

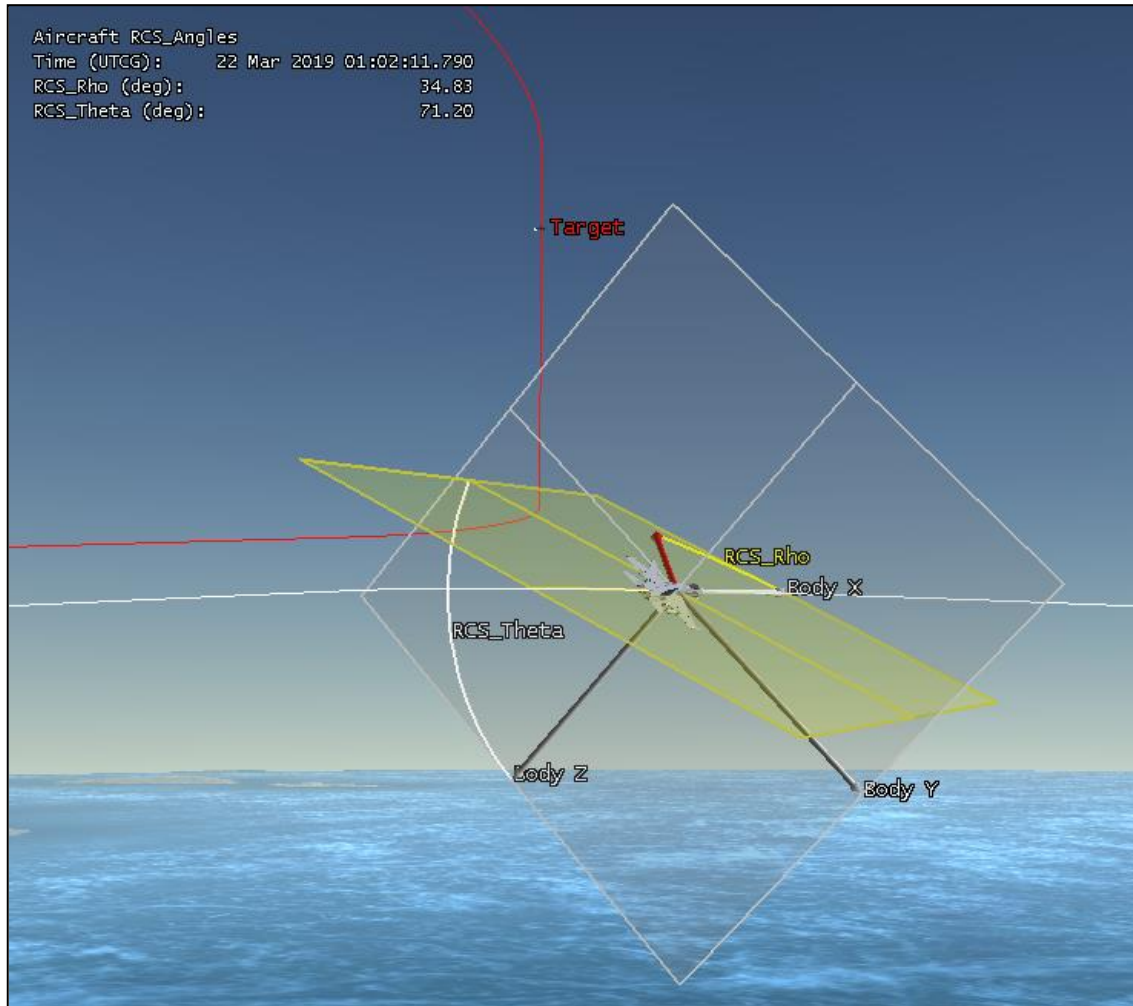
RCS Angles – Computing and Visualizing Rho/Theta in STK

Rho is defined as the angle between the incident vector and the nose of the aircraft. By convention, the **Body X** axis aligns with the aircraft's nose.

Theta is an angle measured entirely in the **Body YZ** plane (perpendicular to the aircraft's nose direction). Theta is measured relative to the **Body Z** axis, and is equal to the angle between the aircraft **Body Z** axis and the *projection* of the incident vector onto the aircraft **Body YZ** plane.

The **Rho** and **Theta** angles are shown below:

- The aircraft's nose is aligned with the **Body X** vector, and the incident vector is shown in *red*. The **Body YZ** plane is shown in white.
- **Rho** is the angle between the **Body X** and incident vectors (arc shown in yellow). The yellow plane shows the plane that Rho lives in – it contains the incident vector and the aircraft **Body X** vector.
- **Theta** lives entirely in the **Body XY** plane. It is measured between the **Body Z** axis and the *projection* of the incident vector onto the **Body YZ** plane (intersection of the yellow/white planes).



Rho & Theta Angles

In STK, Rho can be calculated using a **Between Vectors** angle in Analysis Workbench.

Theta can be modeled by creating a **Dihedral Angle** in Analysis Workbench. With the **Dihedral Angle**, theta is forced to live *entirely* in the **Body YZ** plane.

The screenshot shows the 'Edit Component Properties' dialog box for a 'Between Vectors' angle. The 'Type' is set to 'Between Vectors'. The 'Name' is 'RCS_Rho' and the 'Parent' is 'Aircraft/Aircraft'. The description field contains 'Angle between two vectors.'. The 'From Vector' is 'Aircraft Body.X' and the 'To Vector' is 'Aircraft Target'. The dialog has 'OK', 'Cancel', and 'Help' buttons at the bottom.

The screenshot shows the 'Edit Component Properties' dialog box for a 'Dihedral Angle'. The 'Type' is set to 'Dihedral Angle'. The 'Name' is 'RCS_Theta' and the 'Parent' is 'Aircraft/Aircraft'. The description field contains 'Dihedral angle from one vector to another about third vector.'. The 'From Vector' is 'Aircraft Body.Z', the 'To Vector' is 'Aircraft Target', and the 'About Vector' is 'Aircraft Body.X'. The 'Direction about Vector' is set to 'Positive' and the 'Range' is '-180 to 180 deg'. The dialog has 'OK', 'Cancel', and 'Help' buttons at the bottom.

Rho and Theta angle definitions in STK

Visualize and Report

Visualize the angles on the **Aircraft Properties > 3D Graphics > Vector** window. The dihedral angle supporting arcs can be shown if desired.

To report or graph the values of Rho and Theta, a custom report or graph can be created with data providers from the **Angles** group. By adding **Time**, **RCS_Rho**, **RCS_Theta** a data display/report can be created, or a graph can be generated.

