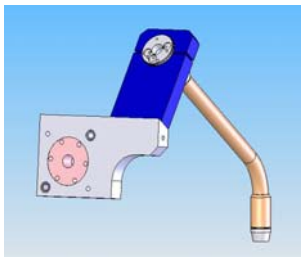
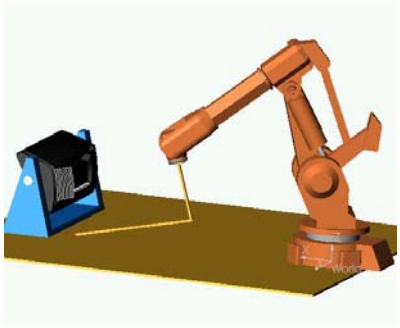
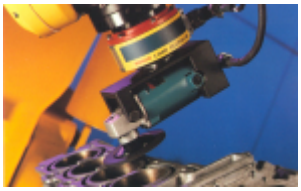
Blue Technik RobotWorks Tutorial F02

Using an imported tool in your application

GIVEN:

- An arbitrary robot End Of Arm Tooling CAD model to be used in a RobotWorks session.
- The EOAT has been exported from a non-SolidWorks application, then imported into SolidWorks.
- For example, a tool model has been exported from Unigraphics to a parasolid format. Then the parasolid models were imported into SolidWorks format.


PROBLEM:

- It is desired to use this imported tool with RobotWorks to do a robot path application.

How to do this?

SOLUTION:
RobotWorks can use any imported Robot End Of Arm Tooling CAD model. But the EOAT CAD model requires very specific features to be attached to the robot tool model. Otherwise, it will not work properly with RobotWorks.

These features are added in SolidWorks to the existing robot tool model. These features consist of a few sketches, axes, and coordinate systems. Once you have these features added, then your tool model will work perfectly with RobotWorks.

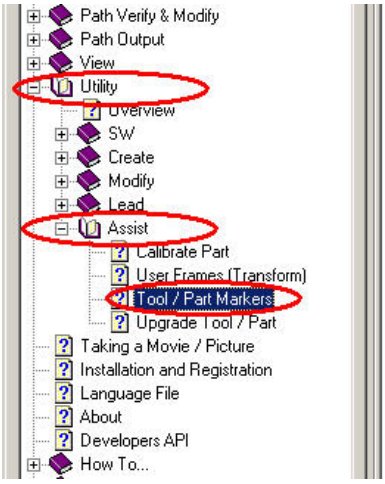
If not done already, then import all of the individual robot tool component files into SolidWorks format. Verify that the individual tool components are properly mated together.

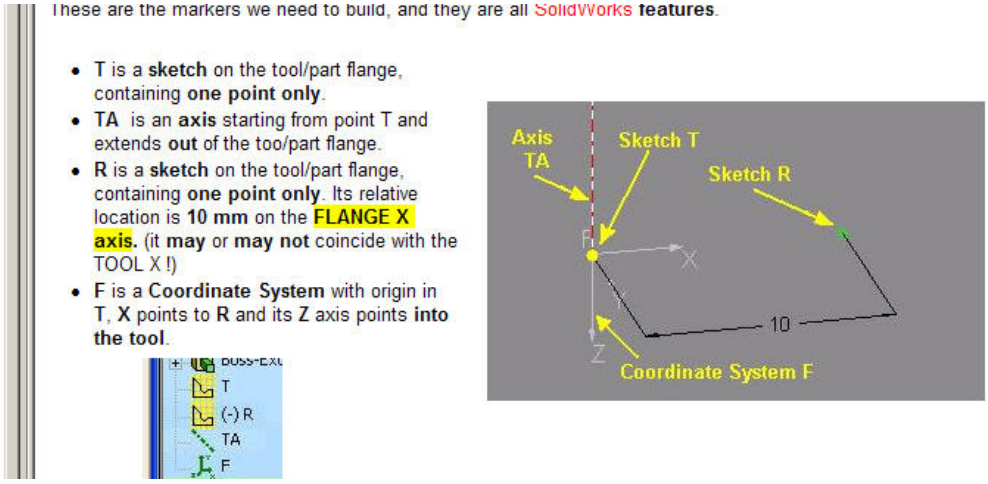
Assumption: the tool center point is NOT located at the model file origin point. This is the general case. It is rare that the TCP is actually constrained or mated to be coincident with the model origin.

Why is this important?

- In the example given here (a welding torch) it is desired to put the torch tip at the weld seam. It is required for RobotWorks to have the correct coordinate transformation of the TCP.
- The default Coordinate Transform of the TCP model is coincident with the model origin point.
- If the model TCP is not located at the model origin point, then it is necessary to create a separate coordinate system at the TCP.
- Then it is necessary to give the coordinate transformation from the EOAT flange to the EOAT TCP.
- ***Luckily, RobotWorks functionality makes all of the transformational mathematics straightforward and easy.***

Reference: see the **RobotWorks Help File** discussion about **Tool Markers**. It is located in the ***Utility / Assist / Tool/Part Markers*** listing in the Help File.

