

KSC-DPV-0104



Distributed Observer Network (DON)

Version 3.0

User's Guide

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1 INTRODUCTION

1.1 OVERVIEW

The Distributed Observer Network (DON) is a data presentation tool developed by the National Aeronautics and Space Administration (NASA) to distribute and publish simulation results. Leveraging the display capabilities inherent in modern gaming technology, DON places users in a fully navigable 3-D environment containing graphical models and allows the users to observe how those models evolve and interact over time in a given scenario. Each scenario is driven with data that has been generated by authoritative NASA simulation tools and exported in accordance with a published data interface specification. This decoupling of the data from the source tool enables DON to faithfully display a simulator's results and ensure that every simulation stakeholder will view the exact same information every time.

1.2 SYSTEM REQUIREMENTS

DON is available on Windows and Macintosh platforms. The table below identifies the minimum recommended system specifications for computers running DON.

	<u>Windows</u>	<u>Mac</u>
OS	Windows 7	OS 10.9
Processor	Intel i5	Intel i5
Available Disk Space	50 GB	50 GB
RAM	6 GB	6 GB
	Mouse/Keyboard	Mouse/Keyboard

1.3 INSTALLATION

DON is distributed via the Kennedy Space Center FileCloud system. If you do not have access to FileCloud or the EMC shared area, contact Mike Conroy (mike.conroy@nasa.gov).

To Install DON from FileCloud:

1. Open your browser and go to <https://filecloud.ksc.nasa.gov>.
Note: If using Internet Explorer, ensure Compatibility View settings for the nasa.gov domain are turned off.
2. Log in using your NDC account name and password. Do not request a new account via this page. Upon successful login the FileCloud interface will display. (Figure 1-1)
3. The FileCloud Under "Files", click on the folder named "Shared with Me".



Figure 1-1 FileCloud Interface

4. Click on the folder named "EMC".
5. Click on the folder named "SEAS".
6. Click the checkbox next to the folder named "DON". This action will display new dialog window with available file actions. (Figure 1-2)
7. Click "Download Folder".
8. FileCloud will build a zip folder of all contents in the DON directory. The user may be prompted for a local location where the zip file should be saved. If the user is not prompted, the file will save in the browser's specified default download location.

Note: Download may take several hours. The DON application and all included mission are approximately 8GB in size.
9. When the download is complete, unzip the downloaded folder using Windows Explorer, WinZip, or a similar application.
10. Extract DON to the preferred location. For Windows machines, a directory location near the "My Documents" level is recommended.



Figure 1-2 Folder Actions Window

2 GETTING STARTED

2.1 LAUNCHING DON

2.1.1 Windows

1. Open Windows Explorer and navigate to the directory where the DON folder is located.
2. Open the "DON" folder
3. Open the "Win32" folder
4. Double click the "DON.exe" icon



2.1.2 Mac

1. Open the Finder and navigate to the directory where the DON folder is located
2. Open the "DON" folder
3. Double click the "DON.app" icon



2.2 SESSION CONFIGURATION

Upon launching DON, the DON 3.0 Configuration window will prompt the user for the settings they wish to apply for the current DON session. Once the user has selected their preferences, they must click the "Play!" button to begin using DON. If the user wishes to exit DON without beginning a session, they may click the "Quit" button to close the application entirely.

DON saves all configuration settings at session start and will display them as the default settings the next time the user launches DON. If the user has never run DON before, the settings displayed in the DON 3.0 Configuration window will reflect the system defaults for each field.

2.2.1 Graphics

User preferences for graphics rendering are configured through the Graphics tab of the DON 3.0 Configuration window. The Graphics tab is the default tab that appears when the configuration window is displayed. Users may adjust the following:

