The weld path is constructed from the information encoded in a solid model or similar representation of the manufactured part. This work will consider that the welds required for manufacturing are a collection of linear segments with defined work and travel angles for the torch, where the work angle is an angle measured about the weld seam from a reference plane and the travel angle is a rotation about an axis perpendicular to the weld seam and the torch axis. Finally, the torch can be rotated about the torch axis without affecting the weld so this angle (torch angle) can be freely chosen. The pose of the torch at any point will be contained in the pair of triplets (*Pi,Oi*) where *Pi* contains the *x,y,z* positions of the torch tip and *Oi* contains the three angles, work angle, travel angle and torch angle following a defined rotation operation (see the section, defining torch orientation). Thus, the weld path is defined as a set of points and orientations:

with WP the set of weld points, WO the set of weld orienations for a total of *l* defining the weld path. The weld path is series spline of linear segments connecting all points and orientations contained in the sets, WP and Wo (see Figure 7 Sample Manufactured part). The weld path then consists of intersecting line segments, for all weld paths *i=1…l* with orientations *Oi,i+1* defined over each weld path between *Pi* and *Pi+1*. The trajectory is defined as a Linear segment with appropriate blends for the full robot pose. Parabolic blends are used in this work, but could be replaced with a blend that would limit the magnitude of higher derivatives of join motion. The weld specifications defines the travel speed along each line segment, and finally a nominal blend time for the end of the paths is selected as 2.5% of the total path time. The LSPB applied to each segment yields a function with *q* the function yielding robot configuration *C* at any time over the interval ti, *tf* the initial and final times determined from the linear segment speed and blend percentage, time. Note that required torch orientations are not continuous at the line intersection. In practice, one way of handling this discontinuity is by inserting an additional path segments between line segments , and , with end points with a small displacement along the along the weld seam toward point *i* or *i+2* and orientations at the endpoints, .