11.2. Air Bearing Fixture

As an intermediary step for eventually working up to using the Halbach magnet array of superconductors, an air bearing will provide the passive support along the rotor's axis of rotation (z-axis) for incremental development testing stages. Part of the motivation for using an air bearing is to partially reduce the degrees of freedom that need to be controlled. Consequently, this allows for more focused tuning of the coil energizing sequence as well as the active magnet bearing (AMB). There is a channel in which the "cap" on the bottom of the rotor will ride through which also has physical guard rails, thereby assisting in the AMB's responsibility to correct for roll and pitch of the rotor assembly.

Figure **11.5** below shows the air bearing plenum through which building air will enter at approximately 80 psi. The plenum has a very similar form factor to that of the superconductor array and is, ideally, a drop in substitute.

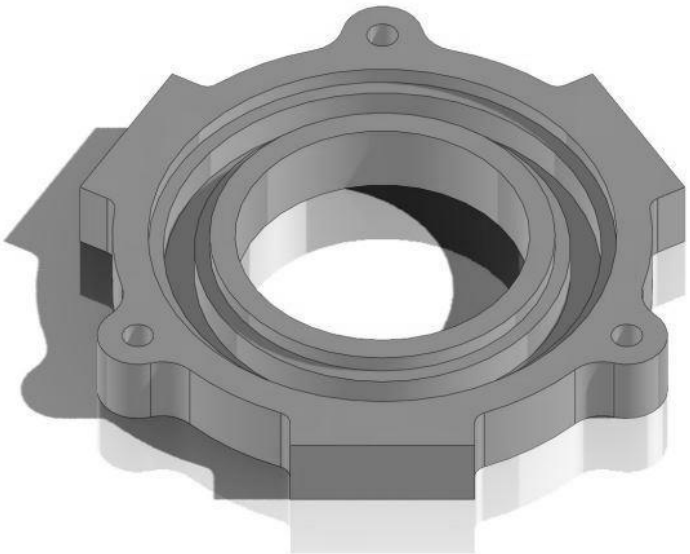

Figure 11.5 Air Bearing "Part"