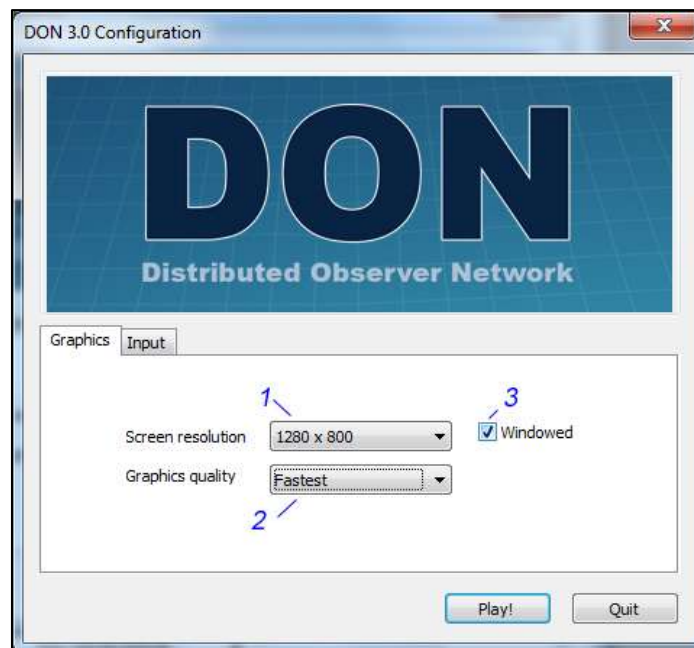


Figure 2-1 DON Graphics Configuration

Screen Resolution: Determines the screen resolution for which DON should render the virtual environment. This setting is adjusted using the dropdown menu labeled "1" in Figure 2-1. Dropdown 1 provides all possible resolutions that can be supported by the user's monitor.

Default Setting: Lowest resolution

Graphics Quality: Determines the quality of all graphics rendered within the virtual environment. This setting is adjusted using the dropdown menu labeled “2” in Figure 2-1. Dropdown 2 provides options ranging from “fastest” render time to “fantastic” render quality.

Default Setting: Fastest

Screen Mode: Determines the amount of screen space DON should occupy. This setting is adjusted using the checkbox labeled “3” in Figure 2-1. If “Windowed” is checked, DON will run in window mode on the user’s screen at the resolution specified by the Screen Resolution dropdown. If it is unchecked, DON will run in full screen mode.

Default Setting: Unchecked/Full screen

2.2.2 Input

The Input tab of the DON 3.0 Configuration window is a development artifact slated for removal. Modification of settings on this screen will not affect navigation within the DON virtual environment. Reference section 3.2 for default navigation controls.

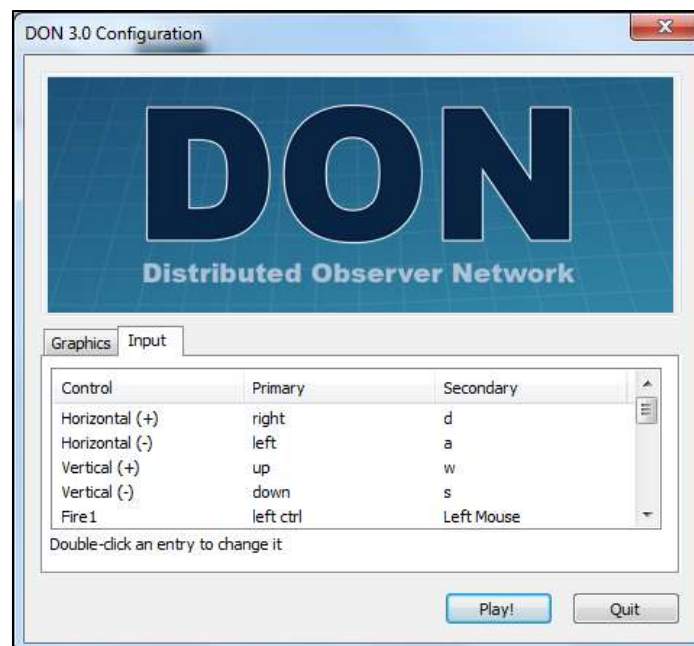


Figure 2-2DON Input Configuration

2.3 MAIN MENU

The DON Main Menu, shown in Figure 2-4, provides the user with three options:

Start Mission: Display the list of simulations available for view.
About: Display DON team and build information.
Quit: Exit DON.



Figure 2-3 DON Main Menu

2.4 SIMULATION SELECTION

Selecting a simulation to view in DON consists of two steps – selecting the Mission and selecting the telemetry. A Mission is the pairing of a specific set of models with the location in which their simulated activities occur. Exchanging components or moving a set of models from the surface of one planet to the surface of another constitutes a new Mission. Telemetry is the state information that identifies model interactions at every given point in time for a specific scenario. Missions may have multiple telemetries, each representing a different option for how the models could interact. For DON purposes a simulation is defined by its telemetry; the two terms may be used interchangeably.

Example: Curiosity on Mars is a Mission. It identifies the models under assessment (the components of the Curiosity rover) as well as the location where the simulation takes place (the surface of Mars). The different traversal paths Curiosity can follow as it explores Mars are simulations. Each would be represented in DON by a separate telemetry.

