

Figure 1. A typical underhood cooling fan in a shroud that permits the free inflow/free outflow (FIFO) condition to be examined.

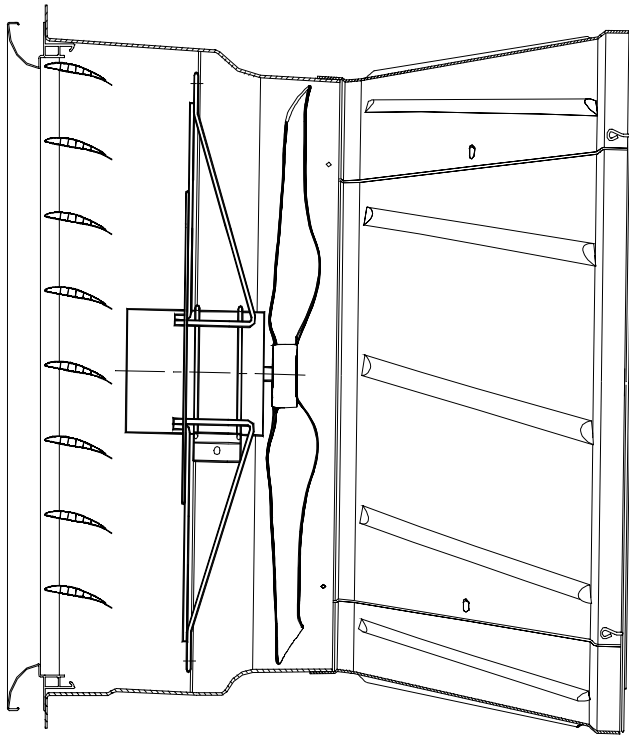


Figure 2. Aerotech 26 inch axial fan with inlet shutter and diffuser cone.