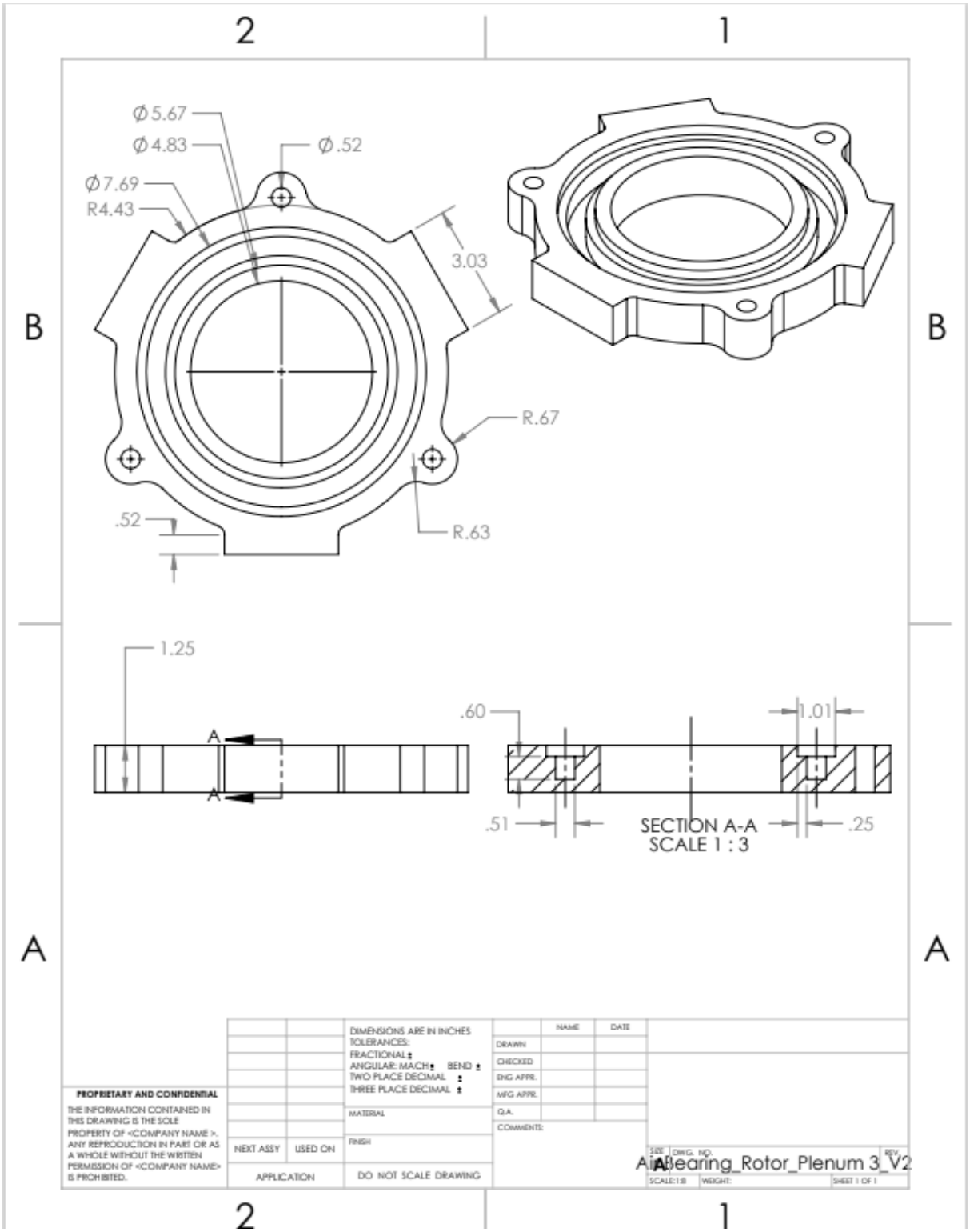

Figure 11.6 Air Bearing "Drawing File"

The plenum takes in air from 6 entry points (2 inlets per lug) through the three square lugs (depicted in the figures above) and distributes the air throughout the main channel. Air is then forced up through the radially spiraled holes in the distribution plate which are intended to increase the incoming air's stream velocity. The flywheel will "ride" on a film of air between the distribution plate and the flywheel tray.

Figure **11.7** and Figure **11.8** below show the part and its drawing file respectively.

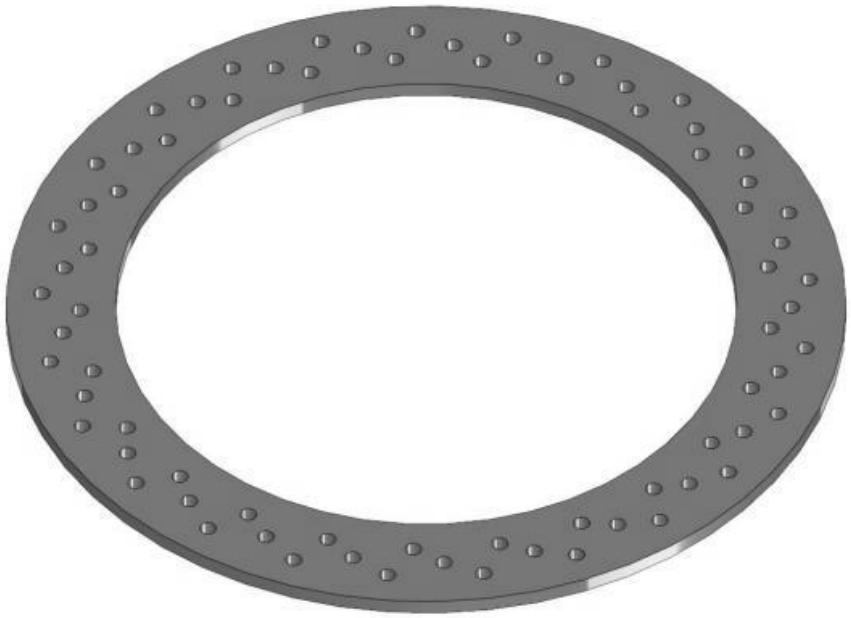

Figure 11.7 Air Distribution Plate "Part"