2.4.1 Choosing a Mission

Click on “Start Mission” on the DON Main Menu. This action will replace the main menu with a list of all Missions available for viewing within the current DON installation. Clicking the “Back” button at the top of the list will return the user to the Main Menu. Clicking any of the other items on the Mission list will provide additional information about that particular Mission, including a picture and details about its simulation content and origins. The Mission selection screen with an item selected is shown in Figure 2-5.

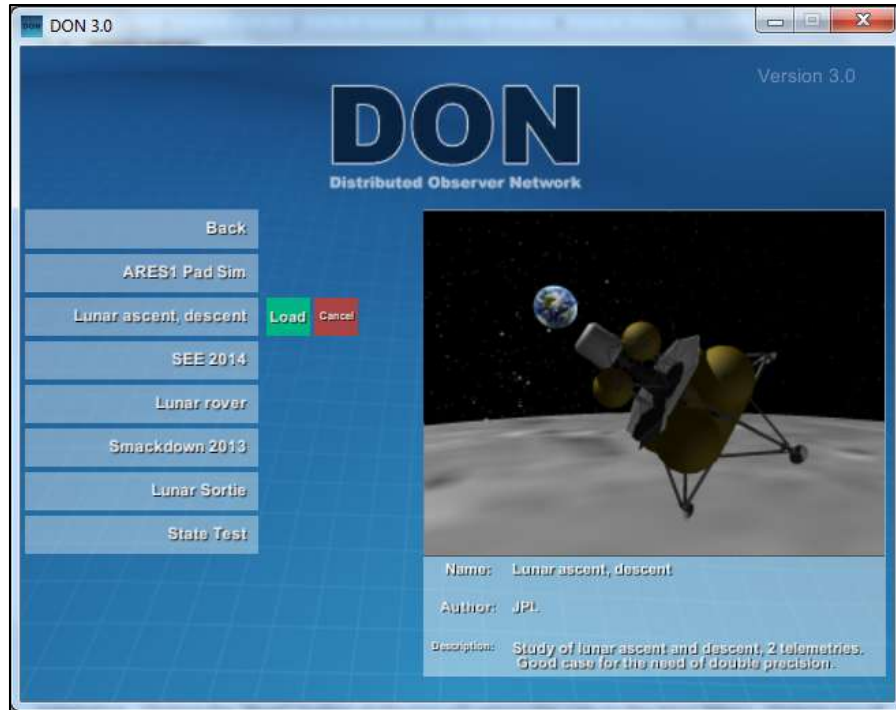


Figure 2-4 Mission Selection Screen

In addition to calling up the simulation information, clicking on a Mission in the list will display two buttons next to the selected list item.

Clicking the green “Load” button will cause DON to load all objects (e.g. models, terrain) associated with the Mission. The user may cancel this loading process at any time by hitting the Escape key on their keyboard and confirming they wish to exit the mission.

Clicking the red “Cancel” button next to the list item will remove the simulation information display from the Mission list screen. Choosing “Cancel” is not required before clicking another item on the Mission list to preview its details.

2.4.2 Choosing Telemetry

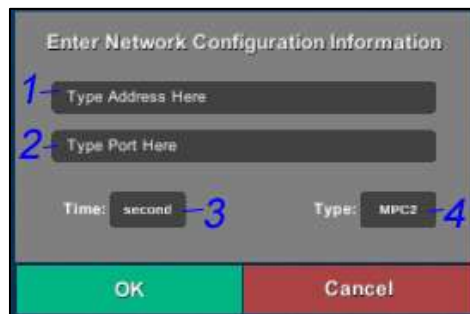
After DON has finished loading all objects for the Mission, a dialog box will appear prompting the user to select a simulation. Each item displayed in the box is a pre-generated telemetry file associated with the chosen Mission. Figure 2-6 shows that the telemetry options associated with the “Lunar ascent, descent” Mission example from section 2.4.1 are files to depict ascent or descent of a Lunar Lander.



Figure 2-5 Telemetry Selection Dialog Box

2.4.3 Streaming Telemetry

DON can use a real-time telemetry stream as the data source for any Mission available on the Mission menu. To open a simulation using a stream instead of a pre-generated file, click the black networking icon in the upper right corner of the telemetry selection dialog box. A second dialog, shown in Figure 2-7, will appear requesting the configuration settings to use for the data stream. If this dialog was opened in error, click the red “Cancel” button at any time to close it and return to the previous screen.



