

# HST Launch (STS-31) and Servicing Mission 1 (STS-61)

Add-on for Orbiter2016 (v.160828)

## INSTALLATION

Extract all files to the root of your Orbiter program directory. Be sure "use folder names" is selected if using Winzip. This should NOT overwrite anything in the standard Orbiter package.

## WHAT'S IN THIS ADD-ON?

The Hubble Space Telescope satellite with zoom-view, Go-To by target name or RA/Dec. Replaceable science instruments, guidance and solar array units. Orbital Replacement Unit Carrier, two EVA astronauts and replacement units for STS-61 mission. D3D9 Graphics Client compatible.

STS-31 launch scenario (launch HST)

STS-61 launch scenario (HST Servicing Mission 1)

STS-61 on-orbit scenario (approaching HST rendezvous)

HST on orbit 2018

Scenarios are in the "HST\_EX" folder in the Orbiter Launchpad list.

## OVERVIEW

The HST included in this add-on has various features inc. removable science modules and solar arrays that can be replaced using the EVA astronauts and replacement units available in the STS-61 servicing mission scenarios.

### STS-31

Launch STS-31 carrying the Hubble Space Telescope at 12:33:51 UTC, 24 April 1990.

600km circular orbit at 28.45deg inc. equatorial.

Use the Shuttle's RMS arm to deploy and release the HST.

Land at KSC.

Info: <http://www.shuttlepresskit.com/STS-31/STS31.pdf>

### STS-61

Launch the first HST Servicing Mission (SM1) STS-61 at 09:26:00 UTC, 02 December 1993.

Rendezvous with HST.

Capture HST with Shuttle RMS arm.

Berth HST to Berthing And Positioning System(BAPS) ring on ORUC

Remove/Install RSU 1,2 & 3

Remove/Install both Solar Arrays

Remove WFC and install WFC2.

Remove HSP and install COSTAR.

Re-boost to 614km orbit before release.

Land at KSC

Info: <http://www.shuttlepresskit.com/sts-61/sts61.pdf>

## HST SERVICING OPERATIONS

### HST Berthing

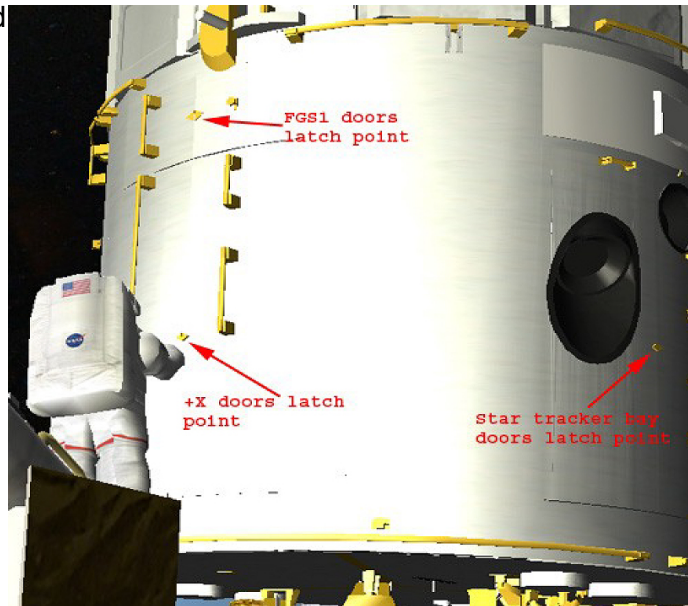
Deploy the BAPS ring on ORUC (ORUC, press [G]).

Grapple the HST using the Shuttle RMS arm. Place HST in the correct position on the BAPS ring and release from RMS arm. HST will be captured automatically if it is less than 0.3m from correct position.

## Opening/Closing HST and ORUC hatches

The HST and ORUC hatches can be opened or closed by placing an attachment point (e.g. Shuttle RMS arm tip or EVA Astronaut right-hand) near to the hatch "latch point" indicated by a small 10cm gold triangle on the model (see image).

The "latch point" is indicated by a beacon (red for latched, green for un-latched) in "Show Grapple Points" mode.