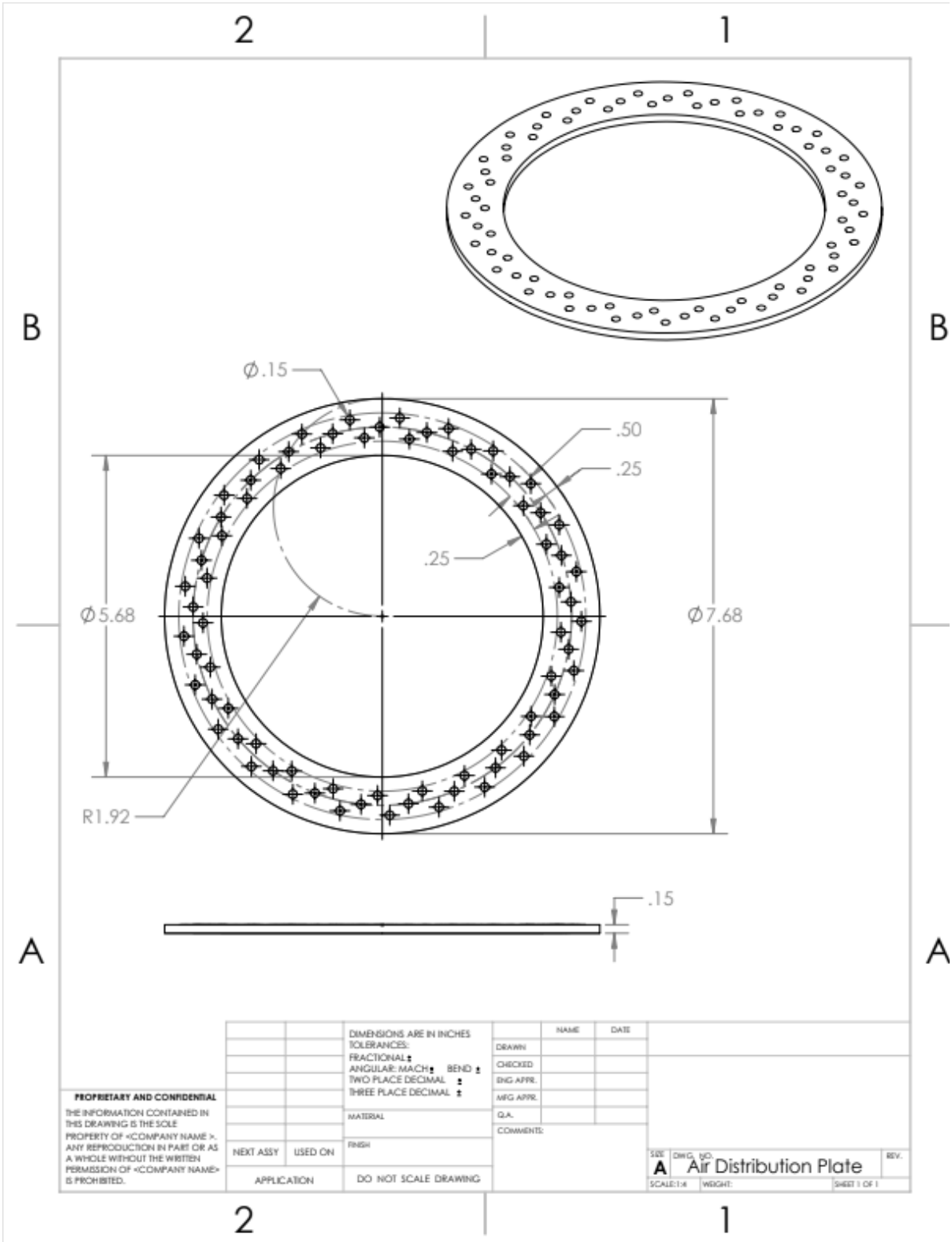

Figure 11.8 Air Distribution Plate "Drawing File"

The last component in this assembly is the “tray” which attaches to the bottom of the rotor and has a protrusion which sits in the channel on top of the air distribution plate.

Figure **11.9** and Figure **11.10** show the part and its drawing file respectively.