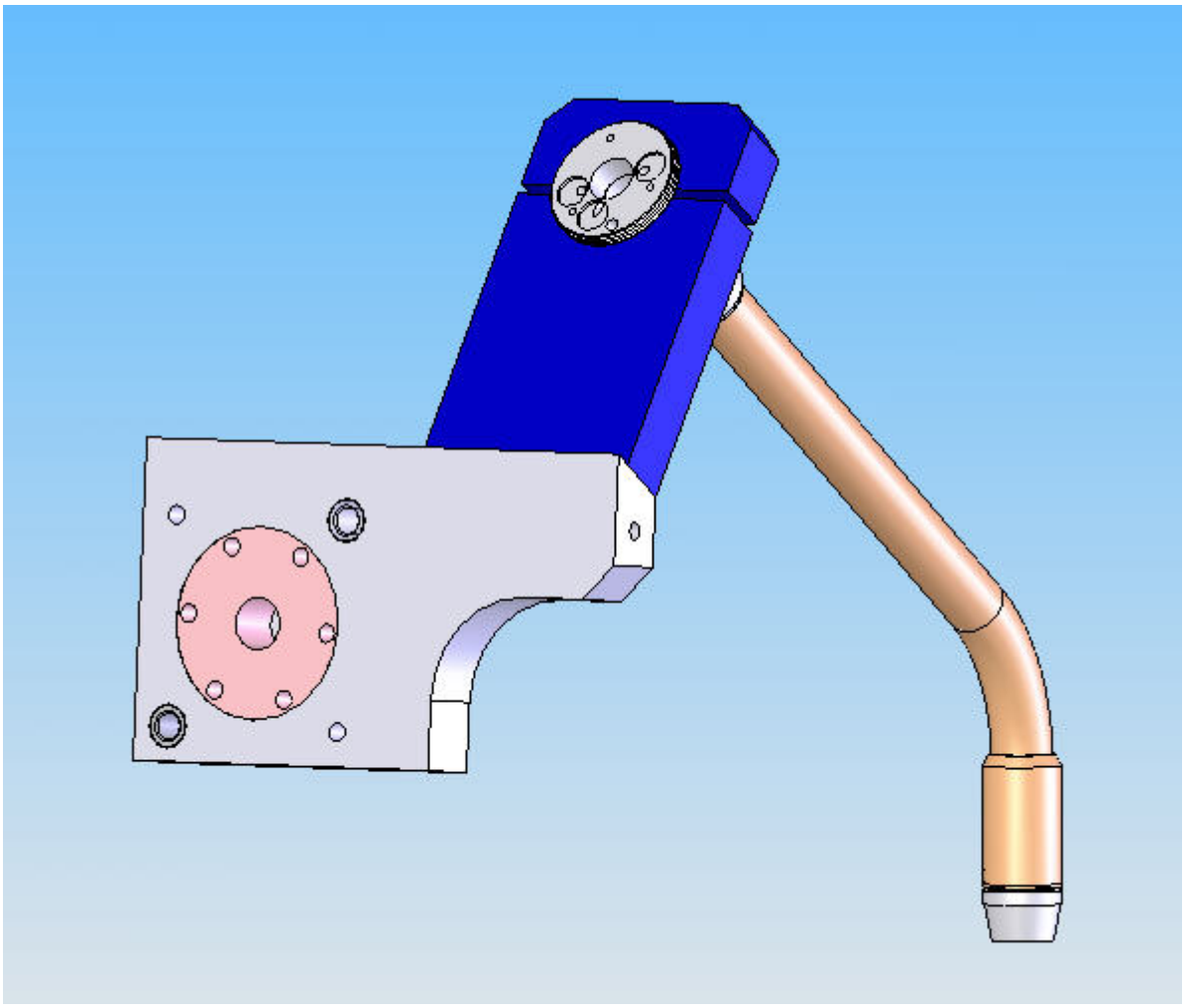




Follow the procedure given on this discussion exactly.