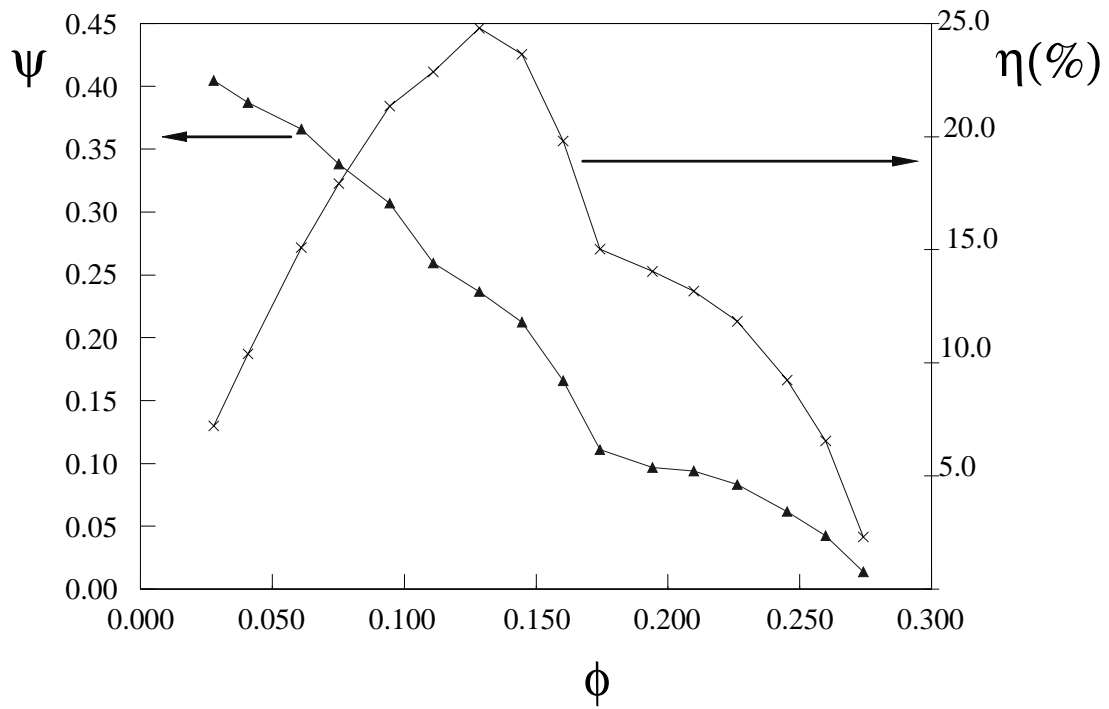
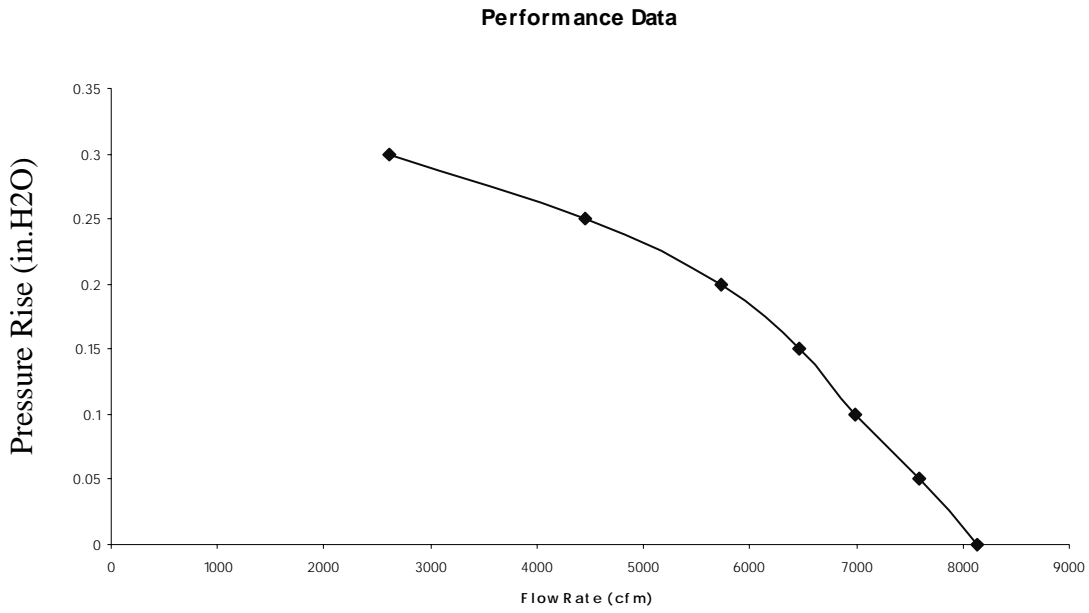
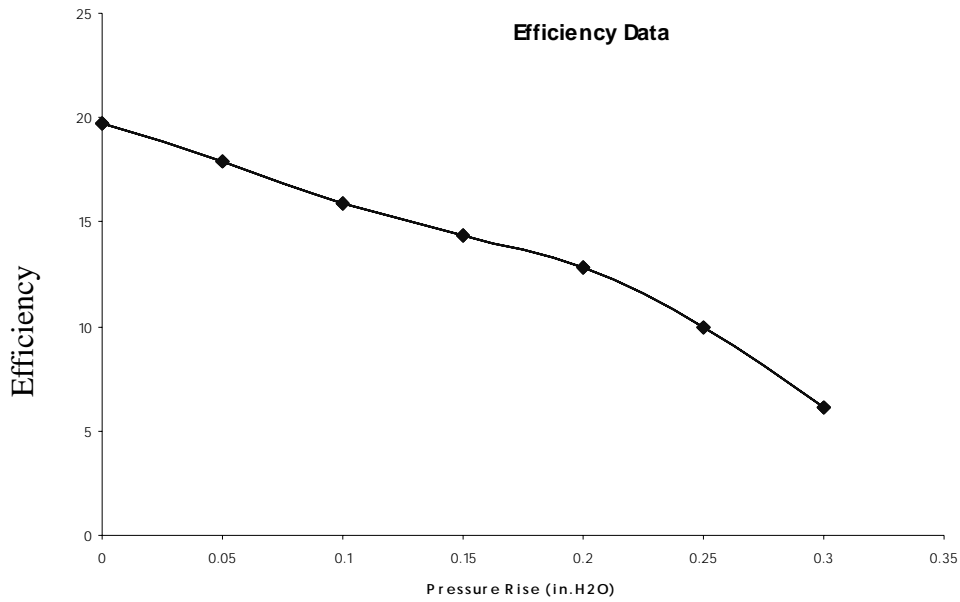


Figure 3. The nondimensional pressure rise (ψ) and efficiency (η) as a function of the nondimensional flow rate. Note, see equations 1, 2 and 3 for ψ , ϕ and η .

