract Crane
N	Attach Eagle to Crane
B	Release Eagle from Crane

Nuclear Generating Area 3

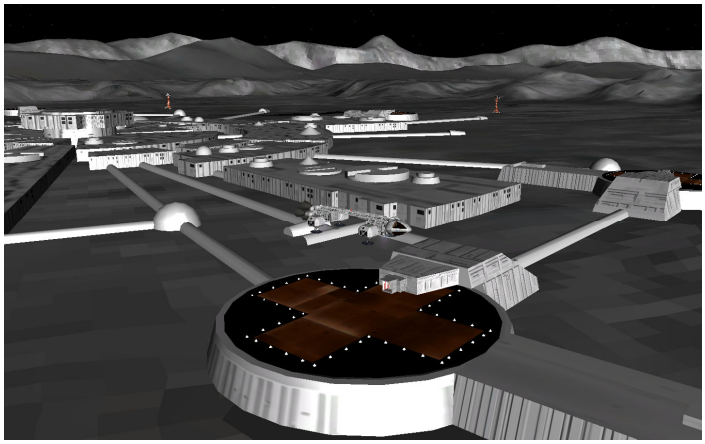
Moonbase Alpha's power requirements are met by solar and nuclear fusion sources. The solar energy plant can supply almost half of Alpha's energy needs at noon during the lunar day. For smaller local requirements, solar batteries on surface buildings, nuclear batteries and cold fusion units can provide supplementary power. The Main Power Unit houses the largest of four fusion reactors, capable of supplying two thirds of Alpha's energy. Nuclear Generating Areas Two, Three and Four are smaller reactors which are only brought up to maximum capacity to meet exceptional power demands and cover during maintenance.[4]

Nuclear Generating Area 3 can be reached via a dedicated T Car line with its central station adjacent to Main Mission. The Generating Area is UMmu and UCGO capable.





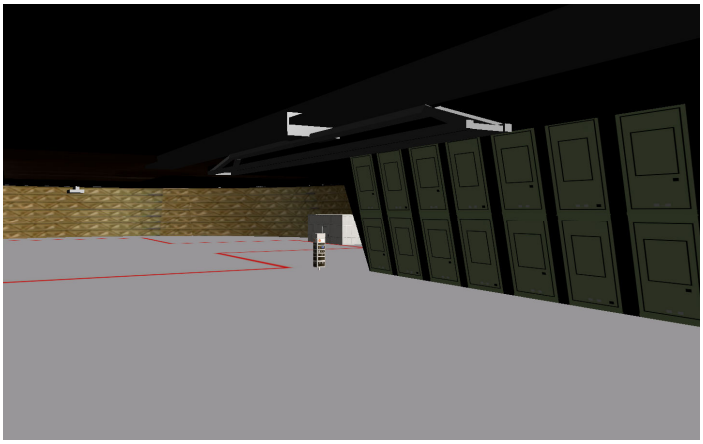
A Pad



Landing Pad

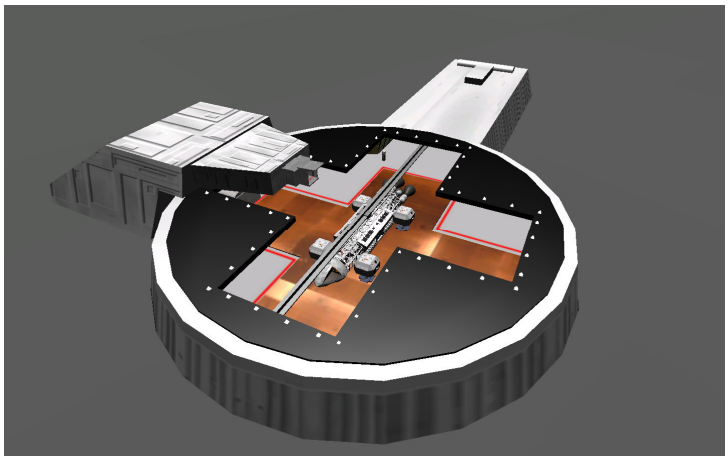
A Pad

Airlock

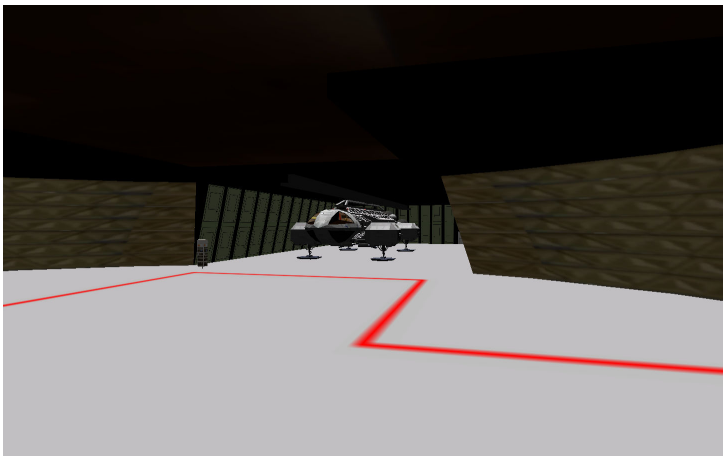


Pad interior with Comm Post
Crane and T Car Station

The Landing Pad and A Pad are identical constructions, allowing a habitable space for storage, Eagle repair, and a tube car station, in the area beneath the pad. This space is accessible through UMmu. The pad surface can be raised and lowered from the Comm Post nearest the hangar area (A UMmu "Action Site") or from the pad's focus (MBA focus for the Landing Pad). Spacecraft attachment to the Landing Pad is controlled from MBA. Attachment to the A Pad is managed from its own focus. A ceiling crane allows spacecraft on the pad to be moved to the hangar area. The pad cannot be lowered with the crane rail extended. The crane cannot be extended without first extending the crane rail. The crane rail and crane are controlled from the A Pad's focus (MBA focus for the Landing Pad).



Eagle with Crane in Position



Eagle in Hangar

Key Commands

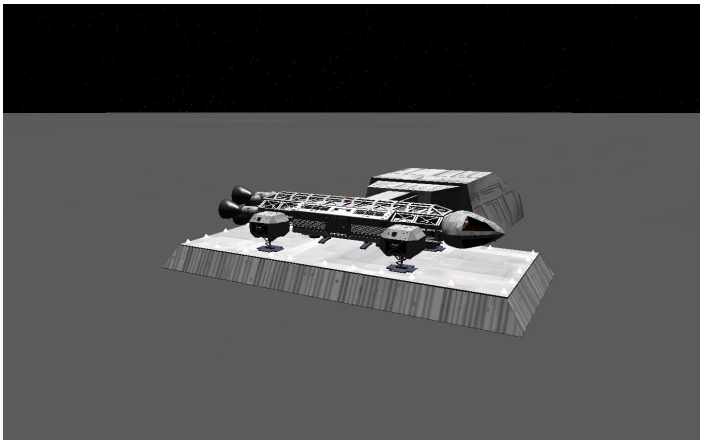
W	Select Landing Pad
8	Select Docking Approach Left/Right
7	Lower/Raise Landing Pad
O	Extend/Retract Docking Lodges
G	Operate Outer Lodge Doors
V	Select Pad Camera Views
K	Attach to Landing Pad
J	Detach from Landing Pad
4	Extend/Retract Crane Rail
5	Extend/Retract Crane
N	Attach Eagle to Crane
B	Release Eagle from Crane

Transporting the Eagle from Pad to Hangar Area

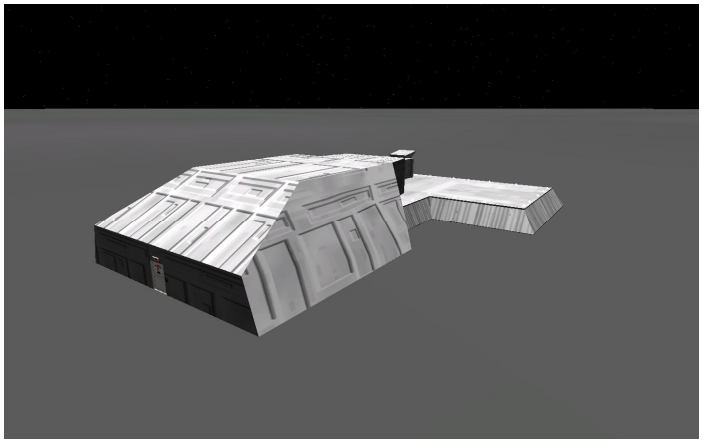
- With the A Pad (MBA for the Landing Pad) as focus (F3), and the Eagle attached to a retracted landing pad, select "4" to extend the Crane Rail
- Select "5" to extend the Crane and "N" to attach the Eagle to the crane
- Select "5" to retract the Crane to the Hangar Area
- Select "4" to retract the Crane Rail

The Landing Pad can now be elevated to pressurize the Hangar Area and allow pad access for other landing vessels.

T Pad

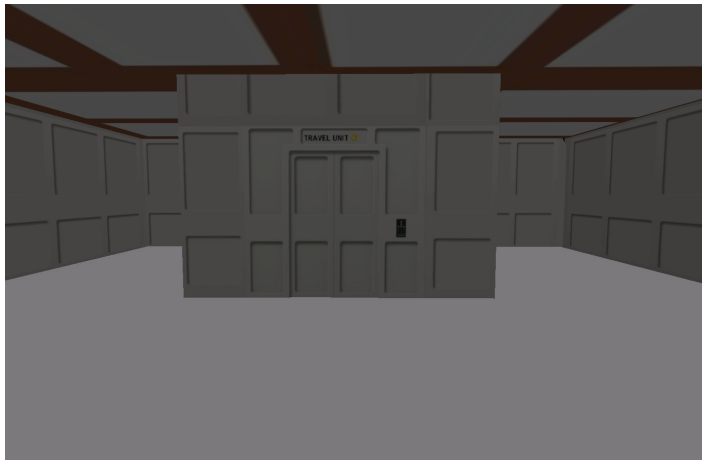


T Pad



T Pad Airlock

T Pad Airlock Interior



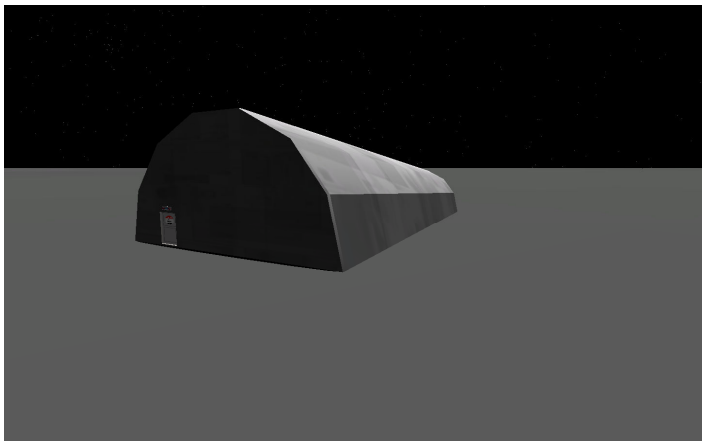
T Pad T Car Station

The T Pad is a variation on the Landing Pad without hangar space but including a T Car station and airlock to the surface. Spacecraft attachment to the T Pad is managed from its own focus. This space is accessible through UMmu.

Key Commands

W	Select Landing Pad
8	Select Docking Approach Left/Right
O	Extend/Retract Docking Lodges
G	Operate Outer Lodge Doors
V	Select Pad Camera Views
K	Attach to Landing Pad
J	Detach from Landing Pad

Cone Station



Cone Station

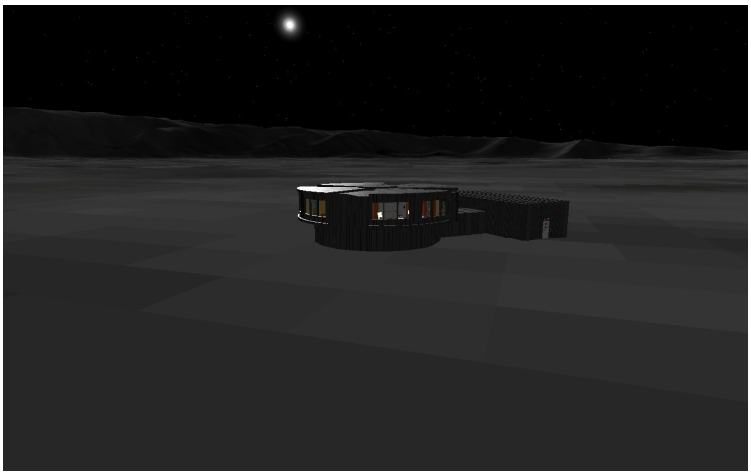
Cone Station Interior with
T Car Station

Cone Station Airlock

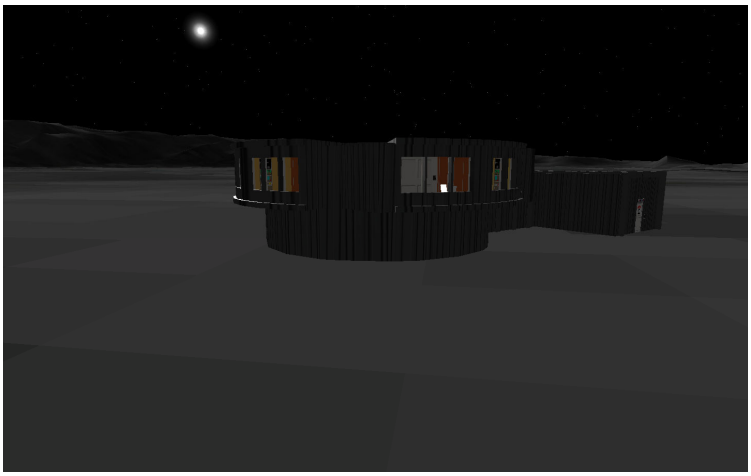
The Cone Station is additional habitable space with an associated T Car station. It is UMmu accessible.

Depot

The Depot serves as a base of operations for mission activities outside the Moonbase Alpha campus. It is the monitoring hub for Nuclear Disposal Area 2. The Depot includes monitoring laboratories, hangar space for Moonbuggys, and a T Car station. It is UMmu accessible. Key command "V" will cycle camera views throughout the structure.



Depot with T Car Station



Depot Offices

Depot Corridor

Depot Moonbuggy Hangar

Nuclear Disposal Areas

Reactor accidents occurring at Three Mile Island and Chernobyl eroded the sense of safety that had been ascribed to the civilian use of nuclear power. Increasing public and political fears about radiation contamination of the environment led the American, Russian, and European authorities to ban civilian nuclear power and decommission all existing fission based plants in late 1987.

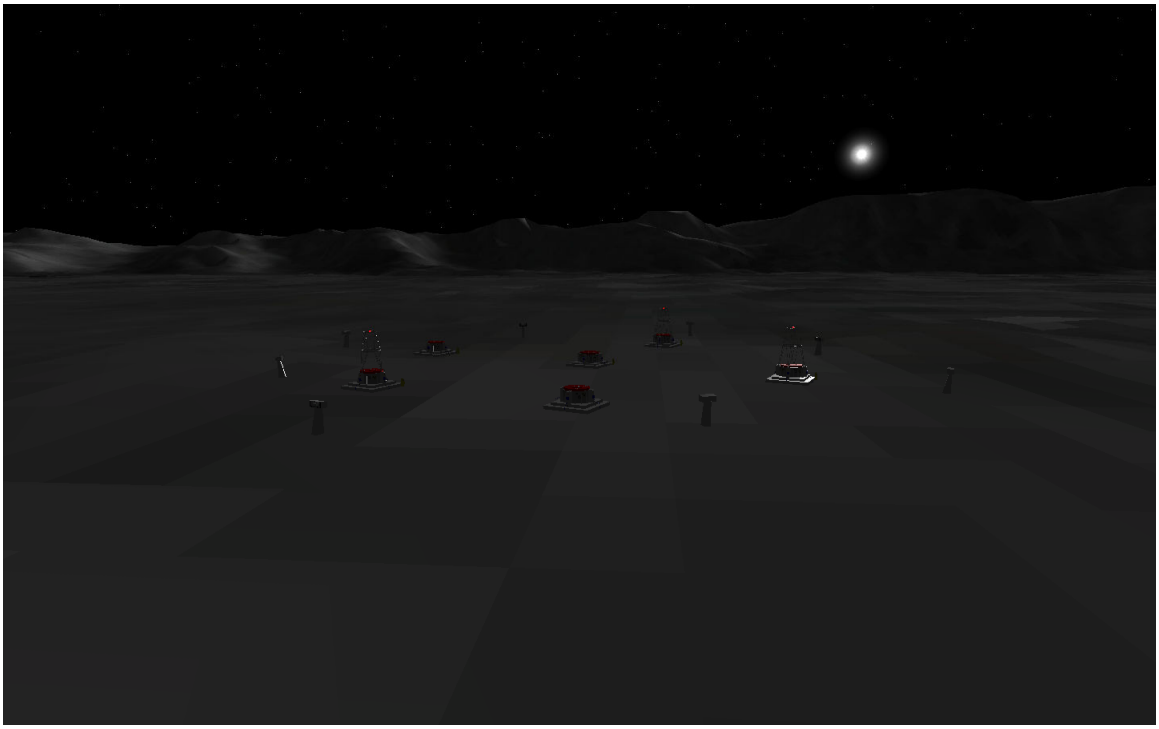
It became clear that the disposal of nuclear wastes in oceans, or in geological formations on land, was environmentally and politically unacceptable. With high quantities of existing wastes in temporary storage, and materials from the dismantling of plants being created, an urgent solution was required. The availability of low cost, safe, and reliable Earth to orbit spacecraft, made the Moon a viable option for disposal of these wastes.[8]

High and intermediate level radioactive wastes are processed at highly regulated regional sites on each continent. There, the wastes are concentrated, cast in stainless steel nimonic 90 alloy canisters 2 meters tall, 2 meters in diameter, and enclosed in a synthocrete shield. These canisters are then ferried to the Moon in lots of thirty.[8]

There are two main nuclear waste disposal areas, a smaller pilot nuclear storage site, and a nuclear fuel core repository. Storage area B-7 is an experimental site surveyed in 1989 and opened late that year. Storage area J-3 serves as a nuclear fuel core repository. Nuclear Disposal Area 1 opened in 1991 and closed after being filled to capacity in 1994. Nuclear Disposal Area 2 opened in 1994 and is still operating.[8,9] The pilot site and both nuclear disposal areas are located on the far side of the Moon.