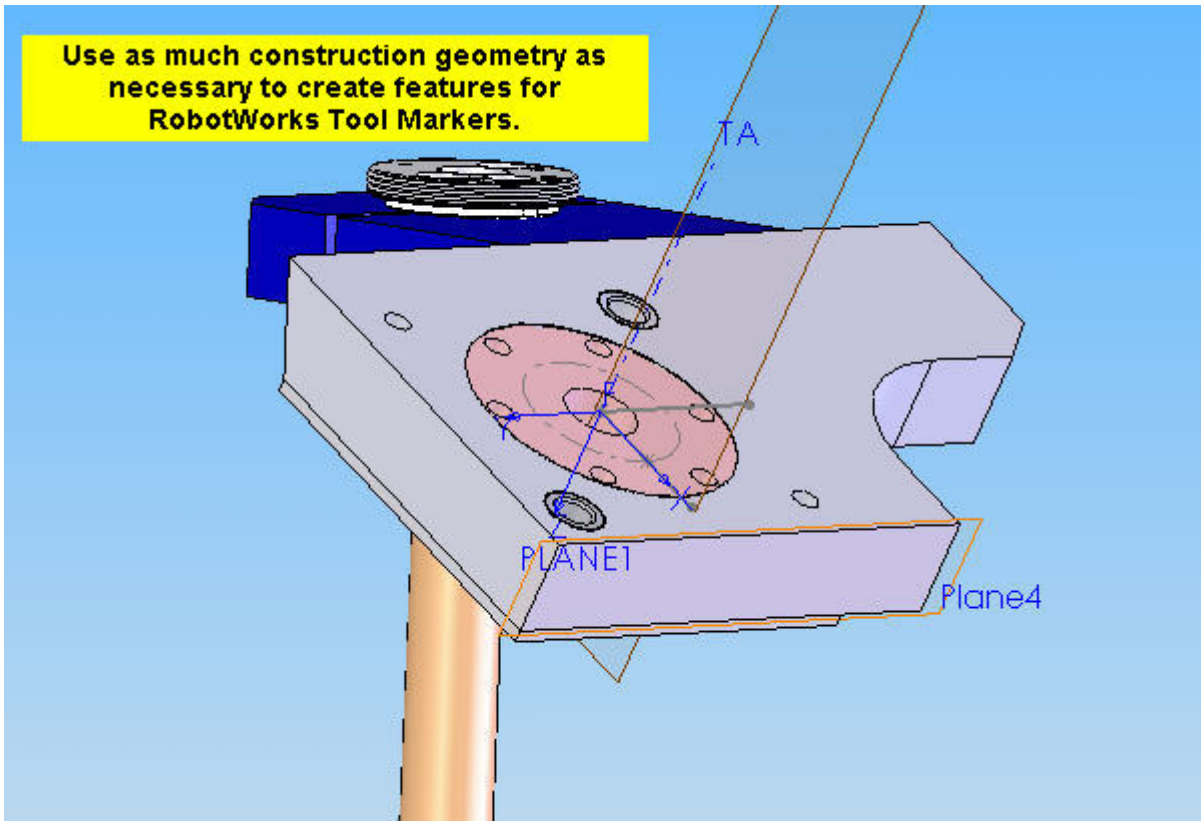
For this example, we have this generic Welding Torch model imported from a non-SolidWorks CAD package.

Here again is a picture of the Welding Torch model. It was imported from a non-SolidWorks CAD package. This obviously is an assembly of parts.