To configure a network stream as the simulation data source:

1. Enter the IP address of the system transmitting the data
2. Enter the port number the data will be streamed through
3. Select the simulation time step from the “Time” dropdown
4. Select the telemetry format from the “Type” dropdown
5. Click the green “OK” button

DON will attempt to connect to the remote simulation. If successful, the virtual environment will launch and the newly configured stream will be saved for future sessions.

3 USING DON

3.1 GRAPHICAL USER INTERFACE

DON's Graphical User Interface (GUI) enables users to interact with the chosen simulation and customize what is displayed within the virtual environment. The primary elements of the DON GUI are identified in Figure 3-1.

1. The telemetry control panel
2. The simulation menu
3. The metadata display windows



Figure 3-1 Simulation GUI

3.1.1 Telemetry Control Panel

The telemetry control panel enables users to control simulation playback. By default this panel is located in the bottom center of the screen. The panel may be relocated anywhere within the simulation display window with the following steps:

1. Place the mouse cursor over the panel in one of the grey areas
2. Press and hold down the mouse button
3. Drag the panel to the desired location
4. Release the mouse button

Components of the telemetry control panel include buttons and informational display. Buttons are black when inactive and white when active. All components are identified in Figure 3-2 and described to the right of the graphic. Those components which are informational only and cannot be acted upon by the user are in italics.

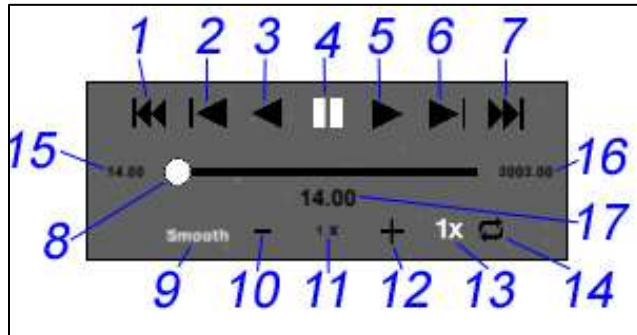


Figure 3-2 Telemetry Control Panel

1. Jump to the beginning of the telemetry
2. Jump backward one time step
3. Play telemetry in reverse
4. Pause/Resume playback
5. Play telemetry forward
6. Jump forward one time step
7. Jump to the end of the telemetry
8. Playback slider – indicates relative position in the telemetry and can be dragged to a specific simulation time
9. Interpolate position between time steps for smoother playback
10. Decrease playback speed
11. *Current playback speed*
12. Increase playback speed
13. Set playback speed to 1 time step per second
14. Loop simulation
15. *Simulation start time*
16. *Simulation end time*
17. *Current simulation time*

When loading a new simulation, playback is in a paused state with the slider at the beginning of the telemetry. To begin the simulation, the user may do one of the following:

1. Press the pause/resume button (4) or play forward button (5) to begin the simulation from the beginning
2. Drag the slider (8) to a desired location within the telemetry stream and play forward (5) or in reverse (3) from that point
3. Use the jump forward button (6) to skip ahead in the telemetry and play forward (5) or in reverse (3) from that point

If the loop simulation button (14) is not active, the simulation will terminate playback when it reaches the end of the telemetry file or, if playing in reverse, the beginning of the telemetry file. To play the simulation again the user must use the jump to beginning (1) or jump to end (7) controls and then press the playback button for the appropriate direction.

3.1.2 Simulation Menu

The simulation menu is an opaque bar across the top of the simulation window. Its position is fixed and cannot be adjusted by the user. It contains five headings – Objects, Simulations, Cameras, Metadata, and Menu – that provide additional ways for the user to interact with the simulation.

3.1.2.1 Objects

Clicking the “Objects” heading on the simulation menu toggles a dropdown list of models tagged by the simulation creator as objects of interest. Clicking on one of the list items will trigger several changes

within the viewing environment. Figure 3-3 provides an example of these changes for a simulation where its “L2 Tower Antenna Array” object is selected.