Storage Area B-7

Storage Area B-7 was the first lunar site surveyed as a nuclear waste repository. The site is located in the crater Ceraski. Geologic surveys in 1989 proved satisfactory, allowing the site to be used as a test bed to perfect secure, environmentally sound equipment and procedures for depositing nuclear waste. Through work here, lunar deep mining techniques were developed. Subsequent research in synthocrete sealants at this site, led to the transition from lunar regolith capping of waste silos to the use of synthocrete silo caps. There are 6 silos, up to 3 km deep, each capped with the prototype synthocrete covers.[5, 8, 9]

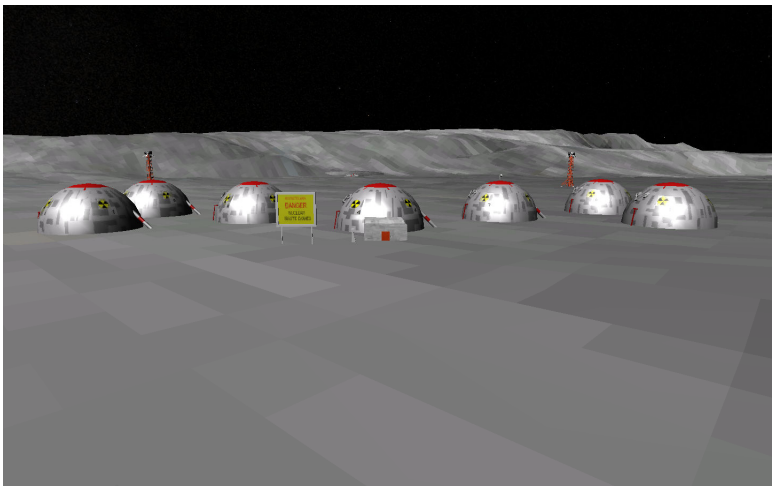


Storage Area J-3

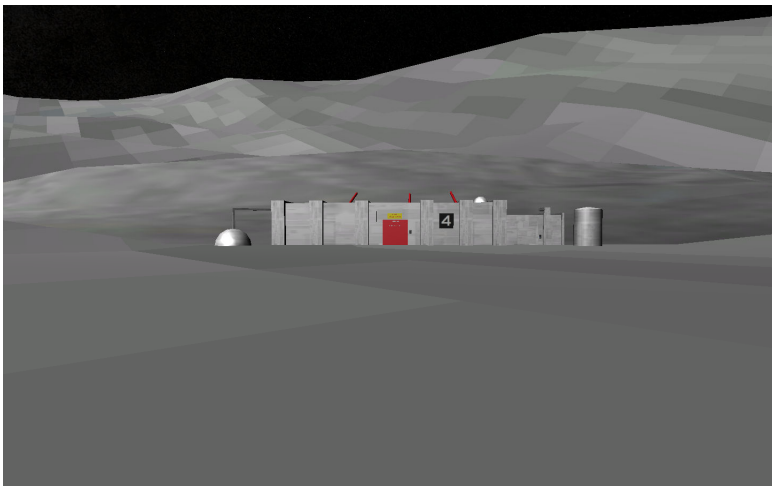
Storage area J-3 is an experimental handling site constructed to store the most radioactive reactor cores. The area was completed in conjunction with Moonbase Alpha and receives the bases reactor cores. It is composed of 6 domes, a Monitoring Station, and nuclear Fuel Storage bunker in the crater Fracastorius on the near side of the Moon.[5, 8, 9]

The Monitoring Station is accessible via its airlock. It contains a telemetry center and a reactor core storage site which can be reached by a corridor off the telemetry center. The monitoring station is UMmu capable.

The Fuel Storage bunker abuts a ridge near the western crater rim. It contains storage cabinets for reactor cores, EVA suit storage, telemetry and communication consoles, as well as an attached Moonbuggy hangar. The Fuel Storage bunker does not have an airlock. The Moonbuggy hangar serves as the airlock for the bunker. The hangar door (as well as the front and interior doors) can be activated with the UMmu in proximity to their action site by hitting "Enter". The Fuel Storage bunker is UMmu and UCGO capable. "V" will cycle camera views within the bunker.



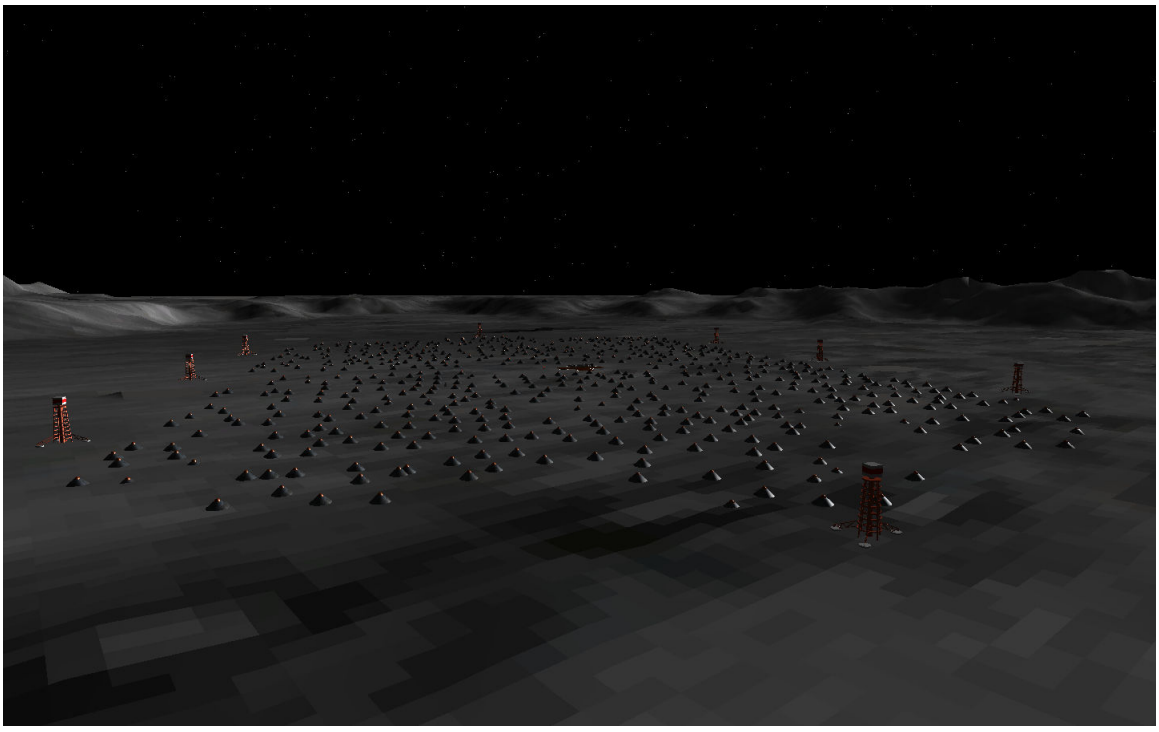
Storage Area J-3



Fuel Storage Bunker

Nuclear Disposal Area 1

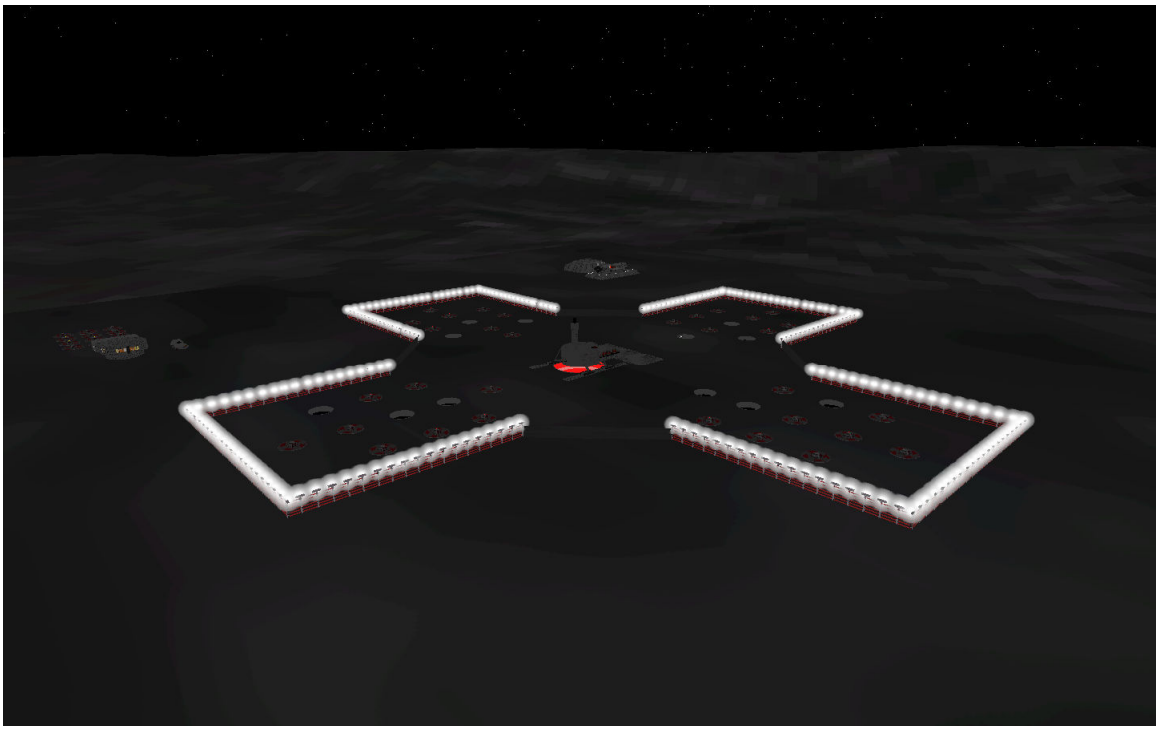
Nuclear Disposal Area 1 was the first nuclear waste dump on the Moon. Located in the Planck basin, it was closed in 1994 and later identified as Navigation Beacon Delta, a landmark for traffic enroute to Nuclear Disposal Area 2. It was built without synthocrete radiation covers; instead the silos are covered with large mounds of lunar regolith and capped by orange monitoring domes. It contains some 30,000 tons of radioactive waste. Between the domes are towers, formerly used to provide artificial gravity and now used as flashing beacons.[5, 8]



Nuclear Disposal Area 2

Located in the crater Schrodinger near the lunar South Pole, Nuclear Disposal Area 2 opened in 1994. Site activities are monitored from the Monitoring Depot. This site is much bigger than Nuclear Disposal Area 1 (140 times as much nuclear waste); encompassing seven fields each ranging from 1.1to 4.8 kilometers in diameter. Unlike the earlier construction, it includes synthocrete radiation covers and a perimeter laser barrier.[4] Some 4.2 million tons of waste is stored in underground silos at this site.[8] Radiation levels are closely monitored from the Depot. Nuclear Disposal Area 2, site 7 is modeled here. The installation includes a T Pad landing area outside the security perimeter with T Car access to the Monitoring Depot. The synthocrete radiation covers necessary for capping silos are stored at the Depot site.

Nuclear Disposal Area 2 is modeled with a central Receiving Well and twelve silos that are UCGO capable. This allows the well to receive and discharge canisters, and the selected silos to be filled and capped.



Nuclear Disposal Area 2
Key Commands

G	Open/Close Gate
K	Activate Barrier
J	Deactivate Barrier

T Pad
Key Commands

W	Select Landing Pad
8	Select Docking Approach Left/Right
O	Extend/Retract Docking Lodges
G	Operate Outer Lodge Doors
V	Select Pad Camera Views
K	Attach to Landing Pad
J	Detach from Landing Pad

Nuclear Waste Processor

The handling of most nuclear waste is by remotely operated equipment or fully automated systems. The Nuclear Waste Processor deployed at Nuclear Disposal Area 2 is a self propelled, four trucked, tracked vehicle that is remotely operated. It is designed to receive and entomb intermediate and high level radioactive wastes from both lunar and terrestrial sites. The waste is received in stainless steel nimonic 90 alloy canisters enclosed in a synthocrete shield. The canisters are designed to be buried in silos. The Nuclear Waste Processor collects the shielded waste and deposits the canisters in the silos.[9] Earlier silos were capped by mounds of lunar regolith. Currently, when filled, the silos are capped with synthocrete radiation covers.

Key Commands

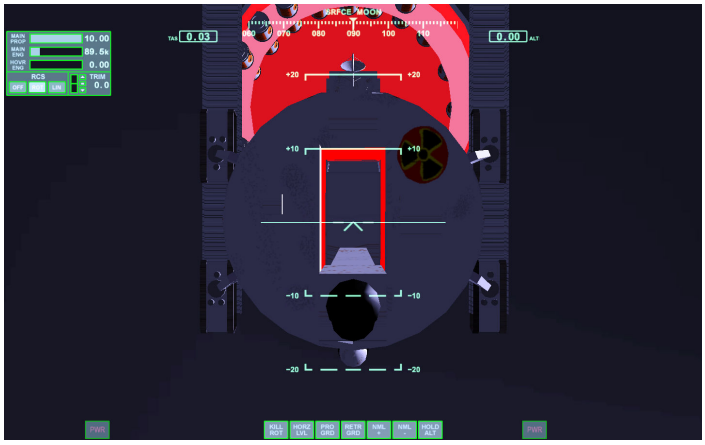
Numpad +	Forward
Numpad -	Reverse
Numpad *	Stop
Numpad 1	Left
Numpad 3	Right
5	Lower/Raise Platform
V	Select Camera View

Nuclear Waste Processor Operating Instructions

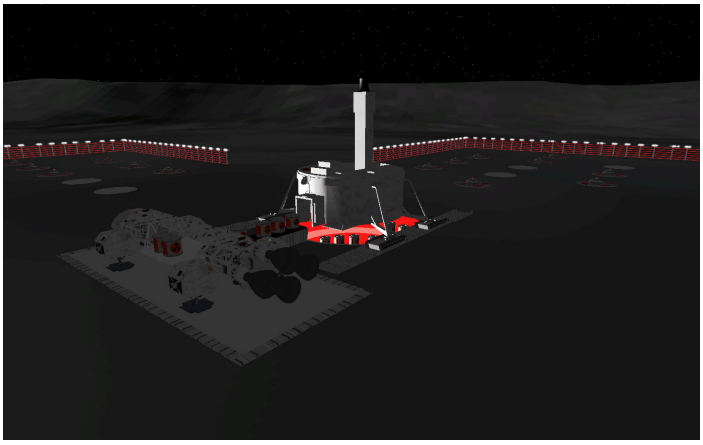
The Nuclear Waste Processor's parking position is over the Receiving Well abutting the Conveyor, at Nuclear Disposal Area 2. Select the waste processor as the focus (F3) and cycle to cockpit view (F1). Your view forward is from the perspective of the access port to the cargo hold of the processor. Maximum Engine Output should range between 58.0 and 110.0 K (load dependent) in forward or reverse. Maximum speed should not exceed 2 KPH. Backing motion can be facilitated by cycling through overhead view (V). Camera MFD utility can also be used as a maneuvering aid for backing. The processor accepts UCGO cargo commands. Please review UCGO documentation for grappling and release instructions.

