Appendix D
AOE Air Supply System Operating Procedure

This appendix contains the instructions and procedures required to operate the high capacity compressed air supply system located in the basement of the Aerospace and Ocean Engineering side of Randolph Hall. This system is a ‘blow-down’ type composed of a 4-cylinder Ingersol-Rand air compressor capable of 765 psig and a pair of storage tanks with a combined capacity of 800 cubic feet. The compressor is run to charge the storage tanks to a desired pressure, then shut down, and air is consumed from storage. Using an initial full charge to 300psi and a flow rate of 35 scfm, an experiment can be run continuously for at least two hours. Leaks in the system will cause a full charge to drain on its own over a period of eight hours, so it is important to charge the system as a last step before an experimental run.

Prior to starting the compressor, check that the control panel in the supersonic lab is turned on and that the load switch is set to unload, as shown in Figure D-1.
Next, walk to the compressor room and go to the large blue control panel, shown in Figure D-2. Check that the E-stop button is off by rotating the button to the right until it pops out. Also, check that the black switch is in the off position and then push the green ‘start’ button. Several auxiliary pumps will turn on, which supply oil and cooling water to the compressor. Move to the oiler and check that there is a drop of oil hanging from each oiler, as shown in Figure D-3. Also, check that the oiler has at least the level of oil indicated in Figure D-4. Look up and to the right to check in the cooling pipe sight window, shown in Figure D-5, to see that the cooling water is flowing. The spinner clicking against the sight window will now be audible. If the cooling water is not flowing, the compressor will start, but then promptly shut down automatically.
Figure D-1. Supersonic tunnel control panel, showing compressor load control.

Figure D-2. Large blue air compressor control panel in the rear left corner of the compressor room.
Look for oil drop hanging here

Push plunger if no oil drop

**Figure D-3.** Check compressor oiler for correct operation by observing an oil droplet in each of the nine oilers.

Oil fill jug

Oil level should be at least half full

**Figure D-4.** Check oil level in oiler and fill as necessary using black jug.
Check for cooling water flow in sight window and listen for clicker.

With the oil and water running, go back to the control panel; turn the black switch to on and then push the green start button again. A loud clunk will be heard, followed by the compressor starting. At this point, all gauges on the control panel will come alive. The readings of the gauges should approximately correspond between runs, and should be near those shown in Figure D-6. Locate the compressor log, shown in Figure D-7, and fill out a line for the run. At this point, all columns can be filled out, except for the intercooler drain and temperature checks, which will be completed just before shutdown.
Figure D-6. After starting the compressor, check the gauges for proper indications, as discussed.

Figure D-7. Fill out a new line in the compressor log for the run.
After beginning the entry in the log, go back to the supersonic lab and turn the load switch to **load**. This will begin charging the tanks, the pressure of which can be read from the pressure gauge next to the load switch, see Figure D-1. It is a good idea to bring something to do while monitoring the storage tank pressure. Charging from empty to full (300 psi) takes approximately 30 minutes. When the gauge reads 300 psi, turn the load switch to **unload** and the panel power switch **off**. Go back to the compressor room, and read and note in the log all of the required temperatures: oil temperature in and out, water temperature, and stage temperatures. These temperatures will vary greatly from run to run depending on the outside air temperature and humidity. Figure D-8 shows all of the required thermometers.

![Figure D-8. Thermometer locations for cooling water and oil temperature readings.](image)

After recording the temperatures, go back to the control panel, **turn the black switch off** and **push in the E-stop button**. When then black switch is turned off, a clunk will be heard and the compressor will wind down. As the compressor slows, begin draining the four condensate tanks. To drain the tanks, slowly open the valves indicated in Figure D-9 and allow most of the liquid to drain into the catch buckets. Close each
valve after draining except for the drain on stage 2, which has a sign indicating that it should be left slightly open. If any of the catch buckets fill up, they should be emptied into the drum shown in Figure D-10.

Figure D-9. Condensate drain valve locations for each compressor stage.
Figure D-10. Drum containing waste condensate oil/water mixture, located on rear wall of compressor room.

For safety reasons, be sure to close the outdoor valve behind Randolph Hall, as shown in Figure D-11, after all runs are complete each day. It is best to open the outdoor valve before running the compressor, to maximize air storage capacity. This valve controls air flow to the Mechanical Engineering (ME) side of Randolph Hall. If any abnormal instrument readings or equipment malfunctions are discovered, consult Steve Edwards in his office next to the supersonic tunnel lab as soon as possible.

Figure D-11. Outdoor valve controlling air delivery to the ME Department side of Randolph Hall.