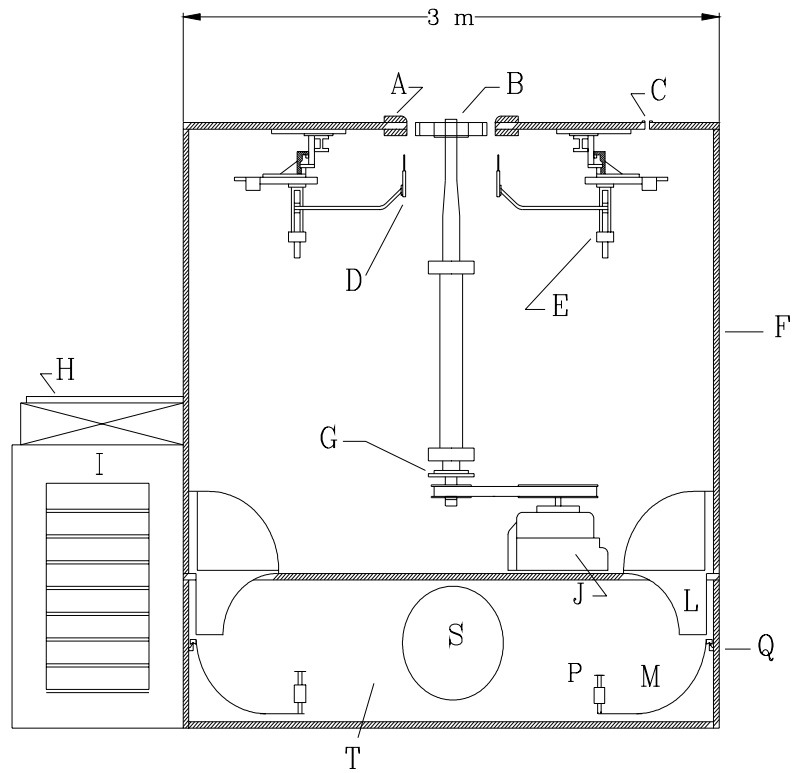


a) pressure rise as a function of the flow rate



b) fan efficiency (cfm/watt)

Figure 4. Performance data the aerotech fan assembly of Figure 2.



- | | | | |
|---|--------------------|---|----------------------|
| A | AXISYMETRIC SHROUD | J | DRIVE MOTOR |
| B | TEST FAN | L | NOZZLE |
| C | PRESSURE TAP | M | TURNING VANE |
| D | HOT-WIRE PROBE | P | FORCE TRANSDUCER |
| E | TRAVERSE | Q | TURNING VANE HINGE |
| F | UPPER RECEIVER | S | INLET TO PRIME MOVER |
| G | OPTICAL ENCODER | T | LOWER RECEIVER |
| H | THROTTLE PLATE | | |
| I | PRIME MOVER | | |

Figure 5. A schematic representation of the aeroshroud. Note, a typical engine mounted fan is shown in this figure. (Drawing is to scale.)