Nuclear Waste Processor
Forward View

Camera MFD Rear View



Overhead View



Nuclear Waste Processor with
Canister Carriage Deployed

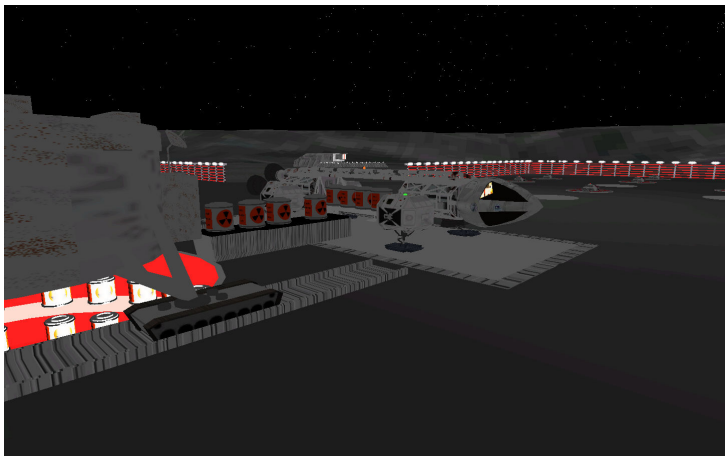
Nuclear Waste Transfer Operations

Upon touchdown at Nuclear Disposal Area 2's Waste Processor Pad (VOR 116.40), Nuclear Waste Canisters are unloaded from either side of the Platform Pod. With the Platform Pod as focus (F3):

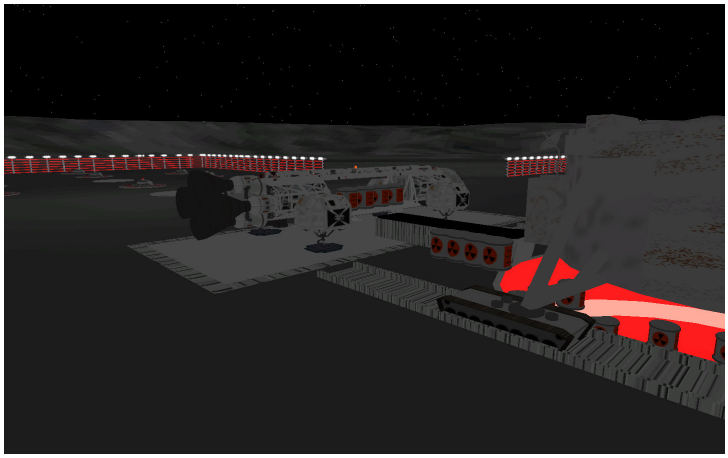
- Select "1" for right unloading or "2" for left unloading
- Release the canisters to the ground "Shift + C"
- Select the Conveyor as focus. Use "C" to grapple the canisters and "Shift + C" to move them to the ground adjacent to the Waste Processor for pickup
- With the Waste Processor as focus, use "5" to lower the canister carriage (Note: The canister carriage must be lowered in order for the Waste Processor receive or discharge canisters)
- With the Waste Processor as focus, use "C" to grapple the canisters and secure them in the processor's hold

The Waste Processor's maximum capacity is 16 canisters. The canisters may be transferred to the Receiving Well beneath the processor, or directly to an available silo.

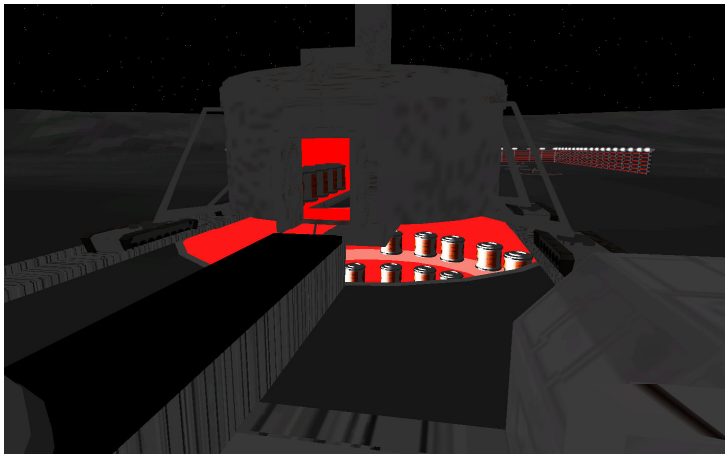
Right Approach Unloading



Conveyor Grapple



Conveyor release

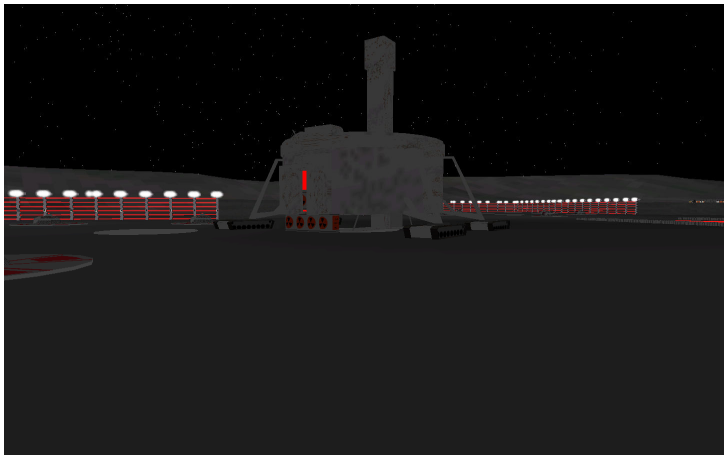


Waste Processor Pickup

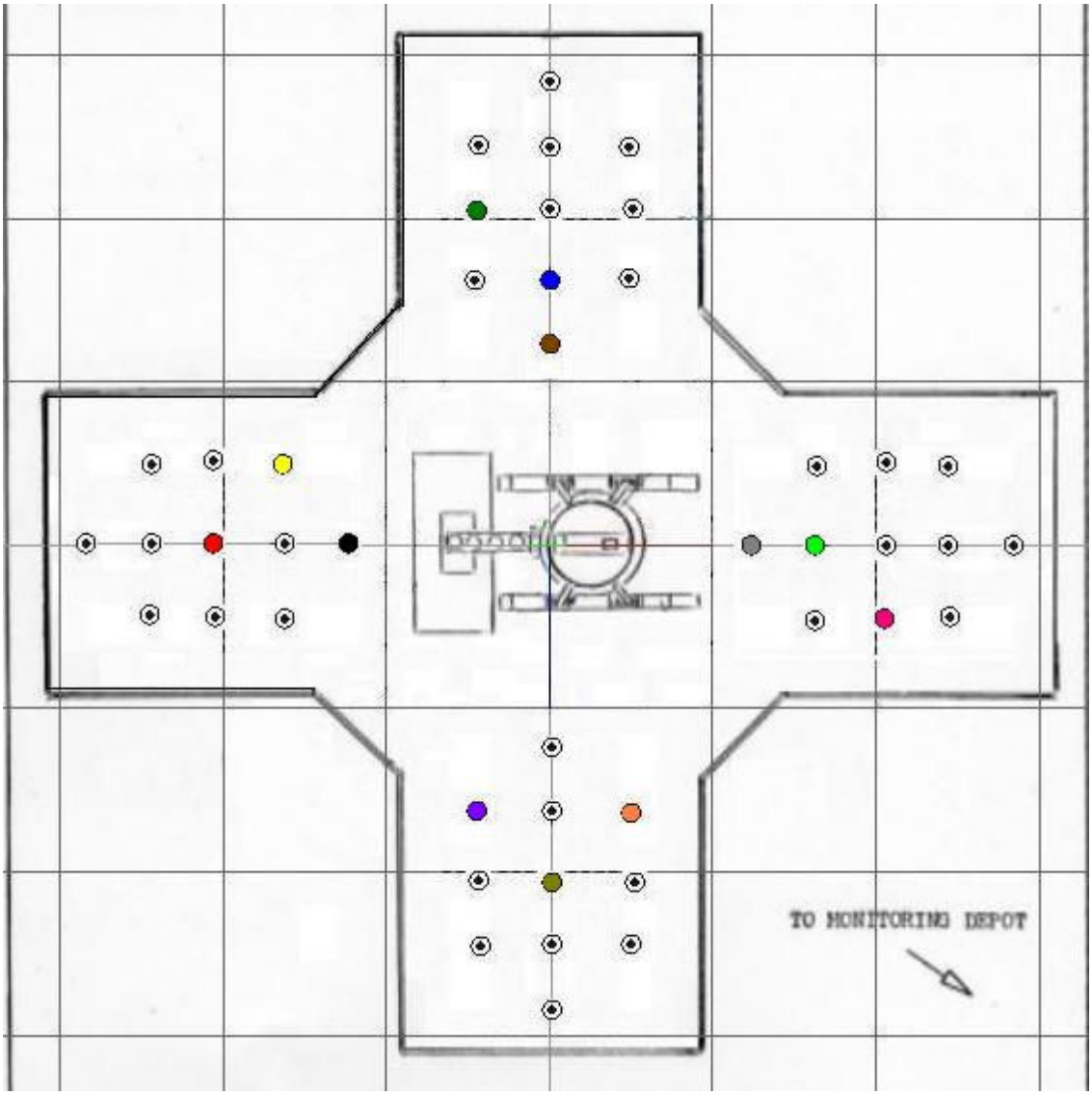
To release Canisters from the Waste Processor to the Receiving Well or Silo

- Position the processor over the well or silo
- Lower the platform “5” (Note: The canister carriage must be lowered in order for the Waste Processor receive or discharge canisters)
- Release the canisters to the ground “Shift + C”
- With the Receiving Well or appropriate silo as focus (F3), use “C” to load the canisters. The silo’s maximum capacity is 12 canisters. The Receiving Well’s maximum capacity is 40 canisters

Canister Release at Receiving Well
(The canisters will “float” over the Receiving Well)



Canister Release at Silo

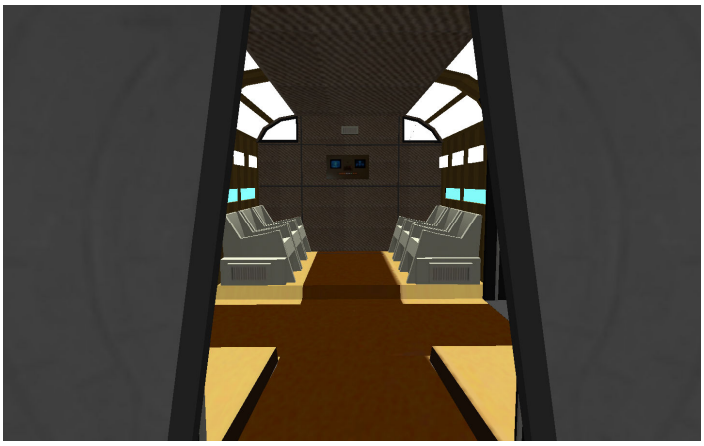


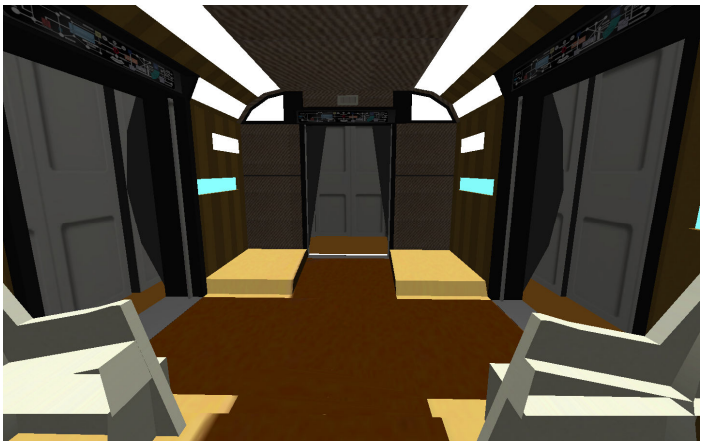
Nuclear Disposal Area 2 Silo Legend

Silo 1 Black	Silo 4 Green	Silo 7 Gray	Silo 10 Orange
Silo 2 Red	Silo 5 Blue	Silo 8 Lime	Silo 11 Olive
Silo 3 Yellow	Silo 6 Brown	Silo 9 Pink	Silo 12 Purple

Nuclear Disposal Area 2 is constructed to allow the waste processor unobstructed access to all silos. Filled silos are identified by a red cap beacon. Twelve silos are available for filling and are identified in the map above. Empty silos are uncapped. Exercise caution during extravehicular activity in close proximity to empty silos to avoid injury.

T Car





The T Car and the tube transportation system is the key that allows full immersion in the Moonbase Alpha experience. The combination of Displacement Booth, Transporter, and UMmu utilities allows transport throughout the Moonbases' habitable areas. The cars are UMmu accessible. Once inside, a dialogue box displays a menu of stops defined by keystrokes. Please refer to Displacement Booth and UMmu documentation for more information.

Due to limitations on the number of Displacement Booth cars available for use in a scenario (9), Transporter utility based T Cars are also utilized to move through structures on and off the Moonbase Alpha campus.

To travel via Transporter utility based T Car

- Determine the name of the T Cars in the scenario and their location (F3 can identify the T Cars in the scenario)
- Since the T Car is UMmu accessible. Move to the door as you would for any UMmu vessel
- Move to the center of the car (the action range is limited to 2 meters). Switch focus (F3) to the T Car you are in. At the left of your screen you will see T Car name: "none listed". Press "[" and type the name of the target T Car at the prompt. Press "G" to activate the car and then press "G" again to turn it off (If you don't deactivate the car, your avatar will not move)
- Exit the car

Spacecraft Modeled

Eagle with Transporter Pod

The workhorse of Moonbase Alpha is the Eagle. It is one of several classes of vessel originally authorized by the International Lunar Finance Commission and constructed by the Engineering and Technics section of Moonbase Alpha using materials and components either shipped from Earth or manufactured on the Moon. Completely modular, the craft is divided into three basic sections: the command module, the service pod, and the superstructure (containing the landing gear), main fuel tanks and boosters. Moonbase Alpha supports a fleet of twelve Transporter Eagles, twenty-six Recon Freighters, and two Rescue Eagles on 24-hour alert status.[2]

Eagles are serviced in the hangar complexes directly beneath the main launch pads. A crew of Eagle engineers is responsible for repairing or replacing damaged components, and maintaining the Eagles in flight-ready condition.[2]

In the event of an emergency requiring the immediate evacuation of Moonbase Alpha, all available Eagles are employed to transport colonists and supplies from Alpha to a habitable planetary environment.[6]

This iteration (Eagle3) has a Virtual Cockpit reminiscent of the original craft. It allows the attachment of interchangeable mission specific modules (Pods) and carries a surface buggy. The Eagle is UCGO and UMmu capable.

The Eagle has six airlocks. Front and Rear, are for exiting to or entering from the ground. TPAD L or TPAD R, are for disembarkment from left or right attachment to a T Pad. APAD L or APAD R, are for disembarkment from left or right attachment to an A Pad or moonbase Landing Pad. Select the correct airlock, open it "D", and egress "E". Your UMmu will appear in the pad's airlock. To return to the Eagle, the UMmu needs to be in the pad's airlock at the same location. Switch Focus (F3) to the Eagle to assure the appropriate airlock is open, switch focus (F3) back to your UMmu and press "E".

New Eagle Flight Deck

Key Commands

9/0	Select Airlock
	Fwd
	Aft
	TPad L
	TPad R
	APad L
	APad R
D	Open/Close Airlock
G	Deploy/Retract Gear
7	Open/Close Buggy Hatch
8	Raise/Lower Buggy
K	Attach Pod
J	Release Pod
N	Attach Buggy
B	Release Buggy
V	Select Camera View

Please see UCGO/UMmu documentation for further information on motion commands.

The Eagles are designed primarily for extra-atmospheric flight and are not dynamically stable in the atmosphere. Atmospheric flight is possible but requires an active autopilot to maintain level flight (Horz Lvl). Orbital insertion can be achieved through the use of the above mentioned autopilot modes, Hover engines, and Trim settings to maintain lift and vector thrust.