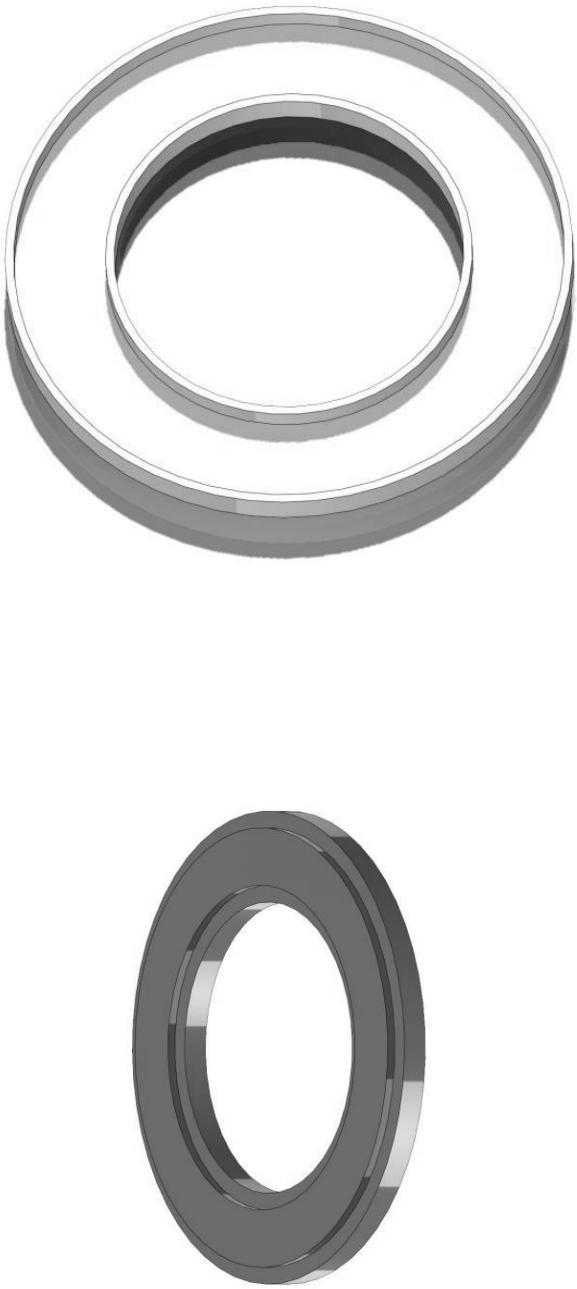

Figure 11.9 Rotor Tray “Part”

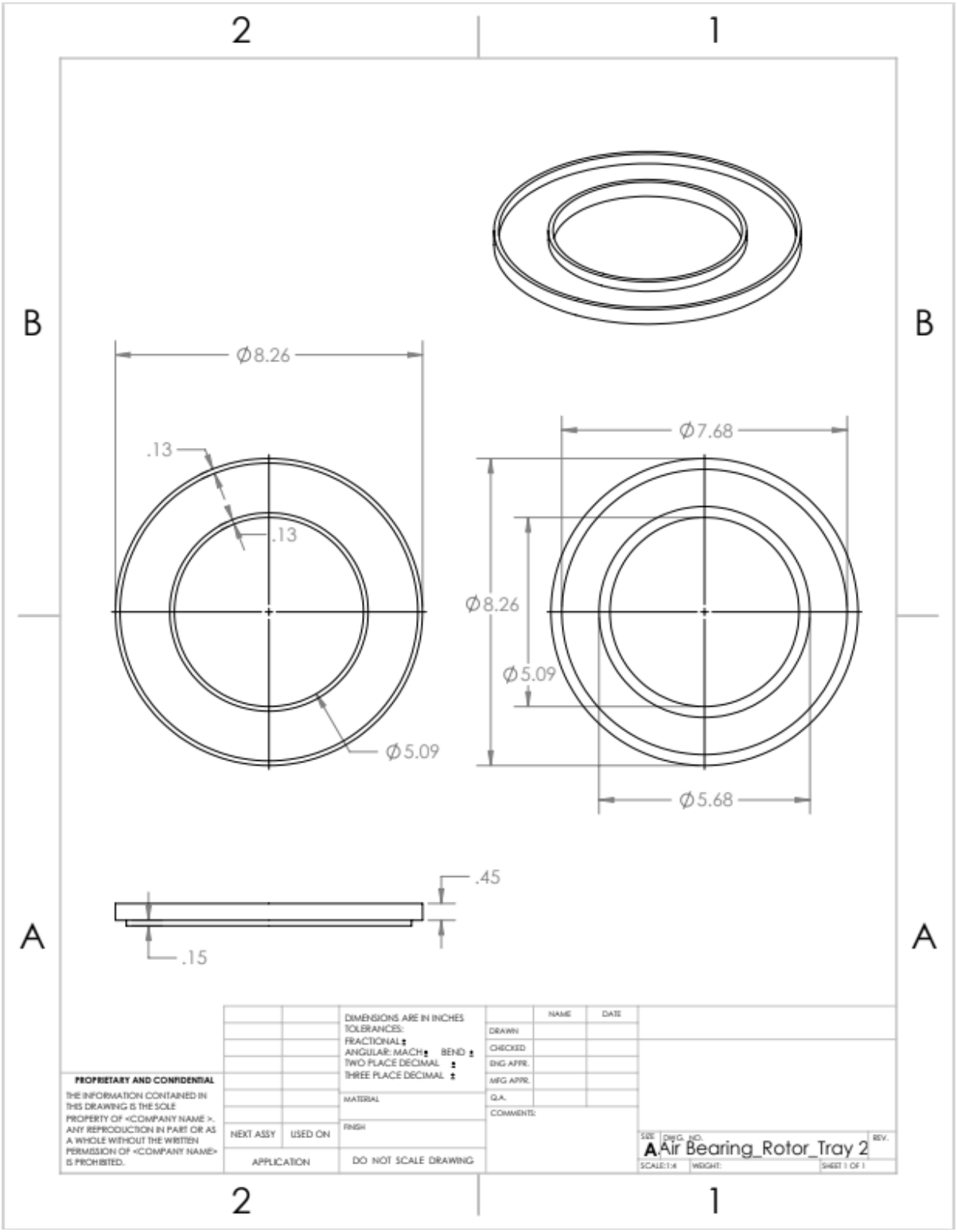

Figure 11.10 Rotor Tray "Drawing File"

Figure **11.11** below shows the final assembly of the air bearing. Note that the rotor is not depicted here.