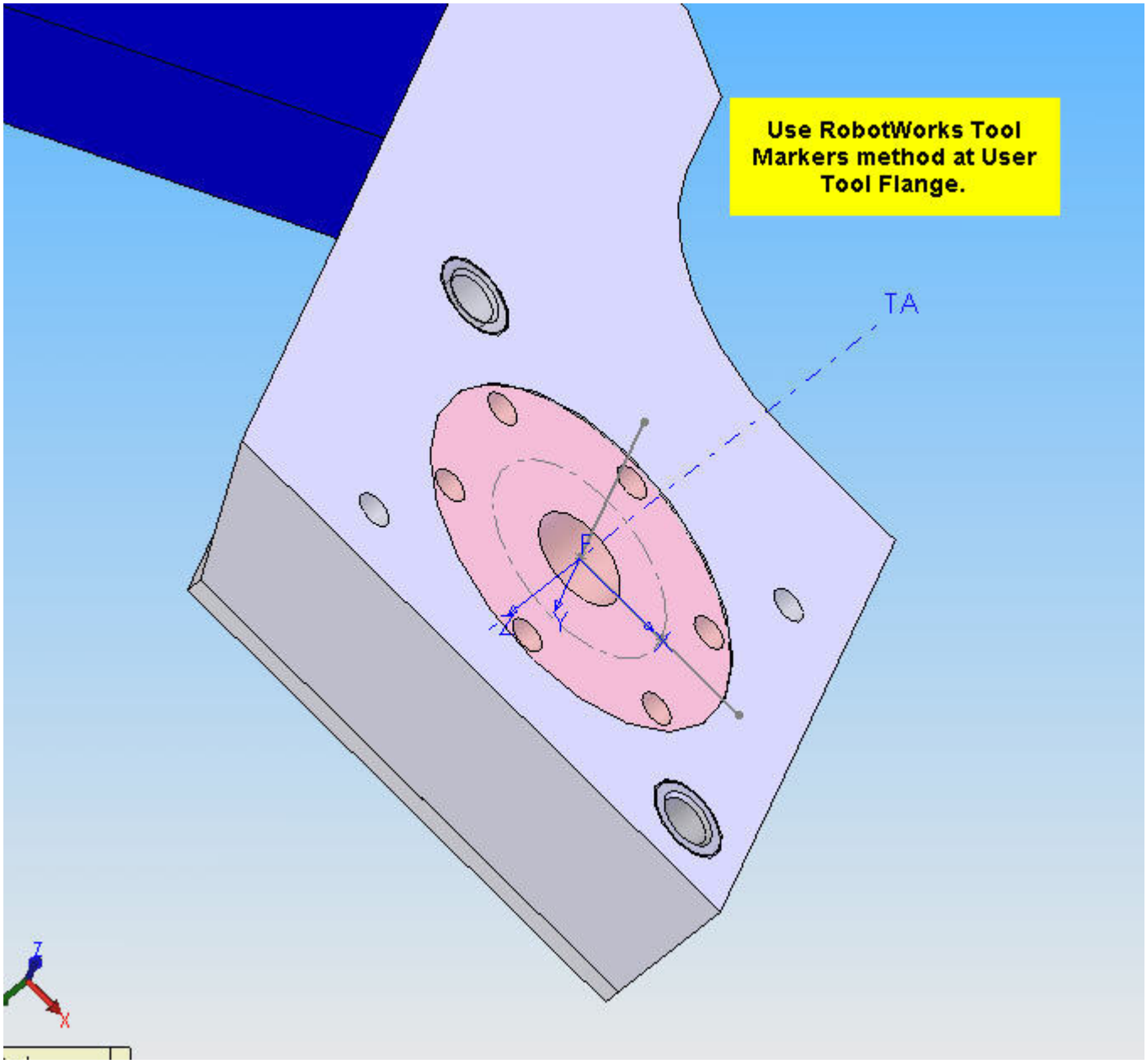


In order to apply Tool Markers, it may be necessary to add a variety of extra construction geometry to the model. This means adding features such as planes, axes, sketches, and coordinate systems.

This is one of the key advantages of RobotWorks over competitive products: the user can use the power of SolidWorks to be any type of virtual feature that is necessary in order to do the project. Even the “high-end” robot offline programming packages have limited capability in this regard.


Use as much construction geometry as necessary to create features for RobotWorks Tool Markers.
TA
PLANE1
Plane4

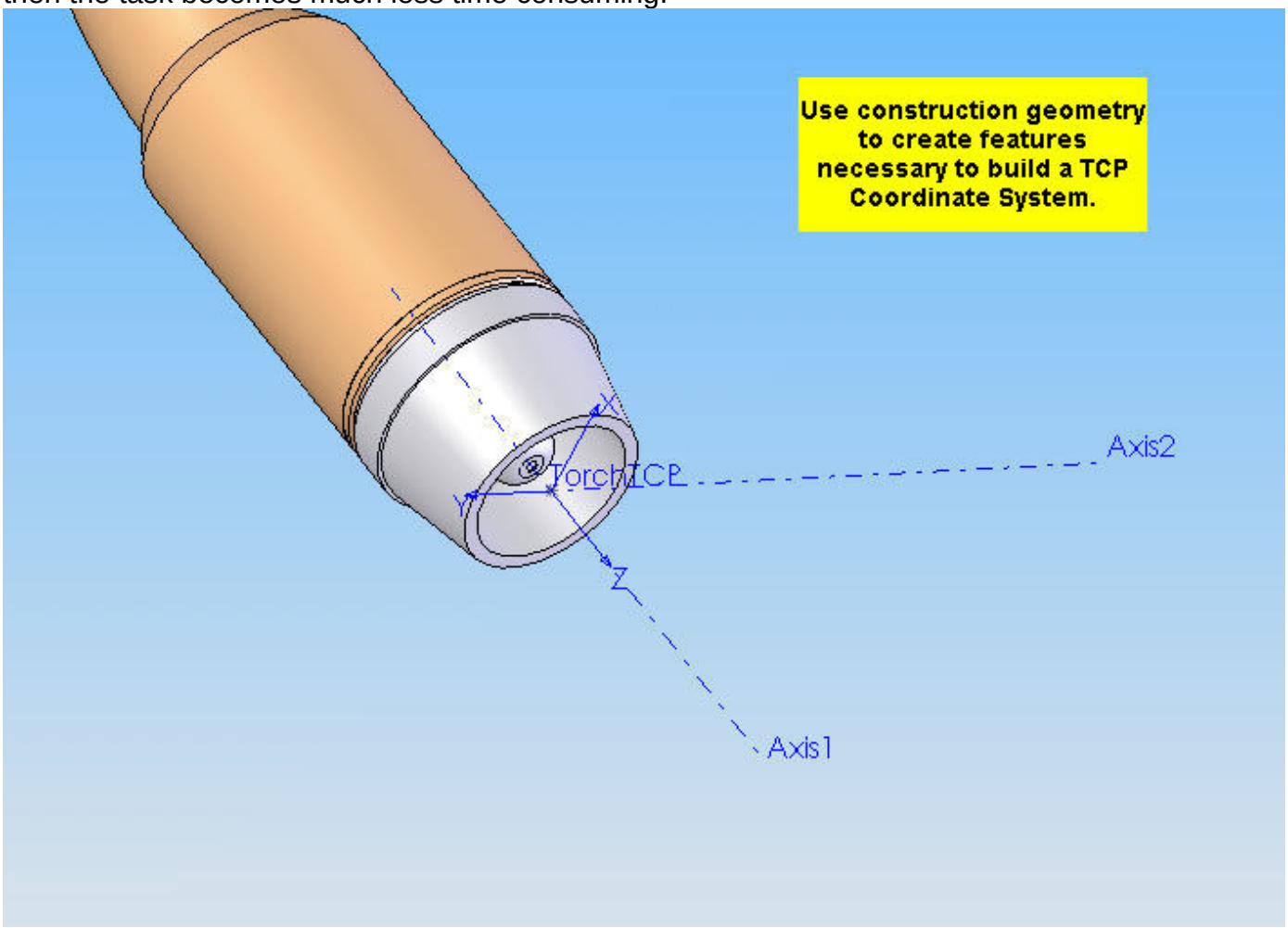
Shown here are some of the required sketch features applied to the tool flange to create the Tool Markers.