Eagle Atmospheric (Earth) Launch Profile

- Activate Surface MFD and Orbit or Ascent Profile MFD
- Activate "L" (Hors Lvl) Autopilot
- Engage Hover engines (≈ 2.04 M provides a VACC of ≈ 0.4 m/s)
- Use rotation thrusters and Autopilot (Kill Rot) to establish heading (42° for ascending node Mir intercept or Lunar insertion parking orbit, 136° for descending node ISS intercept). Retract gear
- Engage Main engines, full thrust. Maintain heading
- Disengage (Hors Lvl) Autopilot, Pitch up 20°Hover thrust (≤ 2.04 M) as needed to maintain a Pitch up of 20°, VS ≈ 200 m/s, and a VACC of > 55 m/s^2 up to an altitude of 80 Km
- At 80 Km, gradually decrease Hover thrust to achieve a VACC of ≈ -50 to -80 m/s^2 and decrease VS to < 10 m/s
- Use Orbit or Ascent Profile MFD to monitor flight
- At a periapsis of ≥ 100 Km and a velocity of > 7300 m/s shutdown Main and Hover engines
- Using Orbit MFD, perform a prograde circularization burn at apoapsis

Approach Procedure to Landing Pad (MBA, A Pad, T Pad)

- From the Eagle's focus (F3) using Hover engines, establish a stabilized descent (< 1 meter/sec) to the selected landing site using VOR/VTOL MFD and onboard views "V" for guidance, RCS in translation mode, and "L" (Hors Lvl) Autopilot to maintain alignment
- At 60 meter altitude, switch to MBA (A Pad or T Pad) focus, select the appropriate landing pad. Select the appropriate (Left/Right) docking approach "8". Return focus to Eagle to maintain a stabilized descent
- At 20 meter callout, switch to MBA (A Pad or T Pad) focus. Follow descent to ≈ 2 meters. Press "K" to attach Eagle to the landing pad
- Return focus to Eagle to shutdown Hover engines and disengage Autopilot

Departure Procedure from Landing Pad (MBA, A Pad, T Pad)

- From the Eagle's focus (F3) select "L" (Hors Lvl) Autopilot to maintain attitude. Using Hover engines, throttle up to ≥ 342 K
- Switch to MBA (A Pad or T Pad) focus, select the appropriate landing pad and select "J" to release the Eagle from the pad
- Use VOR/VTOL MFD and onboard views "V" for guidance. Use RCS in translation mode for orientation and RCS in rotation mode to achieve desired departure heading. Apply Prograde/Retrograde thrust as necessary

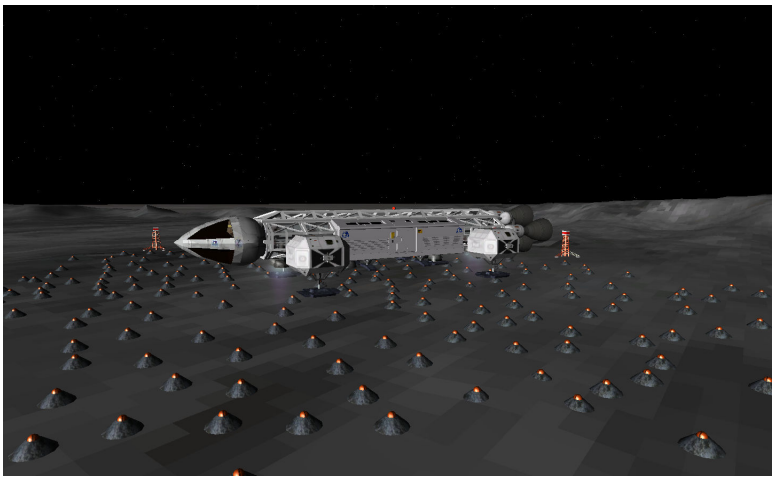
Warning

Jettisoning any Eagle Module (Pod) while in flight will result in an immediate loss of hover thrust which must be compensated by the pilot in command. Failure to maintain adequate hover thrust may lead to rapid loss of altitude and present significant hazard during approach to landing, landing, and departure flight regimes.

Eagle Modules (Pods)

There are four primary mission specific modules (Pods) that can be carried by the Eagle; Freighter, Reconnaissance, Rescue, and Transporter. These Pods have identical external dimensions and are distinguished only by the alternating red and white vertical stripes of the Rescue Pod or the orange of the VIP Transporter Pod.[7] All Pods are UMmu capable. The Freighter, Laboratory, Platform and Winch Pods are UCGO capable.

Freighter Pod



Freighter Pod

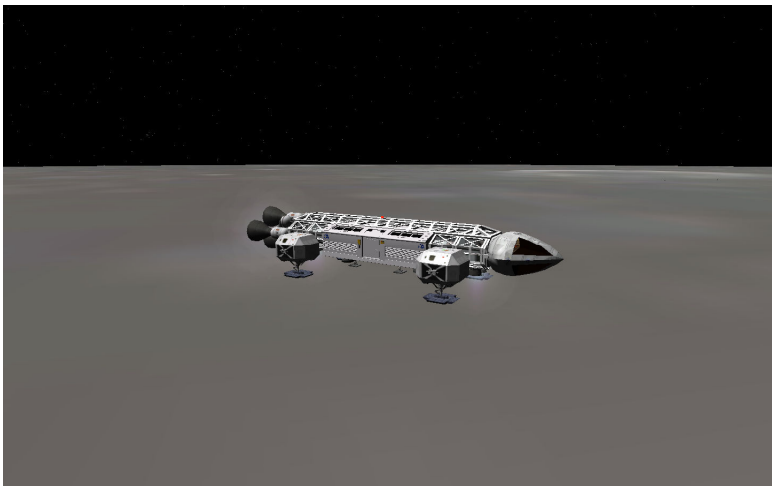
Freighter Pod looking forward

The Freighter Pod is used for transporting supplies and equipment to exploration teams on a planet's surface, and for the return of native elements essential to Moonbase Alpha's environmental and reprocessing systems. Freighters can also be used for refueling Eagles as space-borne tankers or transporting additional fuel to Eagles with insufficient reserves to return to Alpha.[6] The Freighter is UCGO capable and can carry six cargo containers (Please see UCGO documentation for key commands).

Key Commands

4/5	Select Airlock Left Right Forward Aft
D	Open/Close Airlock
6	Rt Cargo Release
7	Lt Cargo Release
V	Select Camera View

Reconnaissance Pod



Reconnaissance Pod

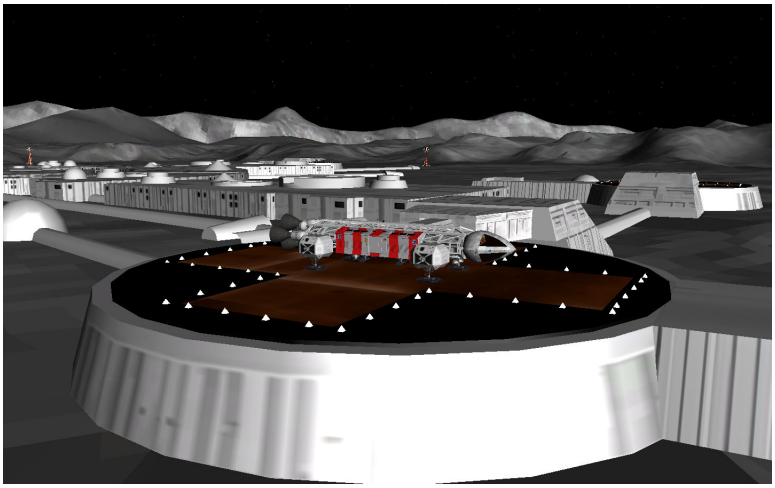
Reconnaissance Pod looking forward

These pods are equipped with various types of sensors for exploratory missions. The Reconnaissance Pods also contain a computer that can work independently or be networked with Moonbase Alpha's primary computer.[6]

Key Commands

9/0	Select Airlock Left Right Forward Aft
D	Open/Close Airlock
V	Select Camera View

Rescue Pod



Rescue Pod at Moonbase Alpha

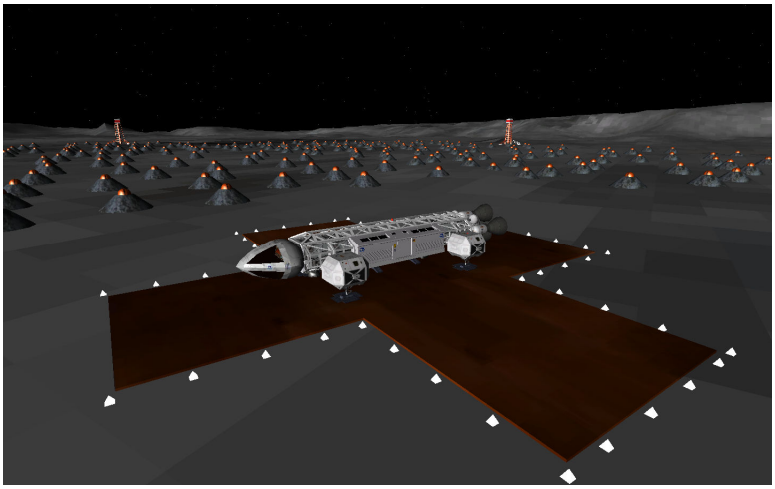
Rescue Pod looking aft

Rescue Pods are Transporters that have been fitted with a special passenger pod, identified by bold red stripes on the exterior. These are adapted for field diagnosis and treatment of injuries or diseases that may be encountered on a mission. Manned by medical personnel, Rescue Pods are equipped with mobile beds, monitors, and facilities for field surgery.[6]

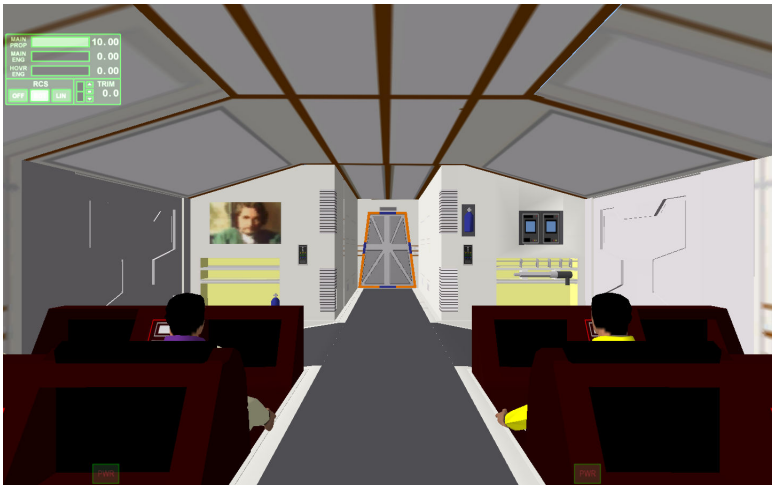
Key Commands

9/0	Select Airlock
	Left
	Right
	Forward
	Aft
D	Open/Close Airlock
V	Select Camera View

Transporter Pod



Transporter Pod



Transporter Pod looking forward

The Transporter is a standard passenger pod (the VIP Pod is a variant of this module). It can normally accommodate eight passengers. Under emergency conditions (such as evacuation of Moonbase), it can carry up to twelve passengers, additional water, and provisions for extended habitation. Transporters are used for missions on the lunar surface, in lunar orbit, in the general vicinity of Moonbase, or on routine planetary landings when no special laboratory or environmental equipment is necessary.[6]

Key Commands

9/0	Select Airlock
	Left
	Right
	Forward
	Aft
D	Open/Close Airlock
V	Select Camera View

Specialty Pods

Winch Pod at Nuclear Disposal Area 2

Platform Pod at Nuclear Disposal Area 2

The Eagle can also accommodate one of several specialty modules such as the Winch, Platform, and Laboratory Pods. The Winch and Platform Pods are used to lift and transport nuclear waste canisters. The Winch does not directly grapple objects. With the Winch as focus (F3), it grapples the Magnet "K". From the Magnet's focus the object can be grappled "K" or released "J". From the Winch's focus "J" will release the Magnet.

The pods are all UMmu accessible. Each pod can be attached or released through the Eagle when the Eagle is the focus vessel. The Eagle's forward and aft airlocks are also operated from the Eagle's focus (see Eagle section). The Freighter, Laboratory, Reconnaissance, Rescue, and Transporter Pods are habitable spaces. Each is accessible to the external environment through airlocks.

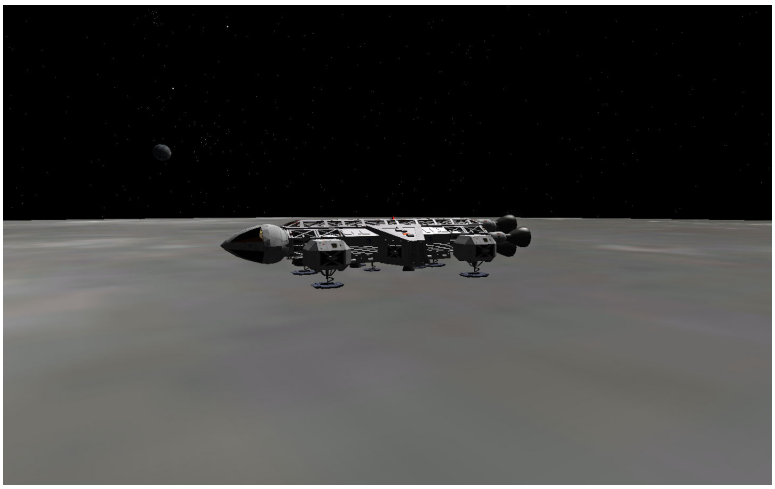
Winch Pod
Key Commands

5	Lower Winch
6	Raise Winch
K	Winch Grapple
J	Winch Release
G	Toggle Grapple Beacon

Platform Pod
Key Commands

9	Cargo Options
Shift + 9	Select Cargo
C	Grapple Cargo
Shift + C	Release Cargo "1" for right release "2" for left release
V	Select Camera View

Laboratory Pod



Laboratory Pod

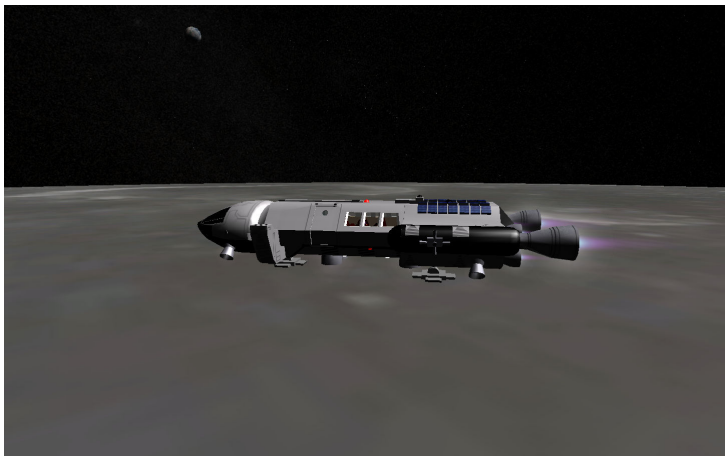
Laboratory Pod looking forward

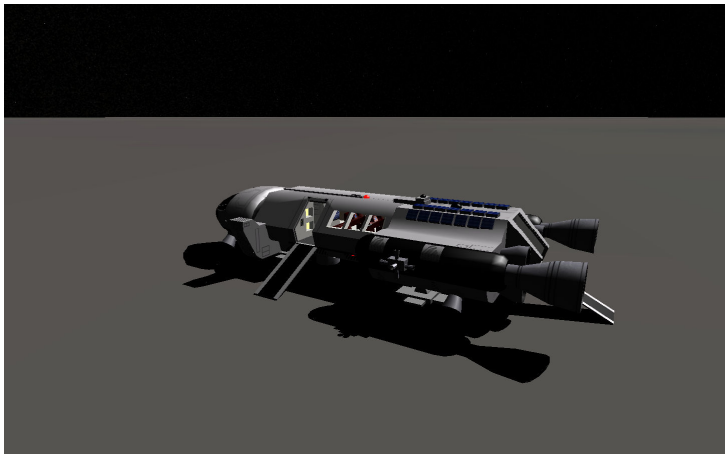
The Laboratory Pod is a modified version of the Transporter Pod equipped to serve as a remote laboratory. Uses of this pod include the location and refinement of crude minerals on a planet's surface, eliminating the need to transport bulky raw ores back to Alpha. This pod also acts as a base for a survey team: it can carry food and water and recycle air to support the team for several weeks, providing ample time for exploration.[6] The space between the left and right inner and outer doors serves as additional airlocks that isolate the laboratory's cabin from the external environment. The Laboratory Pod is UCGO capable, allowing it to carry one cargo container in the space adjacent to the lab table (Please see UCGO documentation for key commands).

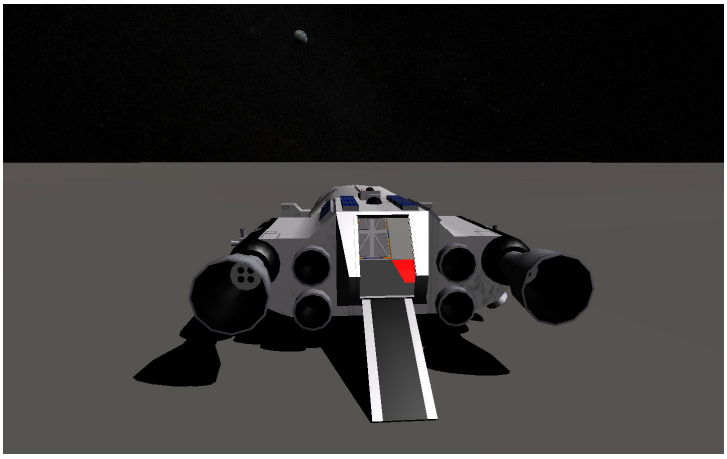
Key Commands

4/5	Select Airlock
	Left
	Right
	Forward
	Aft
D	Open/Close Outer Doors
6	Open/Close Lt Inner Door
7	Open/Close Rt Inner Door
V	Select Camera View

Falcon Shuttle







The Falcon Class Shuttle served as the primary service spacecraft of the 1980's. Developed for the International Lunar Finance Commission, the Falcon shuttles were introduced in 1981. Designed to support Centuri Space Dock, yet capable of meeting the construction demands of Moonbase Alpha, the Falcons were flexible spacecraft. Once Moonbase Alpha was completed, the increasing demand for Earth-Lunar transport prompted the development of a larger spacecraft. The Eagle's unveiling in 1992 marked the end of the Falcon's production run. As a sign of their continuing durability, Falcon shuttles can still be seen in service. The Falcon is UMmu and UCGO capable.