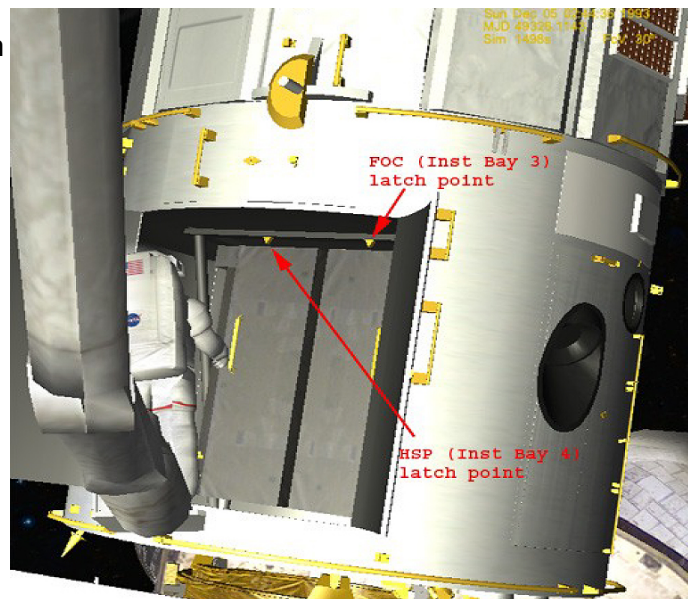


## HST - Removing Units or Solar Arrays

To make a unit (e.g. HSP) available for removal, it must be "unlatched" by placing an attachment point (e.g. Shuttle RMS arm or EVA Astronaut arm) near to the unit's "latch point" indicated by a small (10cm) golden triangle on the model (see image).

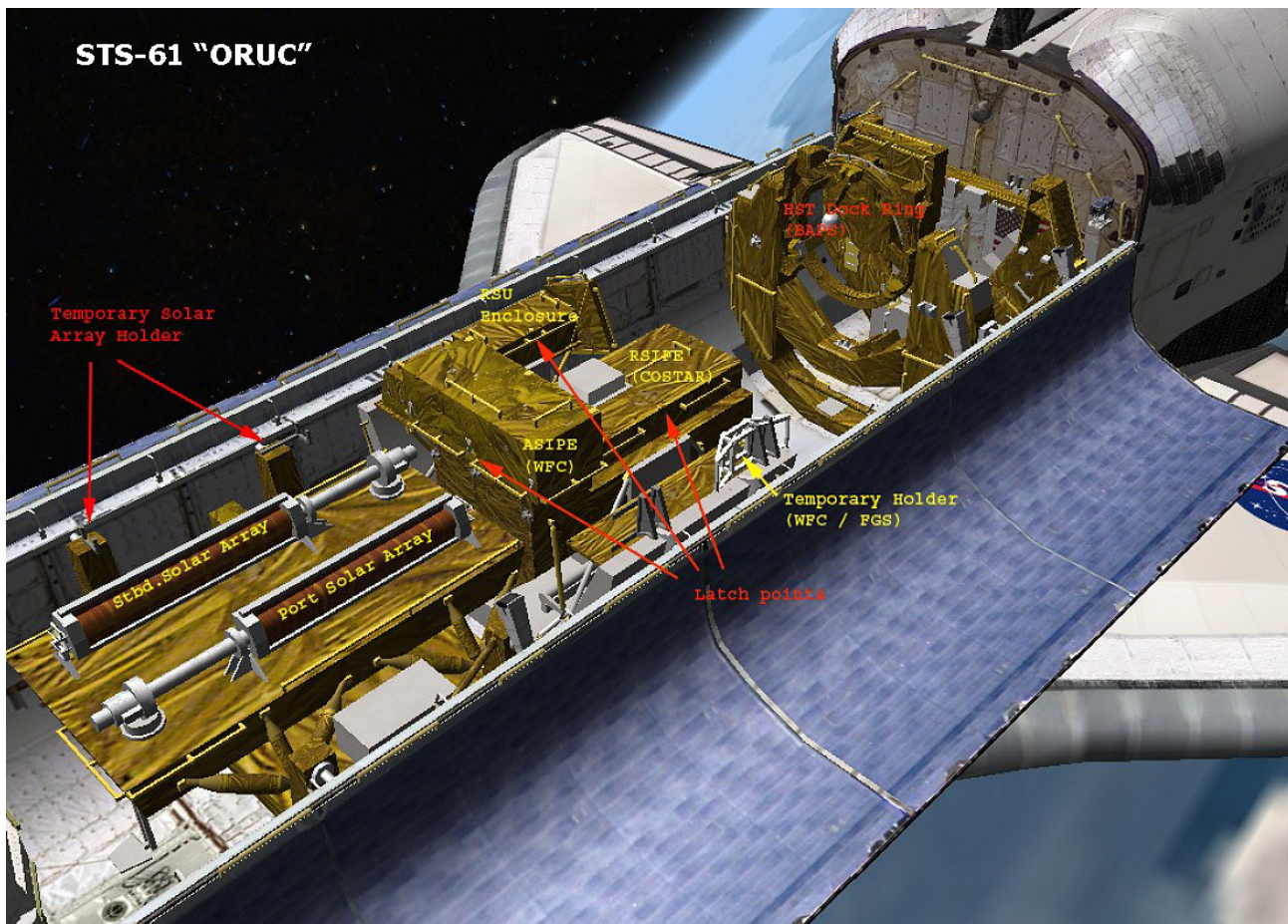
If the unit is successfully unlatched, an on-screen message "RELEASED" is shown at the top of the screen.