For the Torch Tip, we also need a Coordinate System. This will be necessary for accurate model behavior and robot programming.

But the Torch Tip is actually located at an arbitrary location in the assembly model space. It is necessary to create additional construction geometry features in the model. These features will allow us to place a new Coordinate System WHERE we want it, and with the CORRECT ORIENTATION.

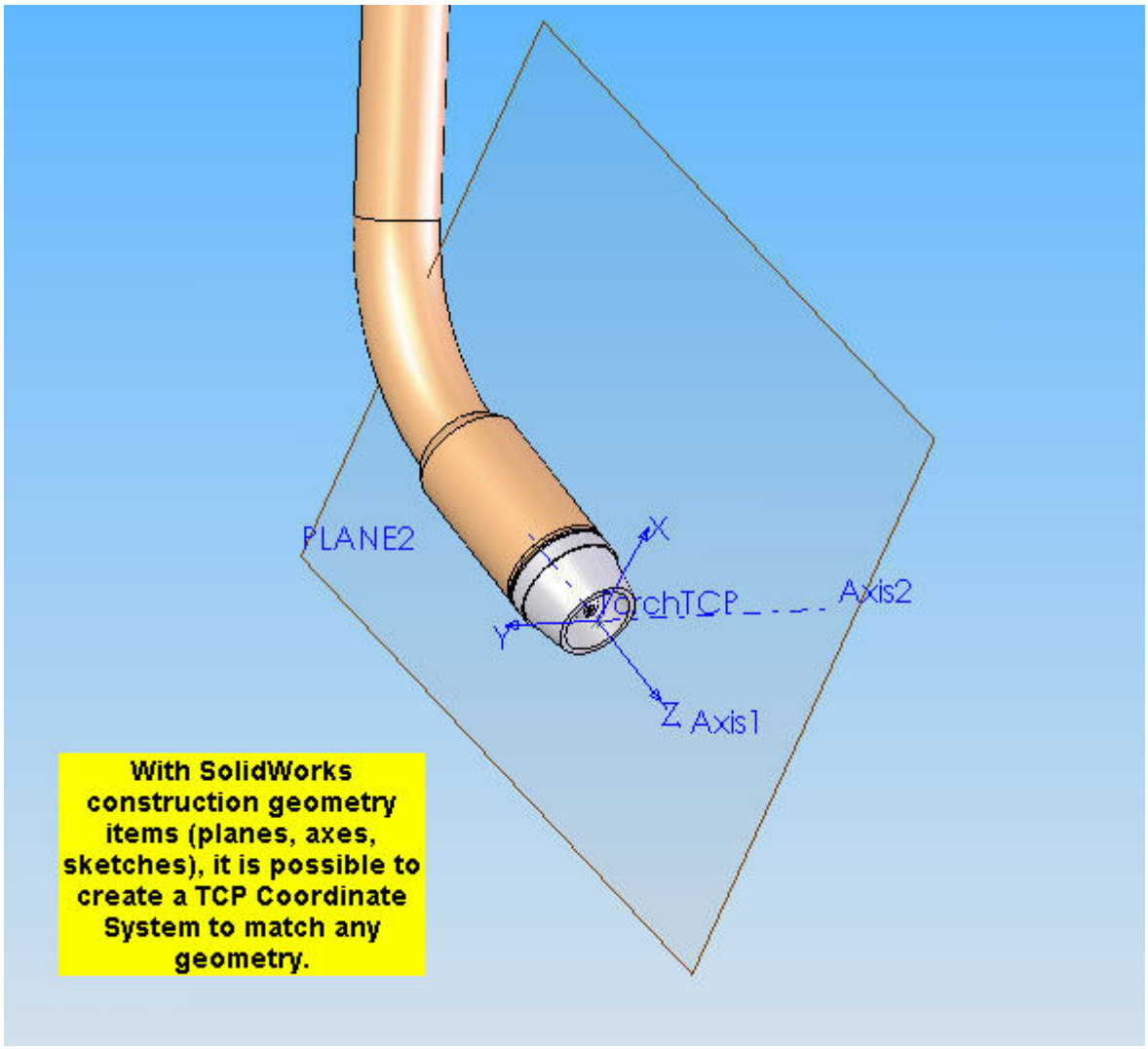
Having the correct orientation is important as any robot programmer knows. If the TCP orientation is known, then the task of teaching points becomes easier. WHY? Think about it. Teaching requires moving the TCP in desired directions. If the desired directions are predictable, then the task becomes much less time consuming.