Key Commands

D	Open/Close Port Hatch
4	Extend/Retract Port Ramp
5	Open/Close Inner Cargo Door
6	Open/Close Aft Hatch
3	Extend/Retract Aft Ramp
G	Raise/Lower Landing Gear
V	Select Camera View

Please see UCGO/UMmu documentation for further information on motion commands.

The Falcons are designed primarily for extra-atmospheric flight and are not dynamically stable in the atmosphere. Atmospheric flight is possible but requires an active autopilot to maintain level flight (Horz Lvl). Orbital insertion can be achieved through the use of the above mentioned autopilot modes and Hover engines to maintain lift and vector thrust.

Falcon Atmospheric (Earth) Launch Profile

- Activate Surface MFD and Orbit or Ascent Profile MFD
- Activate "L" (Hors Lvl) Autopilot
- Engage Hover engines (≥ 435 K provides a VACC of ≈ 0.1 m/s)
- Use rotation thrusters and Autopilot (Kill Rot) to establish heading (42° for ascending node Mir intercept or Lunar insertion parking orbit, 136° for descending node ISS intercept). Retract gear
- Engage Main engines, full thrust. Maintain heading
- Disengage (Hors Lvl) Autopilot, Increase Hover thrust (≈ 585 K), Pitch up to 10° (in 1° increments) while maintaining ACC of > 0.05 m/s^2
- Adjust Hover thrust as needed to maintain a Pitch up of 10°, VS ≈ 200 m/s, and a VACC of > 55 m/s^2 up to an altitude of 80 Km
- At 80 Km, gradually decrease Hover thrust to achieve a VACC of ≈ -50 to -80 m/s^2 and decrease VS to < 20 m/s
- Use Orbit or Ascent Profile MFD to monitor flight
- At a apoapsis of ≥ 120 Km and a velocity of > 7300 m/s shutdown Main and Hover engines
- Using Orbit MFD, perform a prograde circularization burn at apoapsis

Approach Procedure to Landing Pad (MBA, A Pad, T Pad)

- From the Falcon's focus (F3) using Hover engines, establish a stabilized descent (< 1 meter/sec) to the selected landing site using VOR/VTOL MFD and onboard views "V" for guidance, RCS in translation mode, and "L" (Hors Lvl) Autopilot to maintain alignment
- At 60 meter altitude, switch to MBA (A Pad or T Pad) focus, select the appropriate landing pad. Select the appropriate (Left/Right) docking approach "8". Return focus to Falcon to maintain a stabilized descent
- At 20 meter callout, switch to MBA (A Pad or T Pad) focus. Follow descent to ≈ 2 meters. Press "K" to attach Falcon to the landing pad
- Return focus to Falcon to shutdown Hover engines and disengage Autopilot

Departure Procedure from Landing Pad (MBA, A Pad, T Pad)

- From the Falcon's focus (F3) select "L" (Hors Lvl) Autopilot to maintain attitude. Using Hover engines, throttle up to ≥ 72.5 K
- Switch to MBA (A Pad or T Pad) focus, select the appropriate landing pad and select "J" to release the Falcon from the pad.
- Use VOR/VTOL MFD and onboard views "V" for guidance. Use RCS in translation mode for orientation and RCS in rotation mode to achieve desired departure heading. Apply Prograde/Retrograde thrust as necessary

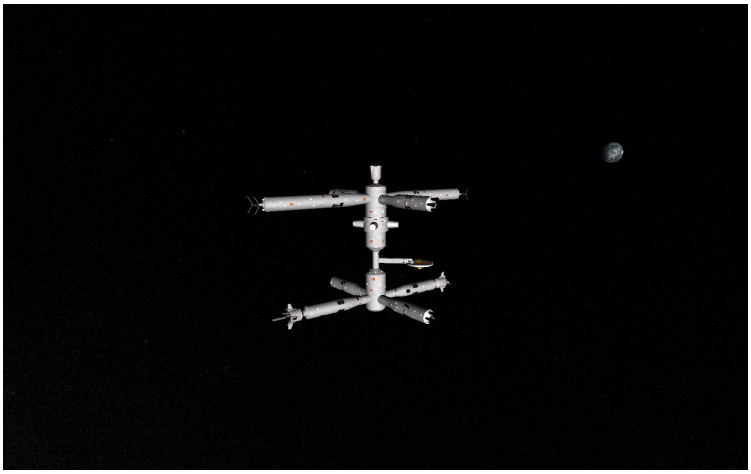
Mark IX Hawk

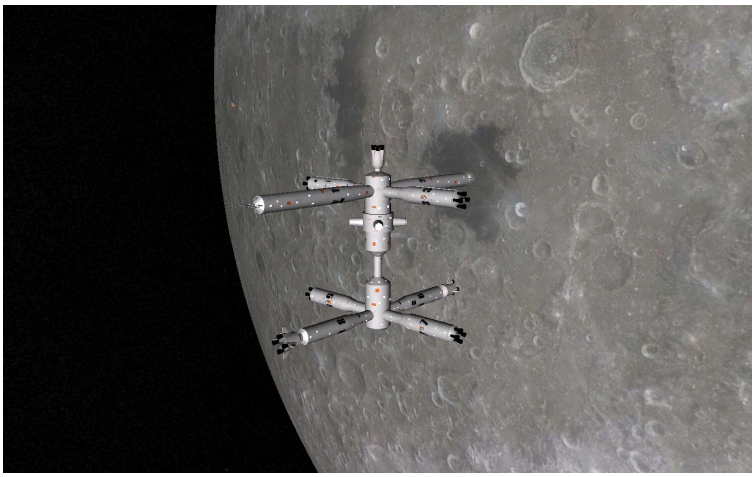
The Mark IX Hawk is a medium-to-long range two man spacecraft designed in the early 1990's as a space based interceptor under the auspices of the Global Defense Command (a predecessor of the World Space Commission). Testing began in 1996 and the Hawk was commissioned in 1997.[10] To shorten response time, a flight of Hawks was stationed aboard the Centuri Space Dock in Lunar orbit. The Hawk is space based and not capable of planetary landing. While powerful, the Hawk was not deemed a successful design. Its costly airframe was not considered as versatile as that of its sister ship, the Eagle. Only eight were built with most of the series scheduled for decommissioning by 2000. The remaining ships were re-tasked as escorts for Moonbase Alpha Eagles and deep space probes launched from the space dock. The Hawk is UMmu capable.

Key Commands

9/0	Select Airlock
D	Open/Close Airlock
V	Select Camera View

Centuri Space Dock





The first Centuri class space dock was built in Earth orbit from the S-II and S-IV-B stages of the venerable Saturn V launch vehicle as an orbital station for scientists and space construction crews. To support lunar exploration, it was towed to the Earth – Moon L1 Lagrange point. The International Lunar Finance Commission ordered a second space dock built in lunar orbit. Construction was begun on this space dock July 2, 1981 and completed June 19, 1982. This station served as a command post for the construction of Moonbase Alpha, a staging base for the Uranus, Meta, and Ultra deep space probes, as well as a second waypoint for Earth - Lunar travel.[11]

The space dock at the Earth – Moon L1 Lagrange point (CenturiL) has eight docking ports; six capable of receiving the Mark IX Hawk or Meta spacecraft, two capable of receiving the Ultra spacecraft, and a landing pad for an Eagle. The landing pad accepts left or right attachment (Note: Spacecraft at the L1 Lagrange point may wander with time acceleration. Lagrange MFD v0.2 http://www.orbithangar.com/searchid.php?ID=4582 maybe useful in correcting space dock placement during long term simulation or when time acceleration is used). The space dock in Lunar orbit (CenturiM) differs from the dock at the Earth – Moon L1 Lagrange point by the absence of the landing pad. The active landing pad or docking tube is identified by a flashing beacon.

Key Commands

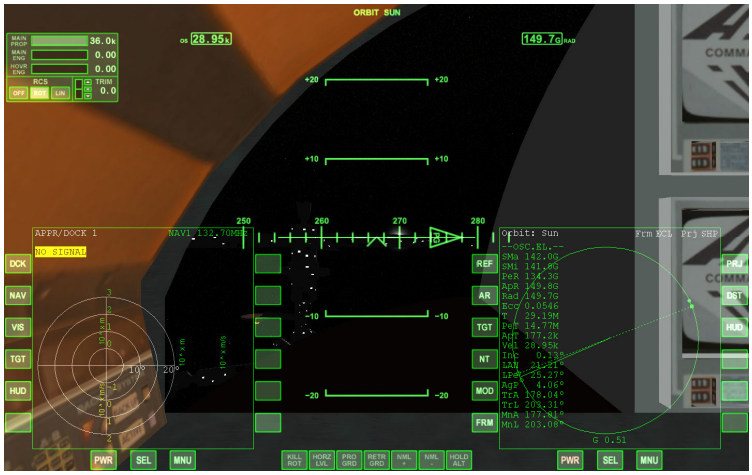
V	Select camera view
W	Select Docking Tube
O	Toggle Docking Tube

CenturiL Only

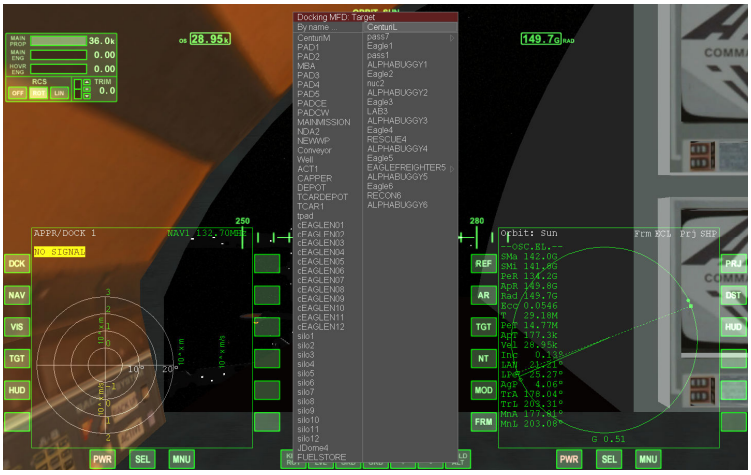
8	Toggle Lt/Rt Attachment
K	Attach to Landing Pad
J	Detach from Landing Pad

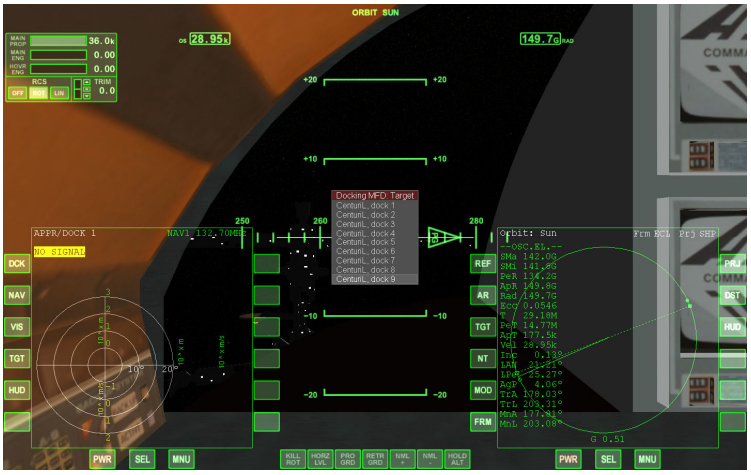
Note

Docking procedures for the Deep Space Probes are detailed below. Centuri Space Dock's (CenturiL) eight docking arms and landing pad are identified as nine docking ports. In simulation, selecting Target (Shift + "T") in Dock MFD results in nine possible docking ports being shown as available. The landing pad (Centuri, dock 9) is the dedicated Eagle landing site. Before beginning an approach to docking, note (from the Centuri Space Dock focus, F3) that the station is at 0° in pitch and roll. After successful rendezvous with the Space Dock, use Orbit HUD to achieve alignment with the landing pad in pitch and roll.

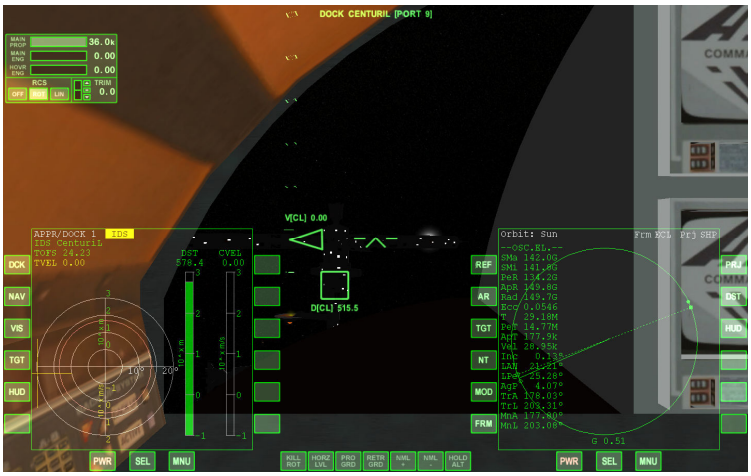


Using Dock MFD, select Centuri Dock 9 and the docking HUD to guide the Eagle's approach to the landing pad.





Once aligned and appropriately oriented, approach the landing pad. Establish a 0.1- 0.3 m/s descent to the pad (Camera MFD is useful in establishing a visual guide to attachment). At ≤ 20 meters above the pad switch to the Space Dock's focus (F3) to initiate attachment to the landing pad. Use "8" to select left or right attachment.

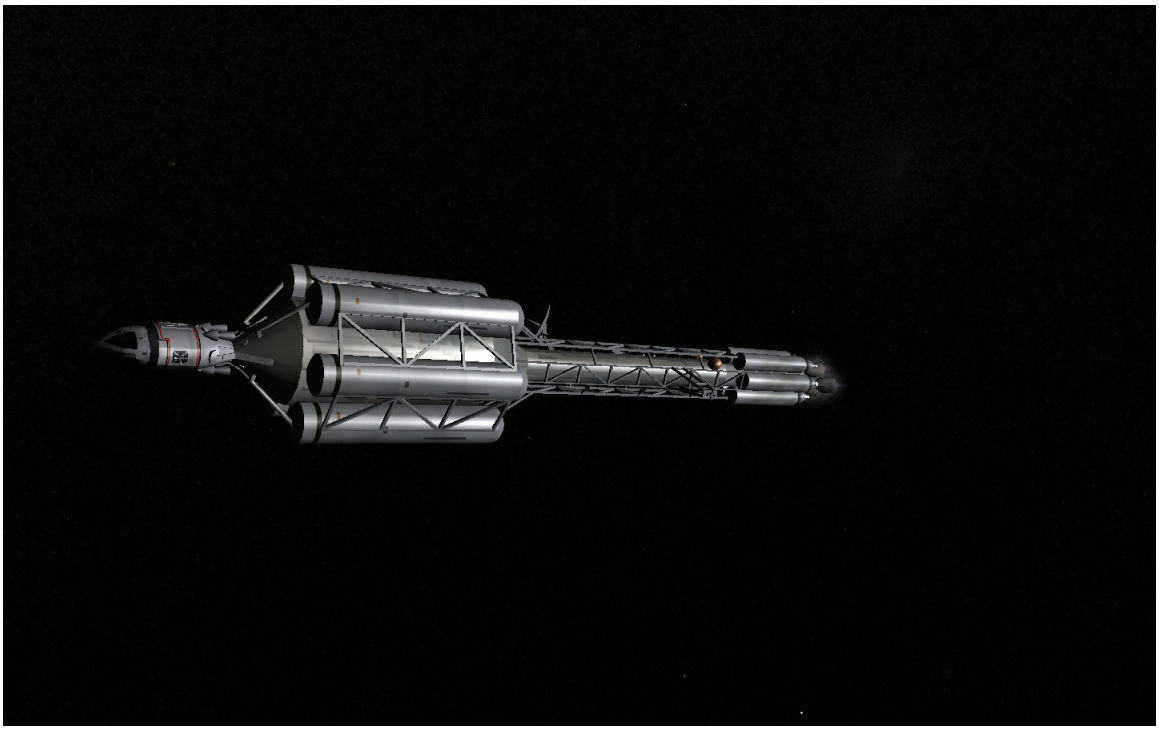


Centuri Pad Camera View
of Attached Eagle

Deep Space Probes

Moonbase Alpha and the Centuri Space Dock serve as logical staging sites for deep space exploration. In the late 1990's the International Lunar Finance Commission mounted deep space research expeditions to the outer reaches of our solar system. The spacecraft utilized for these missions were vessels designed around high specific impulse nuclear thermal engines.