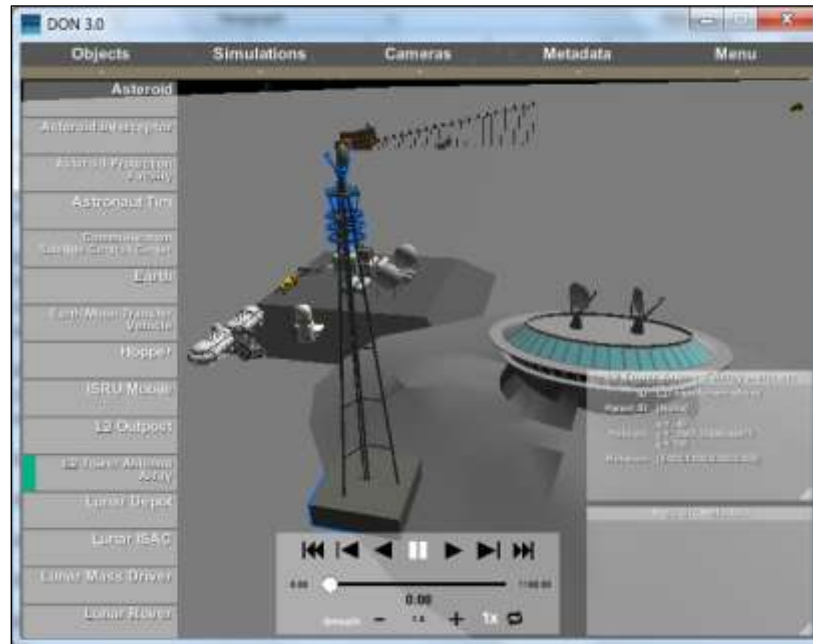


Figure 3-3 Object Selection

- The user's viewpoint jumps to a position that can see the Tower Antenna Array
- The model corresponding to the Tower Antenna Array is outlined in blue
- The object menu displays a green bar next to the “L2 Tower Antenna Array” item
- The object metadata window displays information about the Tower Antenna Array

Note: If the object list is longer than the current window size can support, click and hold the mouse button anywhere in the object list, then drag the mouse to scroll it up or down. Releasing the mouse button will release the list. DON will remember this position when the Objects list is toggled off and display it at the last location next time the Objects list is opened.

3.1.2.2 Simulations

Clicking the “Simulations” heading on the simulation menu toggles a dropdown list of all telemetry available for the current Mission, enabling users to review different simulations without requiring a new DON session. The contents of the dropdown list are identical to those shown in the telemetry selection dialog box after Mission selection. Clicking on one of these items will prompt the user for confirmation that they wish to load a new simulation.

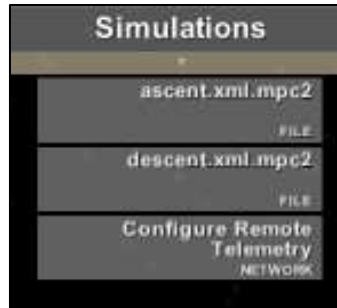


Figure 3-4 Simulation Selection Dropdown

The last item on the list, “Configure Remote Telemetry”, allows the user to identify a new streaming data source for the Mission. Reference section 2.4.3 for directions on how to configure a new network data source.

3.1.2.3 Cameras

Clicking the “Cameras” heading on the simulation menu toggles a dropdown list of all locations identified by the simulation creator as providing views of interest. Clicking on any of these items will jump the user’s viewpoint to the specified location and display a green bar next to the chosen view in the Cameras menu. If the user navigates away from the location by a means other than selecting a different camera, the last chosen camera view will remain highlighted in the menu. Figure 3-5 shows the DON environment with the Cameras menu active and the “Rover Driver” view selected.



Figure 3-5 Camera Menu and Selected View

3.1.2.4 Metadata

Clicking the “Metadata” heading on the simulation menu toggles a dropdown list that allows users to select which metadata display windows to show on the screen. Visible metadata windows are identified on the list by a green bar.

Note: If the “Object Metadata” item is changed from invisible to visible and no object is selected, the window will not reappear until the user selects an object of interest.

Figure 3-6 shows the DON environment with the Objects and Metadata menus active, an object selected, and both metadata display windows active.