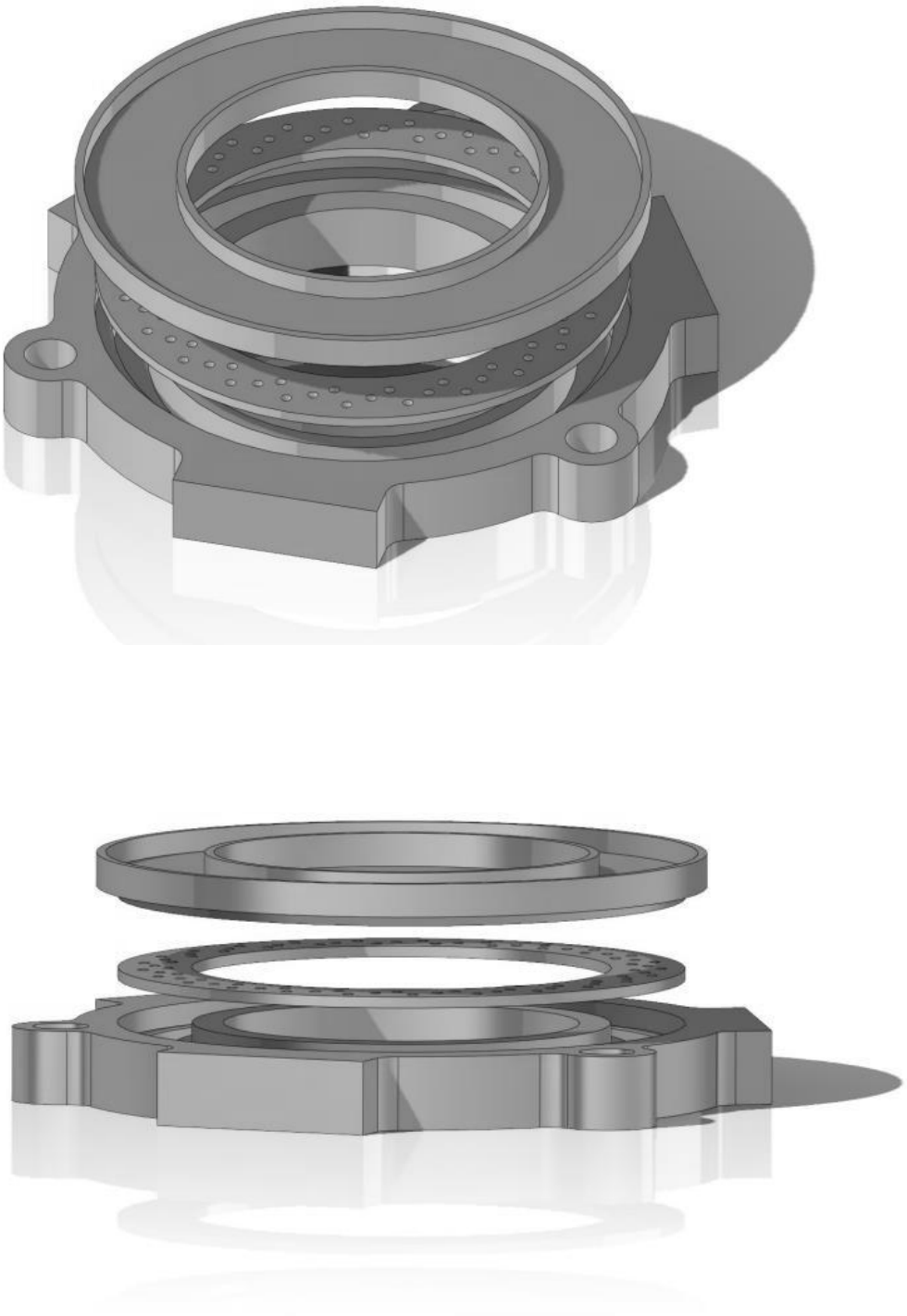

Figure 11.11 Air Bearing “Assembly”