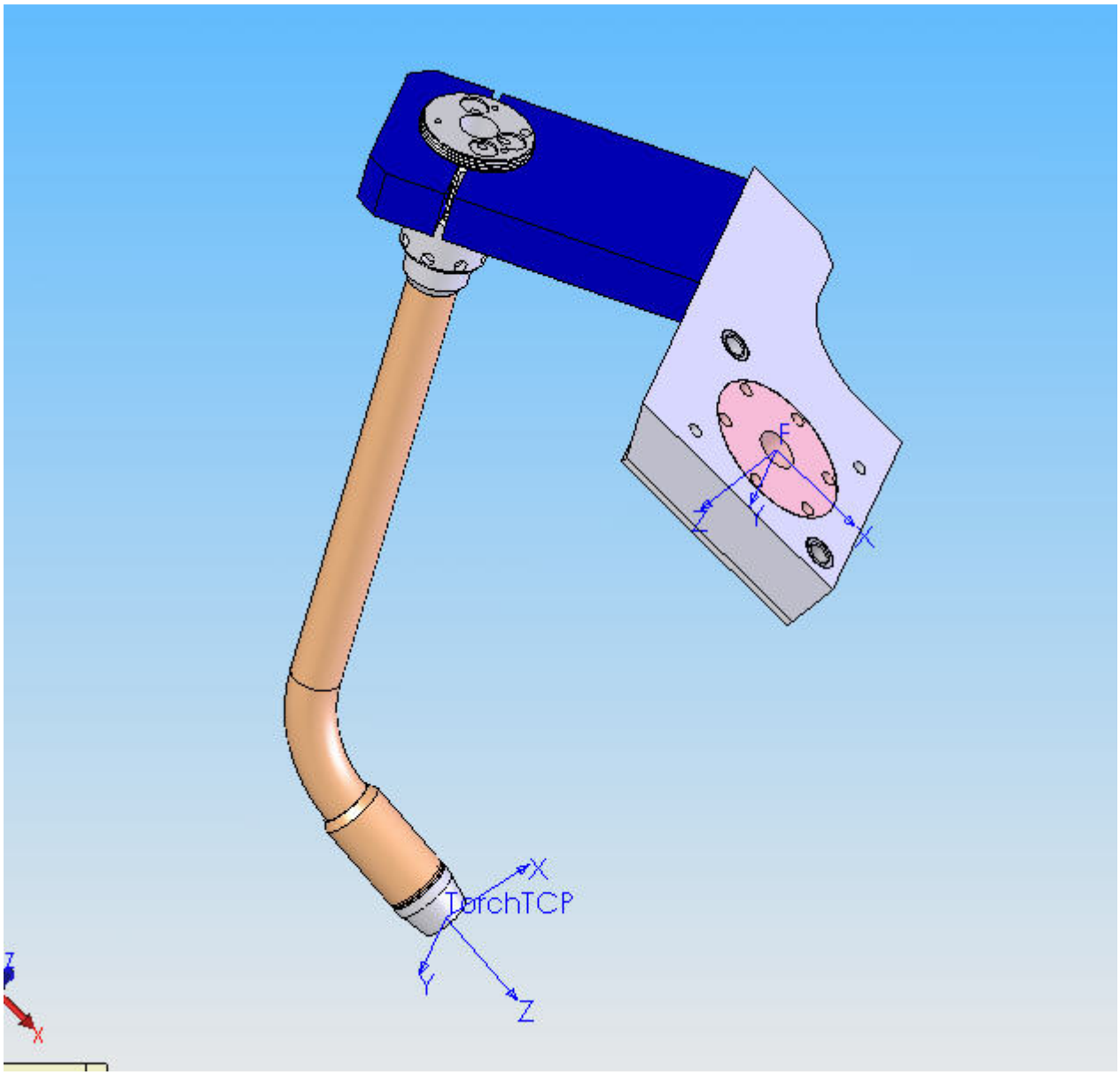
Expert Tip: Depending upon the complexity of your application, you may want to create multiple TCPs. Having multiple TCPs will make it easier to build complex applications.