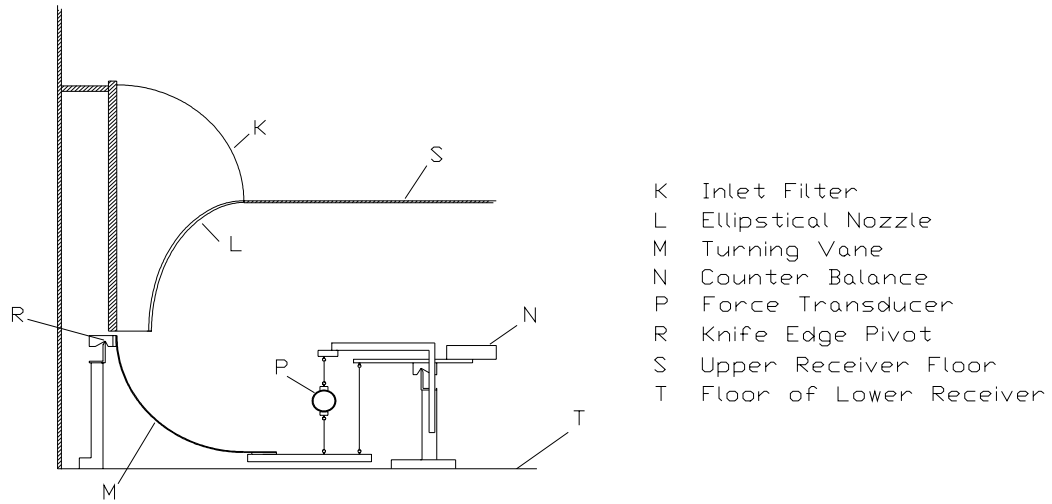


Figure 6. The moment-of-momentum flux device that is used as the flow rate metering techniqe in the AFRD.

axis of rotation
for x-array

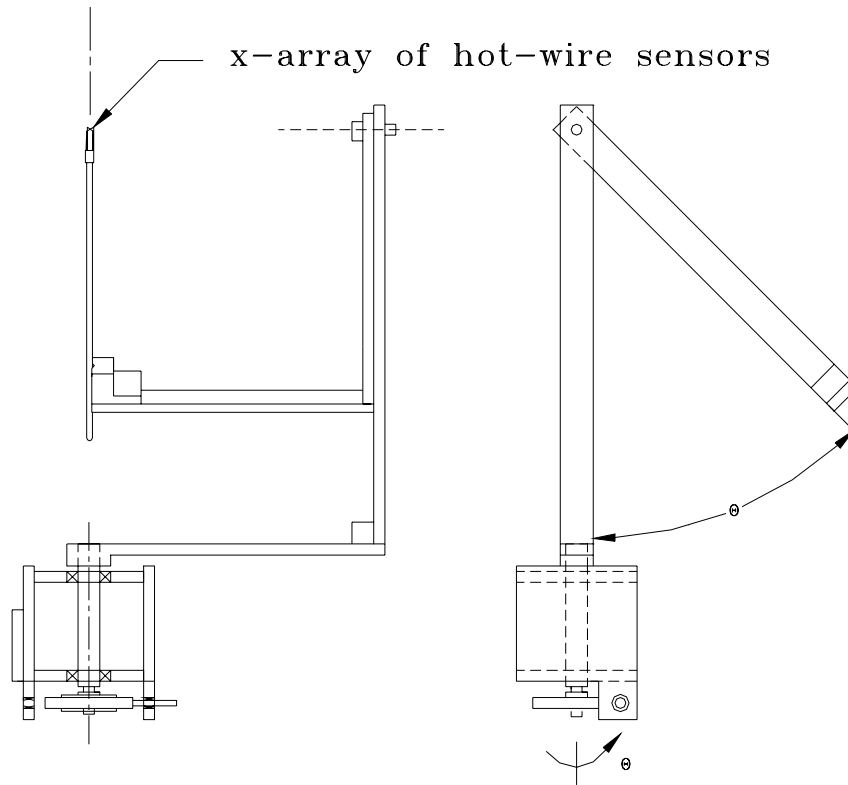


Figure 7. The spherical angle positioning device which allows x-array hot-wire measurements to be aligned with the time mean wake flow at a given r/R position.