Ultra Probe



The Ultra Probe was developed for a mission out of our star system's orbital plane to reach the periphery of our planetary system. The craft consists of a Command Module (CM) with navigation station, and a Drive Module (DM) with its command center, crew quarters and dedicated research stations. The CM is capable of independent missions lasting up to six months. It can be used as a "lifeboat" in an emergency, but is mainly intended as a short range planetary landing craft. The DM's habitable space is separated and shielded from the nuclear thermal drive section by the length of the craft and the engines reactants.

The conjoined ship is controlled from the DM focus (F3) for approach and docking maneuvers, Hohmann transfer or orbital insertion burns. The CM focus is used only for independent Command Module flight operations. The DM has two docking sites; Dock 1, for docking with the CM, Dock 2, for docking with Centuri Space Dock. From the CM focus, hit "G" to open the Docking Latches, then use Ctrl + "D" to separate the CM from the DM. Both Ultra Probe modules are UMmu capable.

Keys Commands:

V	Select Camera View
G	Open/Close CM Docking Latches
D	Open/Close Outer Hatch
5	Open/Close Inner Hatch
6	Raise/Lower Access Ladder

Ultra Probe Docking Procedure

Approach and docking maneuvers are performed from the DM's focus. The Ultra Probe's docking port is on the 90 degree starboard drive module tank. As a result, approach and docking occur out of cockpit view and is managed solely via instruments. The 90 degree displacement of the docking port alters how rotation and translation are represented in the Dock MFD display. Before beginning an approach to docking, note (from the Centuri Space Dock focus, F3) that the station is at 0° in pitch and roll.

- Initiate docking approach to the Centuri class Space Dock by using Orbit MFD to align with the station in pitch and roll
- Once aligned with the station, select the appropriate docking tube (2 or 4) as the docking target in the Dock MFD display

Note

DM RCS thruster placement imparts a pitch moment in translation along the vertical axis and a yaw moment in translation along the lateral axis. This rotation requires pilot in command correction to maintain attitude during docking maneuvers.

DM Yaw results in Alignment Indicator motion along Dock MFD Y-axis

DM Roll results in Alignment Indicator motion along Dock MFD X-axis

DM Pitch results in Dock MFD Longitudinal Rotation Indicator motion

- When aligned with the docking tube, use the RCS in Translation mode to approach the station

Note

Fwd/Aft translation results in Approach Path Indicator motion along Dock MFD Y-axis

Forward translation results in downward deviation of the Approach Path Indicator. Aft translation results in upward deviation.

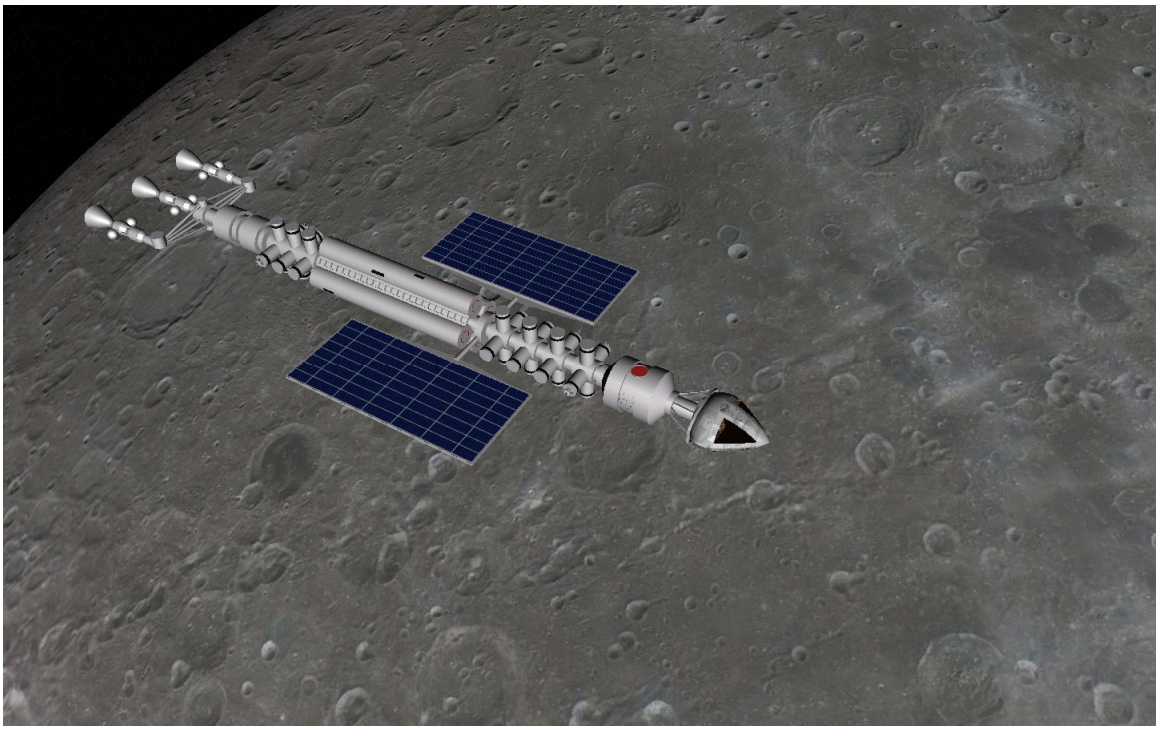
- When the Approach Path Indicator is aligned with the Dock MFD X-axis, use vertical and lateral translation to approach and dock

Note

Vertical translation results in Approach Path Indicator motion along Dock MFD X-axis. Up translation results in left deviation of the Approach Path Indicator. Down translation results in right deviation.

Meta Probe

A variant design employing nuclear thermal engines, the Meta probe was conceived as a deep space survey vessel. With a crew of two, its mission is to explore the minor planets at the margin of our system. The Meta Probe is UMmu capable.



Keys Commands:

V	Select Camera View
D	Open/Close Airlock

Meta Probe Docking Procedure

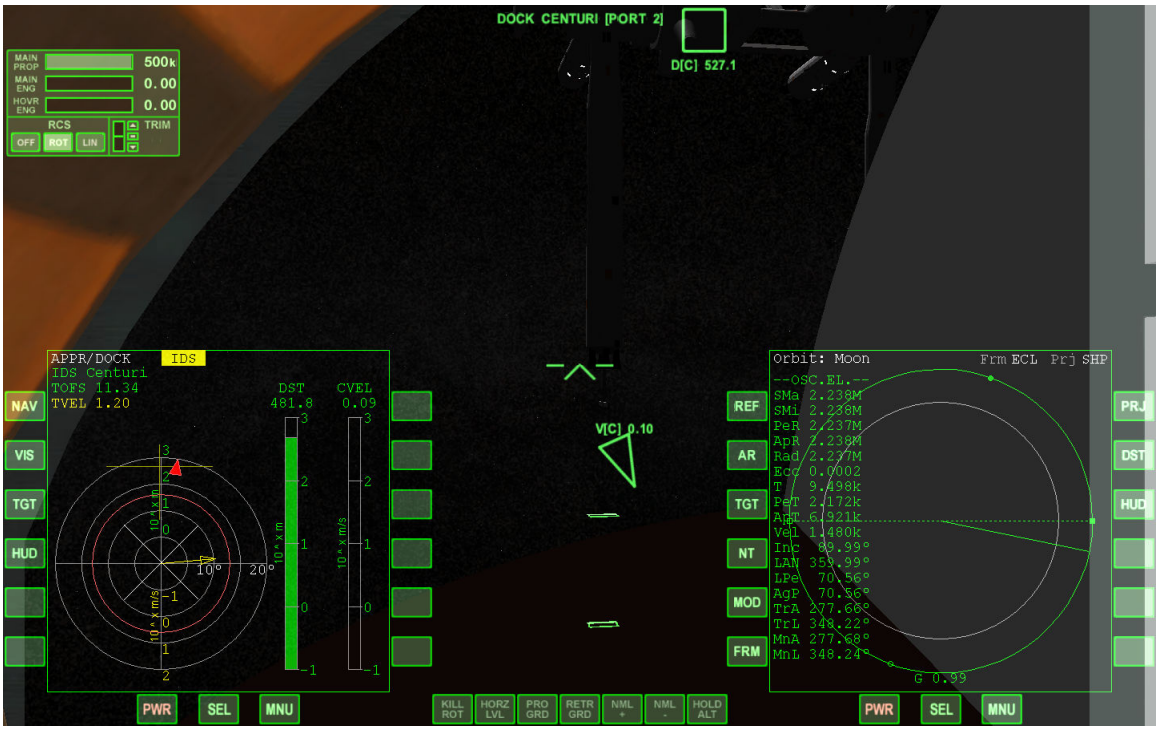
The Meta Probe's docking ring is on the dorsal spine of the spacecraft. As in the Ultra Probe, docking occurs aft of the cockpit. Prior to docking approach, note (from the Centuri Space Dock focus, F3) that the station is at 0° in pitch and roll.

- Initiate docking approach to the Centuri class Space Dock by selecting the appropriate docking tube (1,3,5 - 8) as the docking target in the Dock MFD display
- With RCS in Rotation mode, use Alignment Indicator and Longitudinal Rotation Indicator to align the ship with the extended docking tube

Note

Pitch results in Alignment Indicator motion along Dock MFD Y-axis

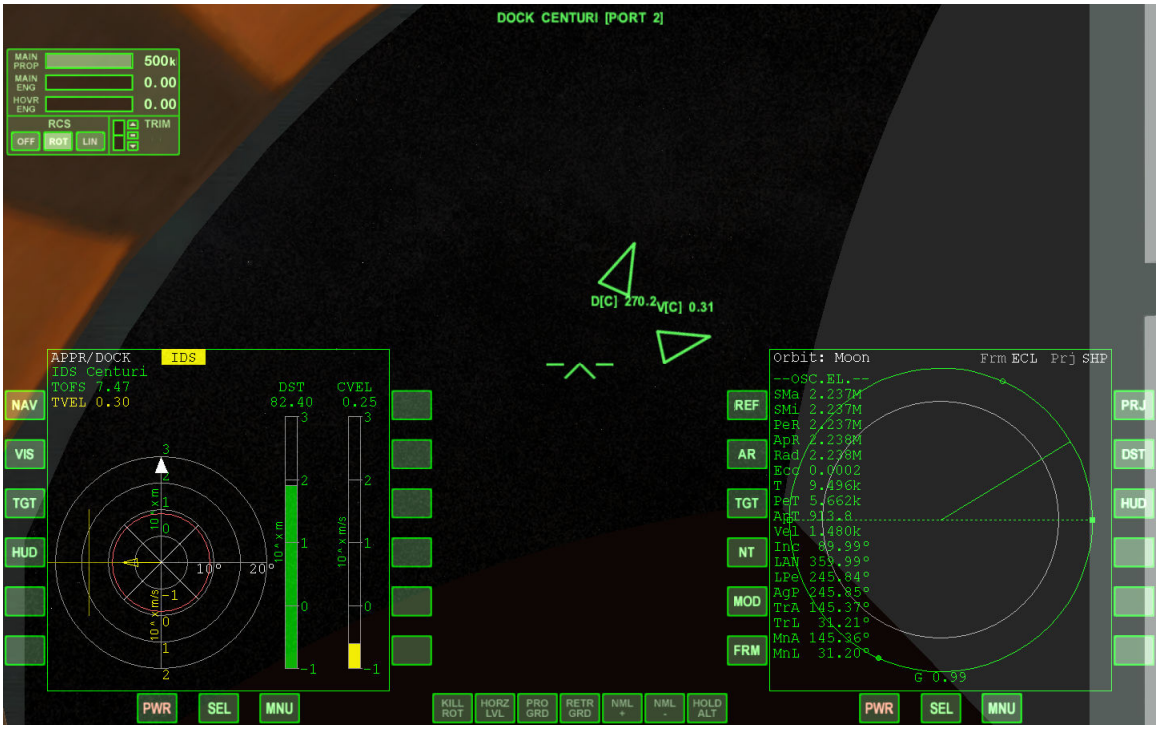
Roll results in Alignment Indicator motion along Dock MFD X-axis



Yaw results in Dock MFD Longitudinal Rotation Indicator motion

- When aligned with the docking tube, use the RCS in Translation mode to approach the station

Note



Use RCS in Translation mode to approach docking tube

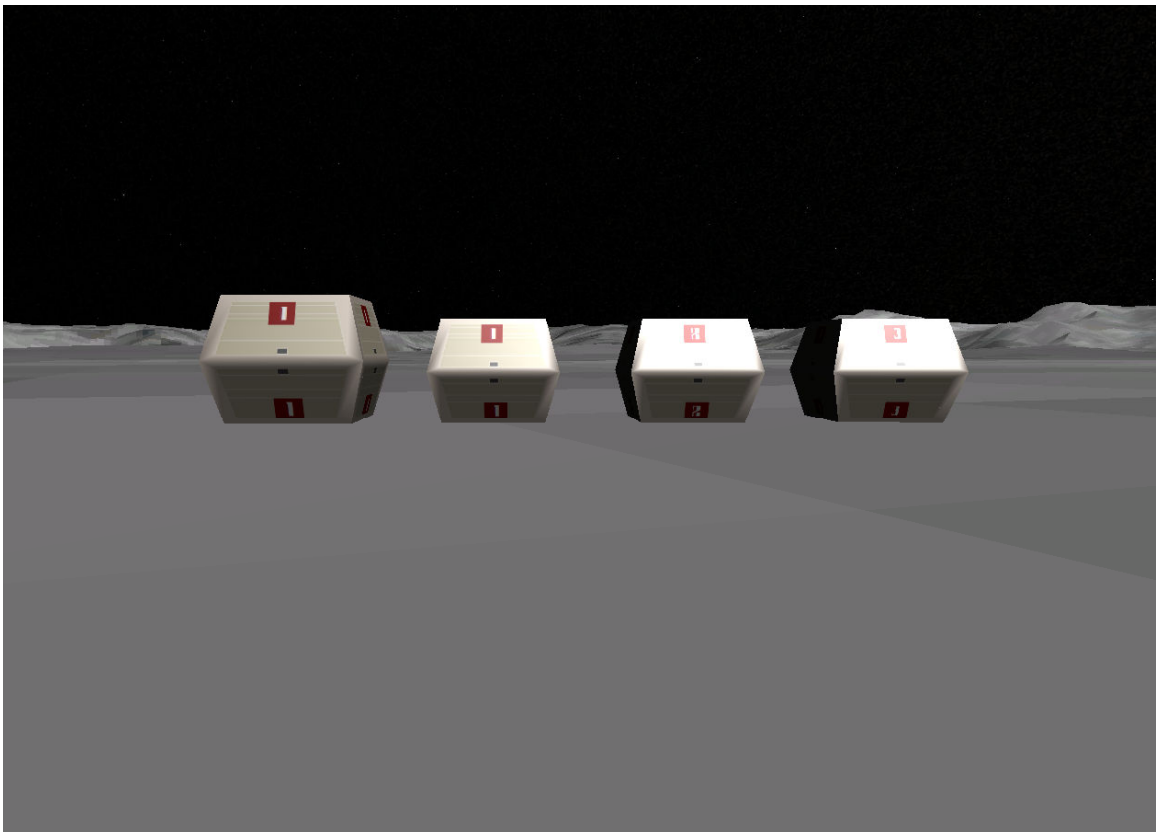
Forward translation results in downward deviation of the Approach Path Indicator. Aft translation results in upward deviation. Lateral translation results in Approach Path Indicator motion along Dock MFD X-axis.

Cargo

UCGO allows the option of modifying cargo containers to those used in Space: 1999 by editing the Config. To use the period appropriate containers, open Config\Vessels\Ucgo\Cargo. Select the cargo you wish to modify. In this example CargoBaseModule is used.

```
; === Configuration file for UCGO cargo ===
ucForceName         = cMODUL                                    ; Force object name when cargo is released max 6
char.
Module              = UCGODynamicCargo                          ; if this cargo can be unpacked by UMMU
Mass                = 2874                                      ; mass of content in kg
MeshName            = UniversalCars/UCGOCargInflatMainBox  ; Box mesh name (packed cargo)
UcUnpackedMesh      = UniversalCars/UCGOCargInflatMain     ; name of mesh once cargo unpacked by UMMU.
UcDescription       = InflatBase Life module                    ; description or keyword if ressource (see below)

UMMuBreathableBase          = 1                                 ; 1 if it's a UMMU base (can breath into it)
UMMuBaseRadius              = 6.30                              ; breathable radius in meter from center of mesh


ImageBmp = Images\UniversalCars\crgLife.bmp ;image for scenery editor

; === NOTE ON UCGO Cargos ===
; UCGO Cargos require only mesh and a config file, anyone can do more
; see doc in Doc\UniversalCars for a step by step help.

; === MANDATORY NO NEED TO EDIT THIS BELOW ===
Size = 20.0             ; size is 1.3 meter but this is to avoid LOD uggly switch
AlbedoRGB = 0.6 0.6 0.6
TouchdownPoints = 0.0 -0.005 3.0 -4.0 -0.005 -3.00 4.0 -0.005 -3.00
EditorCreate=true
EnableFocus = false
; === Attachment specs ===
BEGIN_ATTACHMENT
P 0.0 1.0 0.70  0 0 1  0 1 0  UCGOCG
END_ATTACHMENT
```

Replace the highlighted item with: BASECARGOR1B, BASECARGOR1, BASECARGOR2, or BASECARGOR3 to render the following containers. Backup the original config. Four Space: 1999 specific cargo containers have been created in Config\Vessels\Ucgo\Cargo: Cargowaste1 (BASECARGOR1), Cargowaste1 B (BASECARGOR1B), Cargowaste2 (BASECARGOR2), and Cargowaste3 (BASECARGOR3).