How can multiple TCPs be used?

- Mulitple TCPs on grinding / buffing wheel tools in a Carried-Part application allow easy creation of paths at different grinding / buffing depths
- Motion in different TCP attitudes can be accomplished.



Continue with the process and it is possible to create a RobotWorks-compatible EOAT as shown below. Here we have all of the necessary Tool Markers AND a TCP Coordinate System.



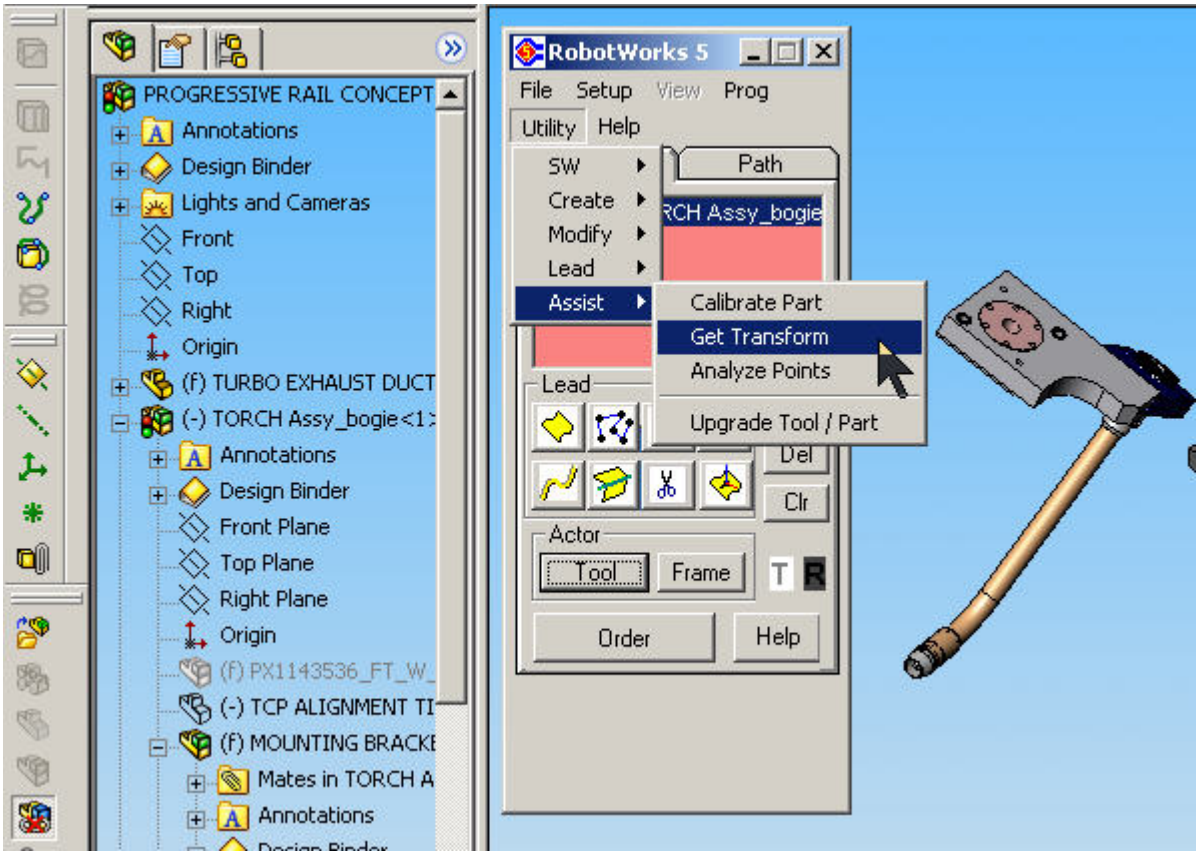
But this will not work by itself. You can try it with RobotWorks, but the part origin will move along the path, not the TorchTCP Coordinate System.

WHY?

Because RobotWorks uses the EOAT part model origin as the default TCP Coordinate System. It is necessary to provide the actual TCP Coordinate System, and it's Coordinate Transform from the part origin, to RobotWorks.