The unit can then be grappled and removed.



### ORUC – Opening/Closing the payload containers

Like the HST, the replacement unit covers can be opened by placing an attachment point (e.g. Shuttle RMS arm or EVA Astronaut arm) near to the door's "latch point" indicated by a small (10cm) golden triangle on the model (see image).



### ORUC – Removing/Replacing Units or Arrays

To remove the replacement unit from ORUC, simply grapple it (e.g. with Shuttle RMS arm or EVA Astronaut arm).

To install the unit on HST, move it to the correct position and release it. The unit will automatically be captured if it is < 0.3m from the correct position, and an on-screen message "SECURED" is shown at the top of the screen.

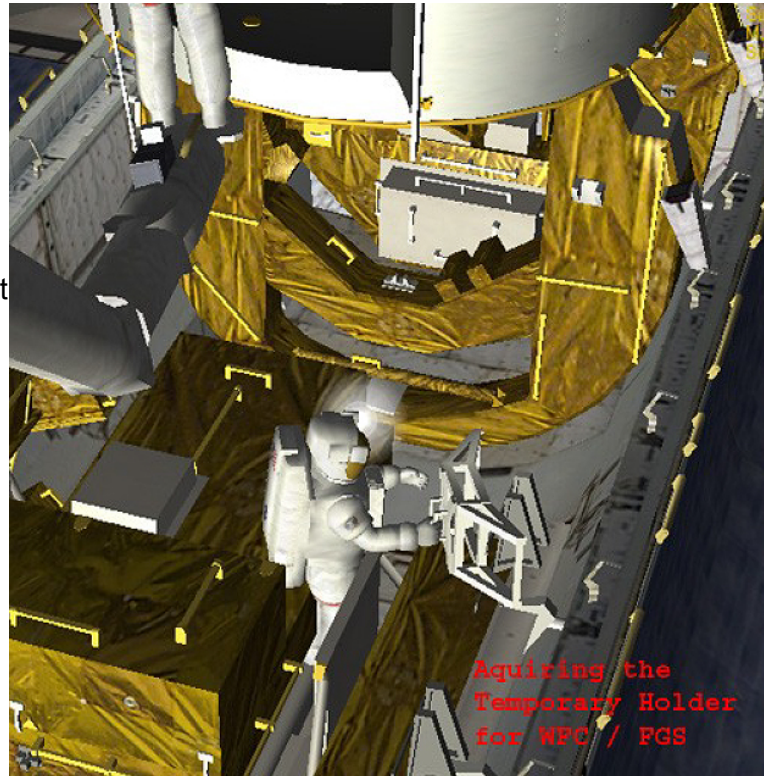


## ORUC – Temporary Holders

A “Temporary Holder” mechanism for use by EVA Astronauts during replacement of WFC, FGS1 or FGS2, is stowed on the port side of the cargo bay (see image).

However, it is not necessary to use it.