BASECARGOR1B BASECARGOR1 BASECARGOR2 BASECARGOR3

In order for BASECARGOR1, BASECARGOR2, and BASECARGOR3 to be grappled properly by UMmu, the highlighted attachment information should be replaced with this:

P 0.0 0.6 0.3 0 0 1 0 1 0 UCGOCG

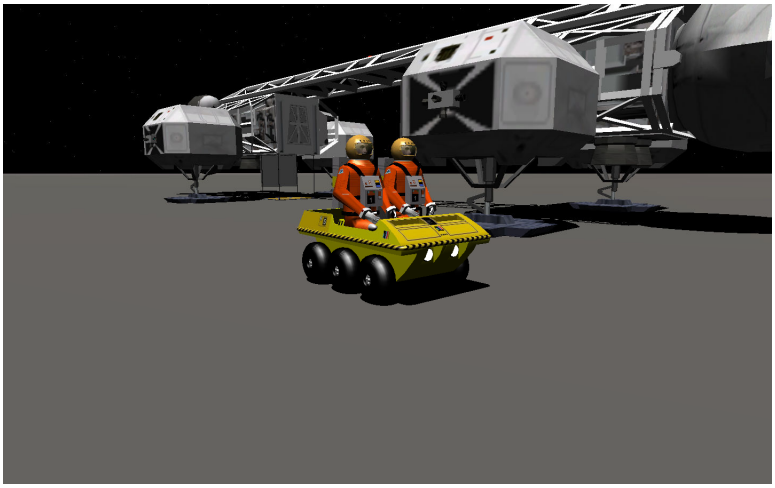
For BASECARGOR1B use:

P 0.0 0.7 0.30 0 0 1 0 1 0 UCGOCG

```
ImageBmp = Images\UniversalCars\crgLife.bmp ;image for scenery editor

; === NOTE ON UCGO Cargos ===
; UCGO Cargos require only mesh and a config file, anyone can do more
; see doc in Doc\UniversalCars for a step by step help.

; === MANDATORY NO NEED TO EDIT THIS BELOW ===
Size = 20.0                ; size is 1.3 meter but this is to avoid LOD uggly switch
AlbedoRGB = 0.6 0.6 0.6
TouchdownPoints = 0.0 -0.005 3.0 -4.0 -0.005 -3.00 4.0 -0.005 -3.00
EditorCreate=true
EnableFocus = false
; === Attachment specs ===
BEGIN_ATTACHMENT
P 0.0 1.0 0.70  0 0 1  0 1 0  UCGOCG
END_ATTACHMENT
```

Surface Vehicles

Moonbuggy



Moonbuggy with UMmu

Moonbuggy with Cargo and extended antenna

The Moonbuggy is an open, surface vehicle modeled after the terrestrial ATV. The Moonbuggy's heritage serves it well in negotiating lunar terrain. As noted above the Moonbuggy can be carried in the aft section of the Eagle. It has a maximum crew of two. It is UMmu and UCGO capable with a cargo capacity of one container (only BASECARGOR1, BASECARGOR2, or BASECARGOR3 containers fit the cargo space). The airlock must be open to perform EVA. Side of EVA can be selected. Be sure to close the airlock before putting the Moonbuggy in motion. Please see UMmu and UCGO documentation for further information.

Key Commands

D	Open/Close Airlock
G	Toggle antenna
1/2	Select Crew Left/Right
5	EVA Left
6	EVA Right
Numpad +	Forward
Numpad -	Reverse
Numpad *	Stop
Numpad 1	Left
Numpad 3	Right

Alpha Construction Tank 1

Alpha Construction Tank 1 with Capping attachment

The construction of Moonbase Alpha required the large-scale movement of regolith and basaltic rock by manned and remotely operated surface vehicles. At the completion of the project, these vehicles were re-tasked to support operations at the moonbase and its various sites. The Alpha Construction Tank 1 is an example of such a vehicle, re-tasked to support synthocrete capping activities at Nuclear Disposal Area 2. The tank can be remotely operated. The Capping attachment (Capper) in conjunction with the Alpha Construction Tank 1 lifts and places the synthocrete caps on the silos (Camera MFD utility can be used as a maneuvering aid). From the Alpha Construction Tank 1's focus (F3), the Capping attachment may be captured "K" or released "J". The Alpha Construction Tank 1 is UMmu accessible. With canopy opened, "E" allows crew to egress. UMmu can return to the craft from its own focus positioned at the left of the vehicle adjacent to cockpit with "E".

Alpha Construction Tank 1
Key Commands

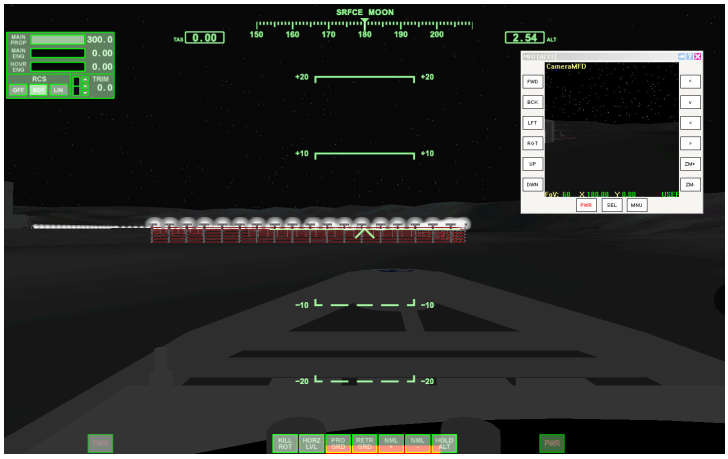
B	Start Engine
Numpad +	Forward
Numpad -	Reverse
Numpad *	Stop
Numpad 1	Left
Numpad 3	Right
V	Select Camera View
D	Open/Close Canopy

Capper
Key Commands

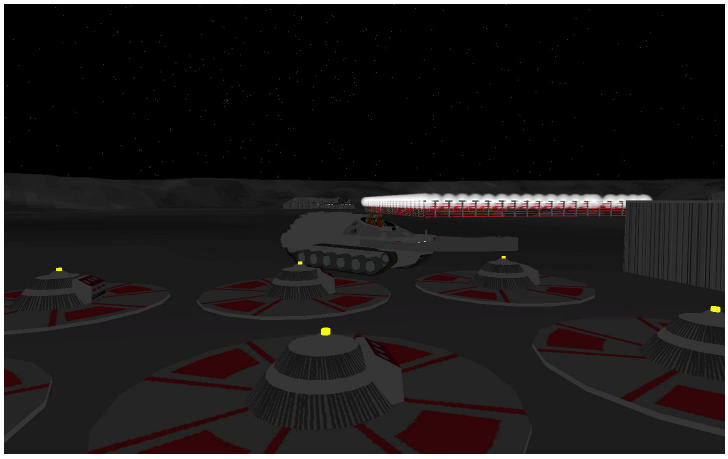
G	Lower/Raise Grapple
K	Attach Cap
J	Release Cap
V	Select Camera View

Silo Capping Operations

The Alpha Construction Tank 1 with the attached “Capper” is employed to seal filled silos with synthocrete caps. The full allotment of caps required for a nuclear disposal area is kept on station to be used as the sites silos are filled. The caps are stored close to the Monitoring Depot. Maximum Engine Output should not exceed 1.58 K in forward or reverse. Maximum speed should not exceed 2.5 KPH. Backing motion can be facilitated by cycling through overhead view (V). Camera MFD utility can also be used as a maneuvering aid for backing.

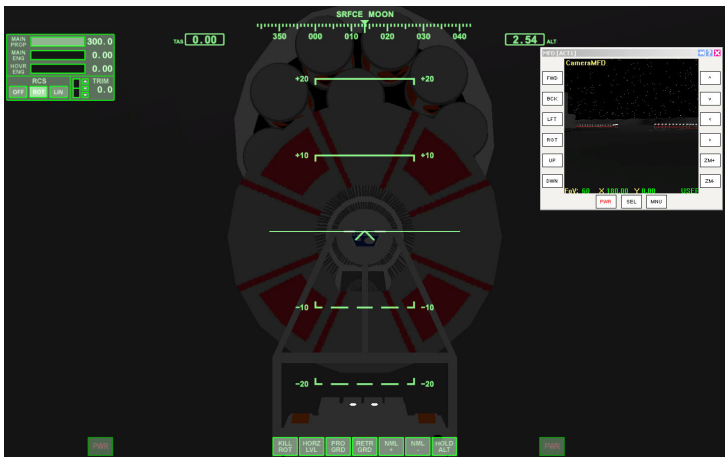


Alpha Construction Tank 1
Backing to Cap Farm



Alpha Construction Tank 1
Approaching for Grapple

Alpha Construction Tank 1
Entering Nuclear Disposal Area 2



Alpha Construction Tank 1
Positioning Cap

Capping Instructions

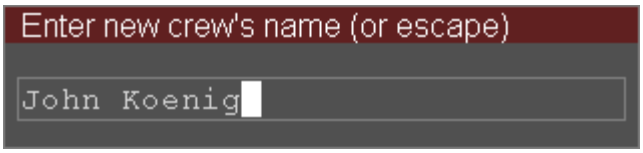
- Start Alpha Construction Tank 1 and Maneuver to Cap Farm
- Use Overhead view from Alpha Construction Tank 1 and Capper to approach and align with synthocrete cap
- When the grapple is positioned over the cap, switch to the Capper's focus (F3), lower the grapple "G", and capture the cap "K"
- Maneuver to the appropriate silo
- Use Overhead view from Alpha Construction Tank 1 and Capper to approach and align the cap with the silo
- When the cap is positioned over the silo, switch to the Capper's focus (F3), lower the grapple "G" and release the cap "J"
- Return the Alpha Construction Tank 1 to the parking area at the Monitoring Depot

Space 1999 Moonbase Alpha Crew

Moonbase Alpha and its outposts can be populated with period appropriate crew, uniformed for their individual position. The uniform has a different collar and left sleeve depending on the rank and department of the crewmember.

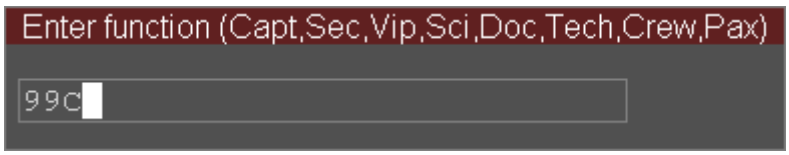
Black - Commander
Flame - Main Mission
Rust - Technical
Yellow - Service
Orange - Reconnaissance
White - Medical
Purple - Security
None – Generic

To create a Moonbase Alpha UMmu crewmember, follow the UMmu prompt from any UMmu capable vehicle. Enter the name:



The age:

And the UMmu ID:



The UMmu ID associated with the following crew ranks are noted below:

Commander (Male)	99C
Commander (Female)	99FC
Main Mission (Male)	99M
Main Mission (Female)	99FM
Technical (Male)	99T
Technical (Female)	99FT
Service (Male)	99S
Service (Female)	99FS
Reconnaissance (Male)	99R
Reconnaissance (Female)	99FR
Medical (Male)	99D
Medical (Female)	99FD
Security (Male)	99P
Security (Female)	99FP
Generic (Male)	99
Generic (Female)	99F

Please see UMmu documentation for further information on motion commands (Note, the Extra Vehicular Activity (EVA) suit is not gender specific).

Errata

Known Issues

- Changing vessel focus (F3) after cycling through camera views “V” may distort the point of view from the new vessel. This can be cleared by cycling through camera views “V”
- Nuclear waste canisters have 2 x 2 x 2 meter dimensions to be consistent with Nuclear Disposal Area 2 and its elements. It is not consistent with standard UCGO cargo (2 x 2 x 1.3 meters). Standard waste canisters are available in the release package
- Un-suiting Space: 1999 UMmu generic male crewmember spawned in any standing structure other than MBA may cause a CTD in some installations. This appears to be a fault induced by the interaction of the Moonbase Alpha Expansion Pack 1 with Moonbase Alpha 101027 v1.1

Acknowledgements

Moonbase Alpha was inspired by the television series Space: 1999 (*copyright Granada Ventures*) which originally aired from 1975 -1978. Earlier iterations were created from Roberto Baldassari's original Moonbase Alpha textures by Cristiano Corti (versions v – beta v3) and updated by Satanas (versions beta v5 and beta v5a). Our work is built on their fine creations.

Main Mission model by 4th Rock http://orbiterspaceport.blogspot.com/
Main Mission Desk model by 3D Alpha http://www.space1999.net/~alpha3d/

The Eagle spacecraft was initially developed by Frying Tiger, with timely updates by Kev Shanow, Jorge Iglesias, and 4th Rock. It was made UMmu capable by Gattispilot. The Eagle virtual cockpit model and textures are by 4th Rock.

The Falcon was developed from blueprints created by Keith Young.

The Moonbuggy was first modeled by Kev Shanow and has been updated by Gattispilot.

This version of Moonbase Alpha was created by Gattispilot and 4th Rock with help from StarshipExplorer and Computerex. Advice on the placement, history, and structure of landmarks in the Moonbase environment was provided by Steve Gerard, CR, and the Space 1999 Eagle Transporter Forum http://www.eagletransporter.com/forum/index.php. Jon Marcure advised us in coding. Axel assisted us in defining spacecraft Isp values. Dbeachy1, Orb, and Tblaxland provided vital programming and debugging assistance. We extend our thanks to all who contributed to this project.

Orbiter is the platform that has allowed us to recreate the world of Space: 1999, to relive our flights of the past, and imagine a spacefaring future. For this, we thank Dr. Martin Schweiger.

Gattispilot
Ben Sisko

Appendix

Technical Information

The information in this section is provided to allow users to integrate non-Moonbase vessels into the scenarios contained in the Moonbase Alpha environment and to aid users in creating their own scenarios. It requires some familiarity with the folder structure of the Orbiter program.

This version of Moonbase Alpha contains static (Storage Area B-7 and Nuclear Disposal Area 1) and active (Moonbase Alpha, Landing Pads, Nuclear Disposal Area 2, Depot, T Pad, A Pad, Storage Area J-3, CenturiL and CenturiM) structures. Information for rendering the static structures is contained in the Config\Moon\Base folder. The active structures are modeled as vessels. This differs from earlier iterations of this add-on. In order to have these active structures appear, they must be placed in the scenario as vessels.