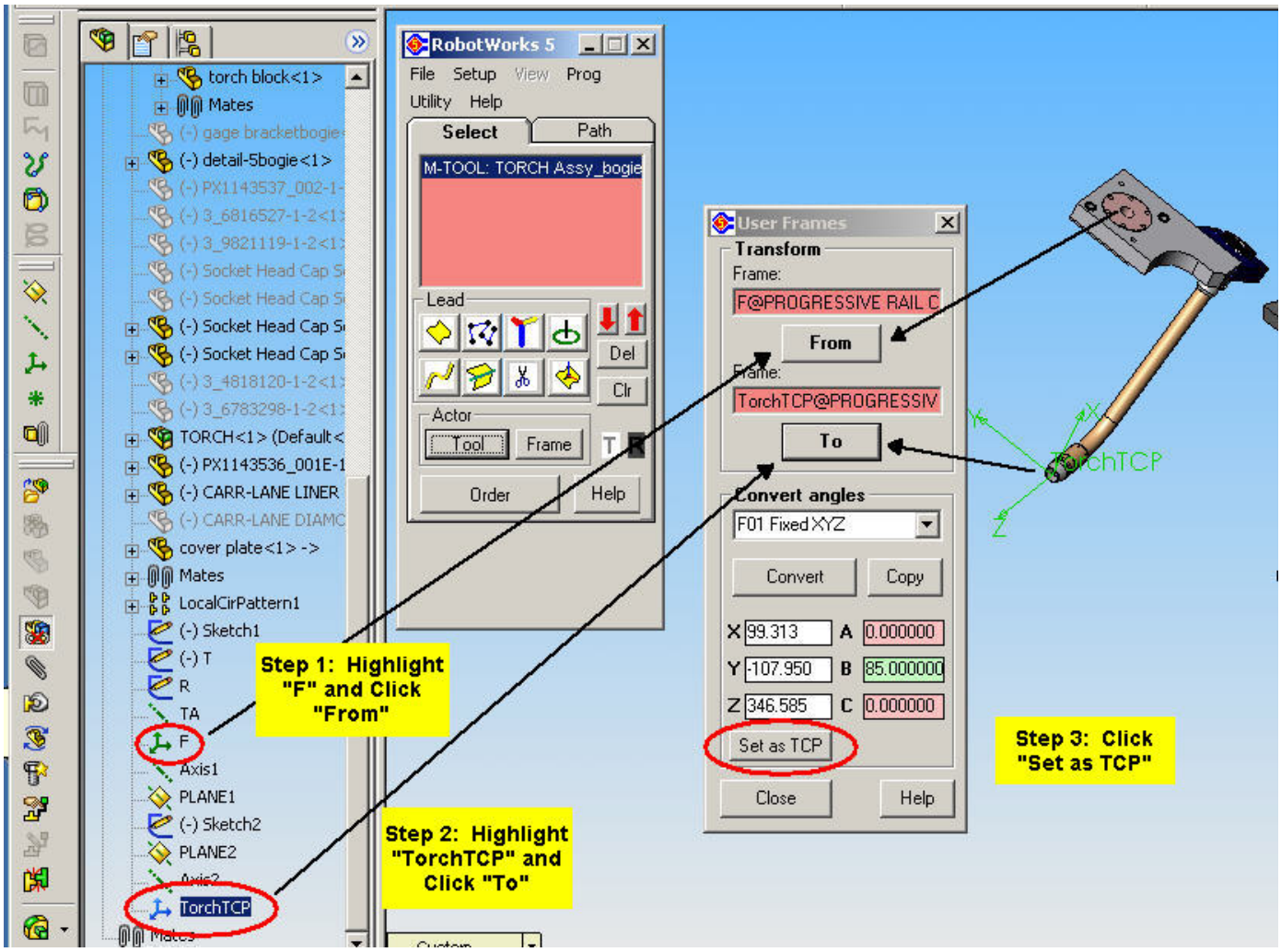
In your RobotWorks session you will add the Tool to the RobotWorks Browser. It will then be necessary to get the correct tool transform for this tool and tell RobotWorks that you've done this. The Get Transform function is found in the ***RobotWorks/Utility/Assist/Get Transform*** drop-down menu.

This will open up the User Frames Dialog Box in your RobotWorks session.



Once that is done, then click on the "**F**" Tool Marker in the SolidWorks Feature Manager. Highlight it, then click the "**From**" button on the User Frames Dialog Box. Do likewise for the "**TorchTCP**" Coordinate System and the "**To**" button on the User Frames Dialog Box.

Click the "**Set as TCP**" button at the bottom of the User Frames Dialog Box to tell RobotWorks what your tool transform is.



See the associated .avi movie file with this tutorial for this procedure in action.

CAUTION: The Tool TCP setting shown in the picture above is not static. If you end the RobotWorks session and start another with a tool like this, then it will be necessary to to perform this procedure again. To eliminate this procedure, it will be necessary to mate or constrain the Tool TCP to the Part or Assembly Origin. ***Doing this will make the Tool TCP definition permanent and automatic. If a lot of applications are done with the same tool, then this is time well-spent.***

END OF PROCEDURE