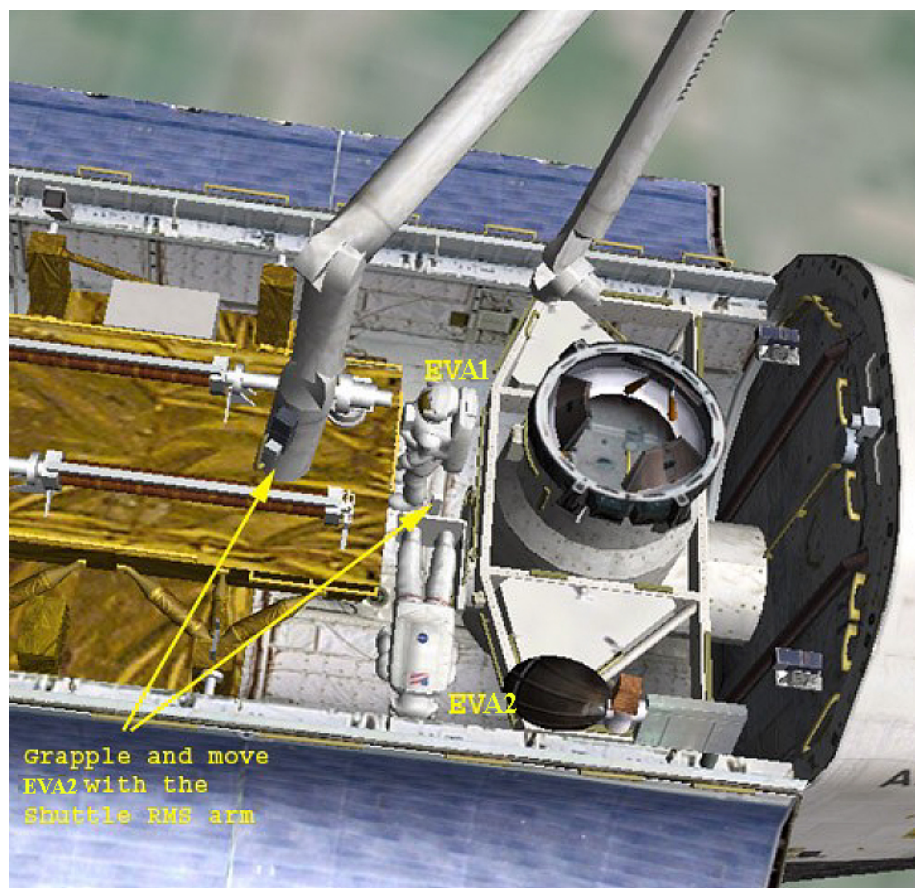
Also, there is a temporary stowage point on the starboard side of the Solar Array carrier (see image previous page). It can be used to store a Solar Array during change over.



## **EVA Astronauts – EVA1 and EVA2**

You can start the EVA from the ORUC cockpit.

Press [J] to create EVA1 and [K] for EVA2 (see image)



The EVA1 astronaut has no RCS and remains “tethered” (attached) to the ORUC, but can move and rotate using the NUMPAD keys as usual.

The EVA2 astronaut has no RCS and cannot move by himself, he must be moved by the shuttle RMS arm or another astronaut. EVA2 is equipped with a footpad for use with the shuttle RMS arm.

Both EVA1 and EVA2 have grapple points on their right hand. They can use the “Temporary Holder” to grapple WFC or FGS units (if desired).

EVA Astronauts are equipped with a lamp fixed to the helmet.

EVA astronauts have a Life Support time limit of 8hrs. Life support is replenished when EVA ends. To end the EVA, move the Astronaut to <1m from a docking port and press [V]

### **EVA Astronaut Controls**

NumPad[ / ]	Toggle Rotation/Linear Movement (EVA1 only)
NumPad[1...9]	Move Linear/Rotate (EVA1 only)
[ ↑ ][ ↓ ]	Raise/Lower Arms
[←][→]	Rotate Right Hand
[Shift]+[ ↑ ][ ↓ ]	Bend Up/Down
[Shift]+[←][→]	Twist Left/Right
[B]	Helmet Lamp On/Off
[G]	Grapple/Release
[N]	Release Temporary Holder
[F5]	Show/Hide Grapple Points
[V]	End EVA ( <1m from airlock)

### **HST Controls**

HST has no RCS or linear translation capability. However, you can still use the NUMPAD keys as usual, to point the telescope. Maximum slew rate 1deg/sec.

[E]	Enter Telescope Target By Name
[V]	Go To Target(Name)
[Shift]+[B]	Enter Telescope Target Right Ascension
[Ctrl]+[B]	Enter Telescope Target Declination
[B]	Go To Target(RA/Dec)
[G] or [Shift]+[G]	Telescopic View Zoom+ or Zoom- (cockpit view only)
[F5]	Deploy Solar Arrays
[F6]	Open Starboard Solar Array
[F7]	Open Port Solar Array
[N]	Solar Array Sun-Tracking On/Off
[M]	Stow Solar Arrays
[K]	Deploy/Stow High Gain Antennas and Sunshade.

### **ORUC Controls**

[G]	Deploy/Stow BAPS berthing ring
[N]	Rotate BAPS Ring + On/Off
[M]	Rotate BAPS Ring – On/Off
[B]	Cargo Bay Light On/Off
[J]	Create EVA1 Astronaut
[K]	Create EVA2 Astronaut
[F5]	Show/Hide Grapple Points

**THANKS....**

Big thanks to Donamy for letting me loose on his HST meshes, and to Felix24 for his D3D9 Graphics effects and textures.....

Original models by Donamy, NASA 3D Resources, BrianJ

Re-texturing and D3D9 Graphics effects by Felix24

Modifications and programming by BrianJ

Happy Orbiting!

BrianJ

Nov 2018