The Moonbase Alpha campus, including pads and T Cars:

```
BEGIN_SHIPS
PAD1:displacement
  STATUS Landed Moon
  POS -9.3191960 51.5882756
  HEADING 120.23
  ATTACHED 0:10,MBA
  AFCMODE 7
  NAVFREQ 0 0
END
PAD2:displacement
  STATUS Landed Moon
  POS -9.3139872 51.6088047
  HEADING 134.99
  ATTACHED 0:11,MBA
  AFCMODE 7
  NAVFREQ 0 0
END
MBA:mba2
  STATUS Landed Moon
  POS -9.2999995 51.6000003
  HEADING 180.00
  AFCMODE 39
  NAVFREQ 0 0
  XPDR 0
END
NGA:NGA3
  STATUS Landed Moon
  POS -9.3073400 51.5937310
  HEADING 307.47
  AFCMODE 39
  NAVFREQ 0 0
  DOOR1 0 0.0000
  DOOR2 0 0.0000
  DOOR3 0 0.0000
END
TNGA3:TCAR
  STATUS Landed Moon
  POS -9.3068554 51.5935061
  HEADING 35.39
  ATTACHED 0:0,NGA
  AFCMODE 7
  NAVFREQ 0 0
  TARGET TCAR2
  DIST 0.000000
END
PAD3:displacement
  STATUS Landed Moon
  POS -9.2794060 51.6120067
  HEADING 225.22
  ATTACHED 0:12,MBA
  AFCMODE 7
  NAVFREQ 0 0
END
PAD4:displacement
  STATUS Landed Moon
  POS -9.2799721 51.5920818
  HEADING 299.90
  ATTACHED 0:13,MBA
  AFCMODE 7
  NAVFREQ 0 0
END
PAD5:displacement
  STATUS Landed Moon
  POS -9.3105565 51.5849735
  HEADING 299.63
  ATTACHED 0:14,MBA
  AFCMODE 7
  NAVFREQ 0 0
END
PADCE:displacement
  STATUS Landed Moon
  POS -9.3315178 51.6039893
  HEADING 101.45
  ATTACHED 0:15,MBA
  AFCMODE 7
  NAVFREQ 0 0
```

```
END
PADCW:displacement
  STATUS Landed Moon
  POS -9.2716204 51.5998799
  HEADING 270.55
  ATTACHED 0:16,MBA
  AFCMODE 7
  NAVFREQ 0 0
END
MAINMISSION:displacement
  STATUS Landed Moon
  POS -9.2999177 51.6001492
  HEADING 90.00
  ATTACHED 0:17,MBA
  AFCMODE 7
  NAVFREQ 0 0
END
TMAIN:TCAR
  STATUS Landed Moon
  POS -9.2999180 51.6004990
  HEADING 90.00
  AFCMODE 7
  NAVFREQ 0 0
  TARGET none
  DIST 0.000000
END
```

Nuclear Disposal Area 2 with Silos, Receiving Well, Waste Processor, T Pad, T Car, Depot, ACT1, Cap farm, Storage Area J-3 with Monitoring Dome and Fuel Storage Bunker:

```
NDA2:nda27
  STATUS Landed Moon
  POS 133.3199175 -78.8110380
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
END
NEWWP:WP
  STATUS Landed Moon
  POS 133.3179920 -78.8110400
  HEADING 90.35
  AFCMODE 7
  PRPLEVEL 0:0.883000
  NAVFREQ 0 0
END
Conveyor:NUCTRACKS
  STATUS Landed Moon
  POS 133.3226380 -78.8110380
  HEADING 0.00
  NAVFREQ 0 0
  UCGO @@0,1,1,1048,CargoEagleNuclear,@@1,1,1,1048,CargoEagleNuclear,@@2,1,1,1048,CargoEagleNuclear,
  UCGO @@3,1,1,1048,CargoEagleNuclear,
END
Well:Silopit
  STATUS Landed Moon
  POS 133.3199620 -78.8110300
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,@@12,1,0,0,@@13,1,0,0,@@14,1,0,0,
  UCGO @@15,1,0,0,@@16,1,0,0,@@17,1,0,0,@@18,1,0,0,@@19,1,0,0,@@20,1,0,0,@@21,1,0,0,
  UCGO @@22,1,0,0,@@23,1,0,0,@@24,1,0,0,@@25,1,0,0,@@26,1,0,0,@@27,1,0,0,@@28,1,0,0,
  UCGO @@29,1,0,0,@@30,1,0,0,@@31,1,0,0,@@32,1,0,0,@@33,1,0,0,@@34,1,0,0,@@35,1,0,0,
  UCGO @@36,1,0,0,@@37,1,0,0,@@38,1,0,0,@@39,1,0,0,
END
ACT1:ACT2
  STATUS Landed Moon
  POS 133.2976780 -78.8060280
  HEADING 180.00
  AFCMODE 7
  PRPLEVEL 0:1.000000
  IDS 0:8 100
  NAVFREQ 0 0
  UMMUCREW 99C-Bill_Roper-41-64-74
  UMMUCREW 99C-Frank_Smith-27-67-55
END
CAPPER:CAPPER
  STATUS Landed Moon
  POS 133.3165680 -78.8048480
  HEADING 246.45
  ATTACHED 0:0,ACT1
  AFCMODE 7
  NAVFREQ 0 0
END
DEPOT:DEPOT
  STATUS Landed Moon
  POS 133.2940780 -78.8057480
  HEADING 0.00
  AFCMODE 39
  PRPLEVEL 0:1.000000
  NAVFREQ 0 0
  XPDR 0
  UMMUCREW 99C-Peter_Falcon-41-65-74
  UMMUCREW 99FT-Franny_Gordon-27-67-55
  UMMUCREW 99D-George_Heller-15-70-45
  UMMUCREW 99-Albert_Jr_Francis-15-70-45
END
TCARDEPOT:TCAR
  STATUS Landed Moon
  POS 133.2940990 -78.8058990
  HEADING 0.00
  ATTACHED 0:0,DEPOT
  AFCMODE 7
  NAVFREQ 0 0
  TARGET none
  DIST 0.000000
END
TCAR1:TCAR
  STATUS Landed Moon
  POS 133.3476610 -78.8052210
  HEADING 0.00
```

```
  ATTACHED 0:2,tpad
  AFCMODE 7
  NAVFREQ 0 0
  TARGET TCAR2
  DIST 0.000000
 END
 tpad:TPAD
  STATUS Landed Moon
  POS 133.3476480 -78.8055080
  HEADING 270.00
  AFCMODE 39
  PRPLEVEL 0:1.000000
  NAVFREQ 0 0
  DT1 0 0.0000
  DT1D 0 0.0000
  TC1 0 0.0000
  DD0 0 0.0000
  DD1 0 0.0000
  UMMUCREW 99C-Peter_Felton-41-65-74
  UMMUCREW 99-Albert_Jr_Falcon-15-70-45
  UMMUCREW 99D-George_Hall-15-70-45
 END
 cEAGLEN01:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2950780 -78.8048880
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN02:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2932180 -78.8048880
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN03:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2914480 -78.8048880
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN04:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2950780 -78.8045480
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN05:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2932280 -78.8045480
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN06:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2914680 -78.8045480
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN07:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2950780 -78.8042180
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN08:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2932280 -78.8042180
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN09:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2914680 -78.8042180
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN10:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2950780 -78.8038880
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN11:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2932280 -78.8038880
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 cEAGLEN12:UCGO\Cargos\Cargondacone
  STATUS Landed Moon
  POS 133.2914680 -78.8038880
  HEADING 0.00
  AFCMODE 7
  IsRessource 1
  RessourceMass 1048.00
 END
 silo1:SILO
  STATUS Landed Moon
```

```
  POS 133.3304960 -78.8110330
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,1,1048,CargoEagleNuclear,@@1,1,1,1048,CargoEagleNuclear,@@2,1,0,0,
  UCGO @@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,@@8,1,0,0,@@9,1,0,0,@@10,1,0,0,
  UCGO @@11,1,0,0,
END
silo2:SILO
  STATUS Landed Moon
  POS 133.3372070 -78.8110380
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo3:SILO
  STATUS Landed Moon
  POS 133.3337920 -78.8117860
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo4:SILO
  STATUS Landed Moon
  POS 133.3240420 -78.8142860
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo5:SILO
  STATUS Landed Moon
  POS 133.3199020 -78.8136260
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo6:SILO
  STATUS Landed Moon
  POS 133.3198920 -78.8129860
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo7:SILO
  STATUS Landed Moon
  POS 133.3066420 -78.8110260
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo8:SILO
  STATUS Landed Moon
  POS 133.3033520 -78.8110260
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo9:SILO
  STATUS Landed Moon
  POS 133.3000520 -78.8102460
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo10:SILO
  STATUS Landed Moon
  POS 133.3160220 -78.8083460
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo11:SILO
  STATUS Landed Moon
  POS 133.3199120 -78.8077160
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
silo12:SILO
  STATUS Landed Moon
  POS 133.3239820 -78.8083560
  HEADING 0.00
  AFCMODE 7
  NAVFREQ 0 0
  UCGO @@0,1,0,0,@@1,1,0,0,@@2,1,0,0,@@3,1,0,0,@@4,1,0,0,@@5,1,0,0,@@6,1,0,0,@@7,1,0,0,
  UCGO @@8,1,0,0,@@9,1,0,0,@@10,1,0,0,@@11,1,0,0,
END
JDome4:JDome4
  STATUS Landed Moon
  POS -35.9998500 23.9999770
  HEADING 90.25
  AFCMODE 7
  NAVFREQ 0 0 0 0
  XPDR 0
END
FUELSTORE:FUELSTORAGE
  STATUS Landed Moon
  POS -36.0309800 23.9992870
  HEADING 90.25
  AFCMODE 7
```

```
  NAVFREQ 0 0 0 0
  XPDR 0
END
```

CenturiL and CenturiM:

```
CenturiL:Centuri1
  STATUS Orbiting Sun
  RPOS -137529066754.19 -12762159.29 -59241544000.14
  RVEL 11399.537 -67.498 -26607.803
  AROT 3.46 -37.07 0.21
  AFCMODE 7
  PRPLEVEL 0:1.000000
  IDS 0:588 100 1:578 100 2:568 100 3:558 100 4:548 100 5:538 100 6:528 100 7:518 100 8:578 10
  NAVFREQ 0 0
  XPDR 24
  DOCK1 0 0.0000
  DOCK2 0 0.0000
  DOCK3 0 0.0000
  DOCK4 0 0.0000
  DOCK5 0 0.0000
  DOCK6 0 0.0000
  DOCK7 0 0.0000
  DOCK8 0 0.0000
  APAD 7
  CAM 0
END
CenturiM:LSTATION
  STATUS Orbiting Moon
  RPOS 1474449.44 -1683397.32 -207.27
  RVEL 1113.435 975.280 0.053
  AROT 89.96 -48.94 0.04
  AFCMODE 7
  PRPLEVEL 0:1.000 1:1.000
  IDS 0:588 10 1:578 10 2:568 10 3:558 10 4:548 10
  NAVFREQ 0 0
  XPDR 494
  DOCK1 0 0.0000
  DOCK2 0 0.0000
  DOCK3 0 0.0000
  DOCK4 0 0.0000
END
```

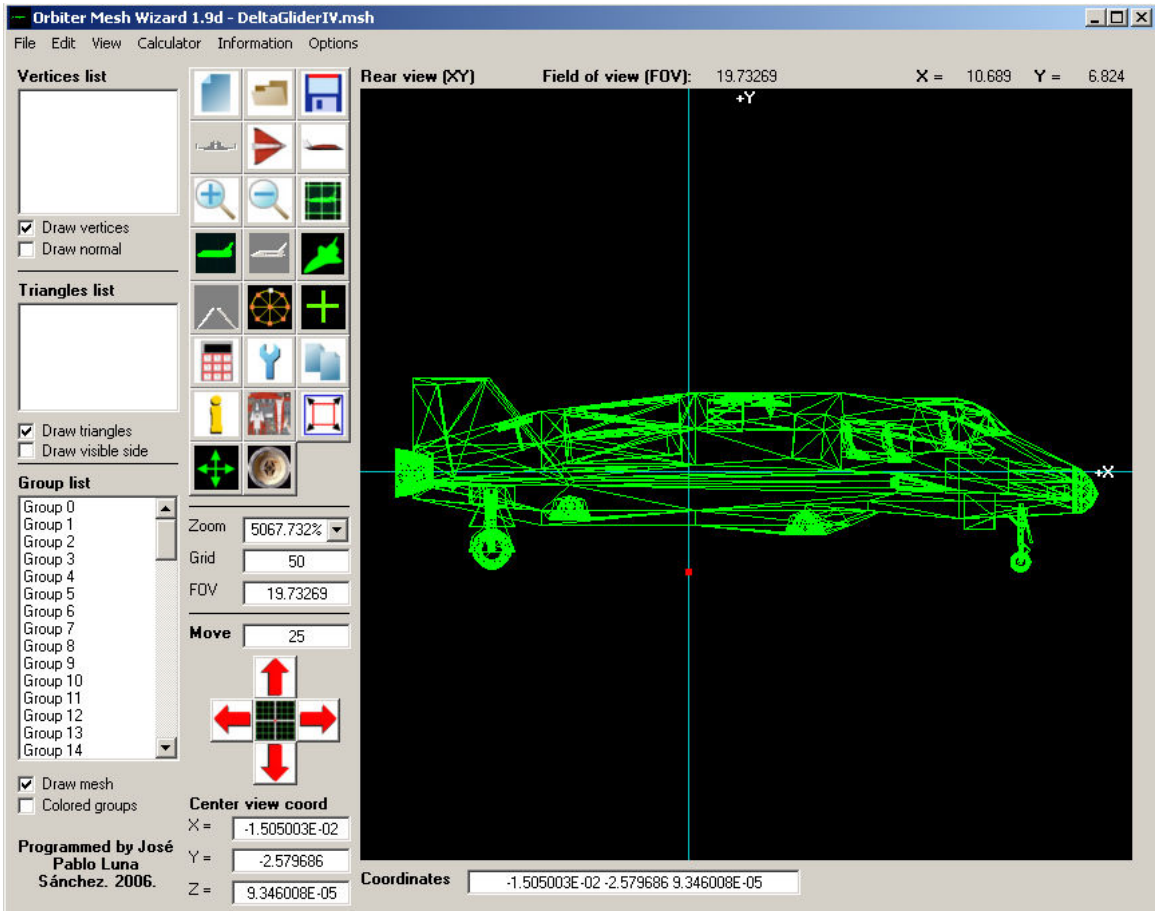
The crater meshes and gravity towers surrounding Moonbase Alpha, and Storage Area J-3 as well as the crater surrounding Nuclear Disposal Area 2 are defined in their respective entries in the Config\Moon\Base folder.

Attachment

All vessels in this add-on, except Nuclear Disposal Area 2 (NDA 2) use attachment points. Each vessel requires a specific attachment ID to define the items or areas to which they can attach. An attachment point can be stated in the Config\Vessels. Here is the Attachment specs section of the Config for Cargondacone (found in Config\Vessels\Ucgo\Cargo):

```
BEGIN_ATTACHMENT
P 0.0 .154 0 0 0 1 0 1 0 UCGOCG
P 0.0 3.9 .55 0 1 0 0 0 1 CONE
P -3 .141 0 0 0 1 0 1 0 MAG
END_ATTACHMENT
```

The first 3 set of numbers define the attachment point. The next two groups of three digits define the direction of attachment. The ID ends the line. To find the attachment point use MeshWizard http://www.orbithangar.com/searchid.php?ID=2740 to review the mesh defining the touchdown point or dorsal attachment of the vessel.



Mesh Wizard view of DeltaGlider IV Mesh with Pad Attachment Highlighted

Below are pad attachment points for the DeltaGlider IV and XR-2 Ravenstar.

Deltaglider IV

```
BEGIN_ATTACHMENT
P 0.0 -2.56 0.0  0 1 0  0 0 1  APR
END_ATTACHMENT
```

XR2 Ravenstar

```
BEGIN_ATTACHMENT
P 0.0 -2.6 -1.5  0 -1 0  0 0 1  APR
END_ATTACHMENT
```

Eagle (Pods) Modules

The Eagle Pods use child attachment points to attach to the Eagle. All pods except the Laboratory Pod have the attachment ID of XS. The Laboratory Pod has an attachment ID of XL. The attachment ID of XS or XL tells the Eagle how many additional hover exhausts to display. XS calls for 4 and XL calls for 6.

```
P 0.0 1.5 0  0 -1 0  1 0 0  XL
P 0.0 1.5 0  0 -1 0  1 0 0  XS
```

Moonbase Alpha (MBA) and A Pad

Moonbase Alpha (MBA) and A Pad use attachments on the crane and pads. The Displacement Booths have child attachment points. MBA and A Pad have parent points for the pads, crane, and T Car (Displacement Booths). To attach to MBA pads or A Pad, the attachment ID MUST be APR. To attach to the crane, the attachment ID MUST be EGLETP.

T Pad

The T Pad uses an attachment on the pad. The Displacement Booths have child attachment points. The T Pad has parent points for the Pad and T Car (Displacement Booth). To attach to a T Pad the attachment ID MUST be APR.

Winch

The Eagle Winch has both parent and child attachment points. The child point is to attach to the Eagle. The parent point is the hook so the attachment point moves with the hook. The attachment range is 10meters. The attachment ID must be WIN for the Winch hook to attach.

Eagle

The Eagle has both parent and child attachment points. The child point is to attach to the pad and crane. The parent points are for attaching the pods and buggy. The attachment range is 10meters. The Attachment ID for the center pod opening must be XS or XL for the Eagle to attach. The Attachment ID for the buggy ramp must be BUG for the Eagle to attach. The Buggy attachment point also moves up and down.

Magnet

The Magnet has both parent and child attachment points. The child attachment point is for the Winch hook to attach. Its ID is WIN. The parent attachment point is so the Magnet will attach. The attachment ID must be MAG.

This is the code for the canisters to attach to the Magnet:

P 0.0 1.97 0 0 0 1 0 1 0 MAG

This is the code for the Magnet to attach to the Winch.

P 0.0 1.98 0 0 -1 0 0 0 1 WIN

Capper

The Capper has both parent and child attachment points. The child attachment point is for the Alpha Construction Tank to attach. The parent attachment point is so the Capper will attach. The attachment ID must be CONE.

Alpha Construction Tank (ACT)

The ACT has both parent and child attachment points. The child attachment point is for the ACT to attach. The parent attachment point is so the ACT will attach. The attachment ID must be CONE.

Depot

The Depot has only a parent attachment point. The parent attachment point is for the T Car to attach.

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