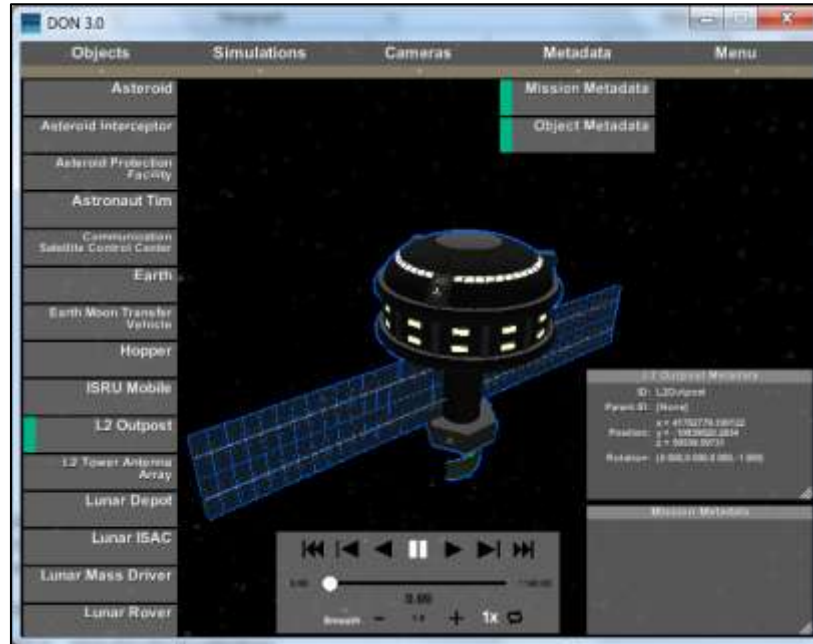


Figure 3-6 Metadata Menu

3.1.2.5 Menu

Clicking the “Menu” heading on the simulation menu toggles a dropdown that provides users with an option to quit the current mission. If this option is selected, the user will receive a confirmation prompt before being returned to the main menu.

3.1.3 Metadata Display Windows

DON provides two metadata display windows within the graphical environment to display simulation-relevant non-graphical information to the user.

Mission Metadata: Provides information specific to the simulation provided by the simulation creator. Examples of simulation metadata a provider may wish to include are scenario description, name and version of the source simulator, run date, versions of 3-D models, and points of contact.

Object Metadata: Provides non-graphical information in the telemetry stream specific to the selected object of interest. This information will change over time as the simulation progresses and may be sourced by a simulator other than the one that generated the positional information. Examples of object metadata include position in the simulation environment, trajectory, velocity, and health and status data (e.g. available fuel, power consumption, cg).

By default the metadata display windows are located in the lower right-hand portion of the screen, as seen in Figure 3-6. They may be relocated using the following steps:

1. Click in the window title bar and hold down the mouse button
2. Drag the window to the desired location
3. Release the mouse button.

Metadata display windows may also be resized by using the click and drag method above on the textured corner of the window highlighted in Figure 3-7.

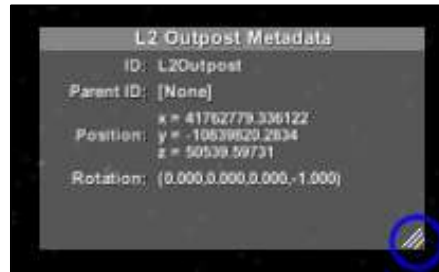


Figure 3-7 Metadata Display - Resize Tab

DON will remember metadata display window size and position when the windows are toggled off and display them at the same size and position the next time they are turned on within the session.

Note: Other GUI elements cannot be accessed through a metadata display window. If a metadata window is positioned on top of the telemetry control panel or a simulation menu dropdown, it must be dragged out of the way before the user will be able to interact with dropdown menu items or telemetry control buttons.

3.2 USER NAVIGATION

Users may explore the DON virtual environment using their mouse and keyboard. Default navigation controls are identified in the table below.

<u>Hotkey</u>	<u>Command</u>
Q	Ascend
W	Move forward
E	Descend
A	Slide Left
D	Slide Right
S	Move Backwards
Z	Rotate Counterclockwise
C	Rotate Clockwise
X	Reset Orientation
Click+Hold Alternate Mouse Button	Pan viewpoint

While navigating the simulation environment, clicking on a 3-D model with the primary mouse button will select the item if it is a defined object of interest.

3.3 SHORTCUTS

DON provides shortcuts for interacting with some features of the GUI. Available shortcuts are provided in the table below.

<u>GUI Function</u>	<u>Hotkey</u>	<u>Command</u>
Camera Selection	Number Keys 1 – 0	Choose Camera N, where N is the number in the “Cameras” dropdown list ordered from top to bottom
Telemetry Control	Y	Go to Beginning of Stream
	U	Step Reverse in Frame
	I	Play in Reverse
	O	Toggle Between Pause and Play (Forward/Reverse based on last selected)
	P	Play Forward
	[Step Forward in Frame
]	Go to End of Stream
	H	Toggle Smoothing
	J	Step Backwards With Scrubber
	K	Step Forwards With Scrubber
	L	Reset Playback Rate to 1x
	;	Toggle Looped Play
	,	Decrease Playback Rate
.	Increase Playback Rate	
Simulation Menu Navigation	Tab	Cycle through all non-VCR menu items
	Enter	Activate current tabbed item