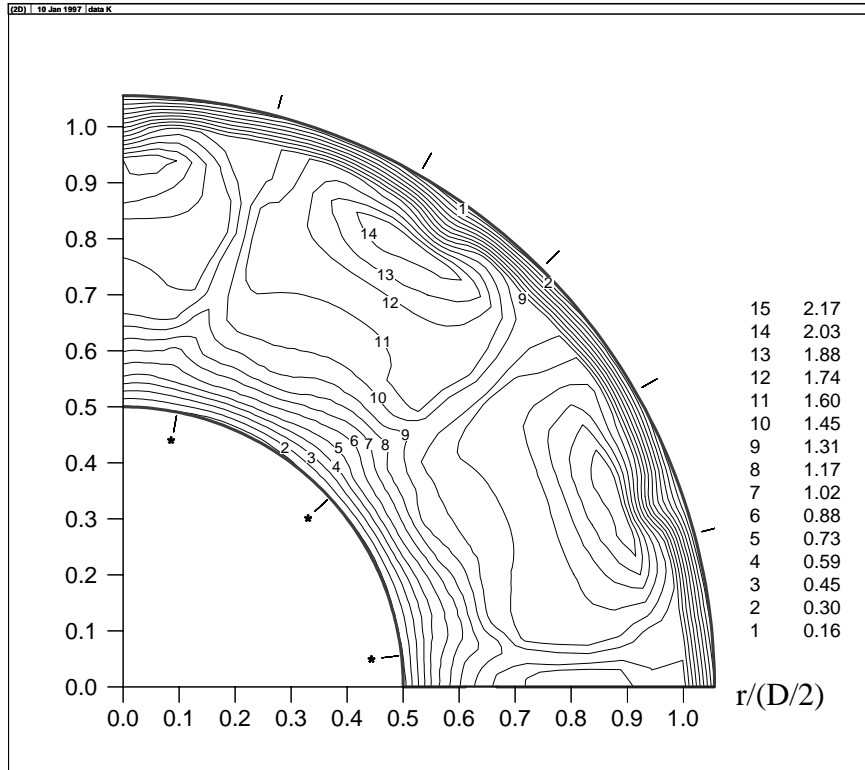


Figure 8. Contours of phase averaged axial velocity: U_x/U_{tip} .
 Note: Blade rotation is clockwise.

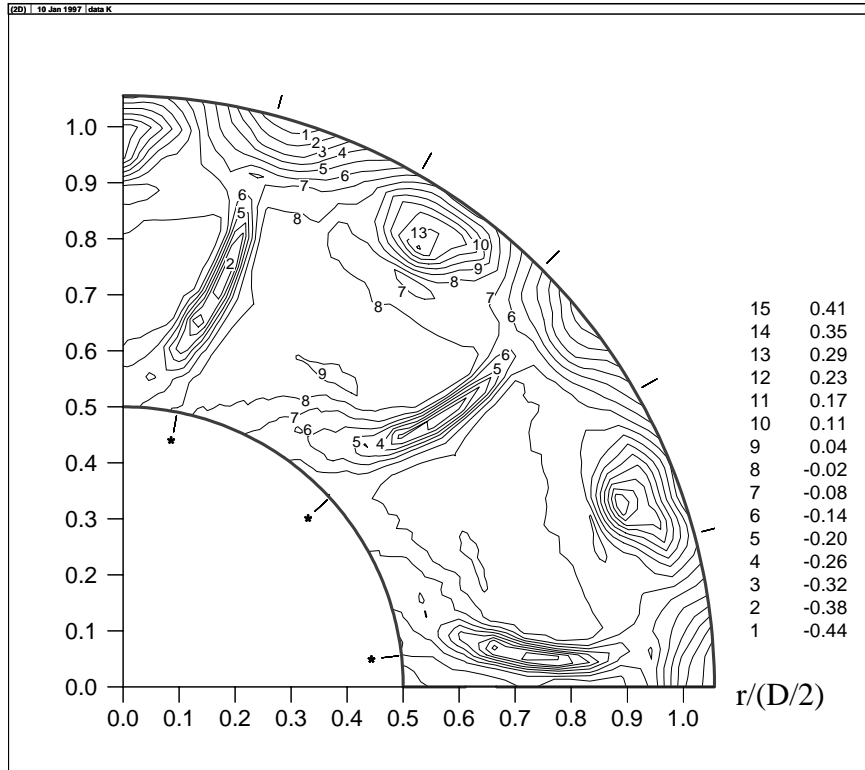


Figure 9. Contours of phase averaged axial vorticity: ω_x/DU_{tip} .
 Note: Blade rotation is clockwise.

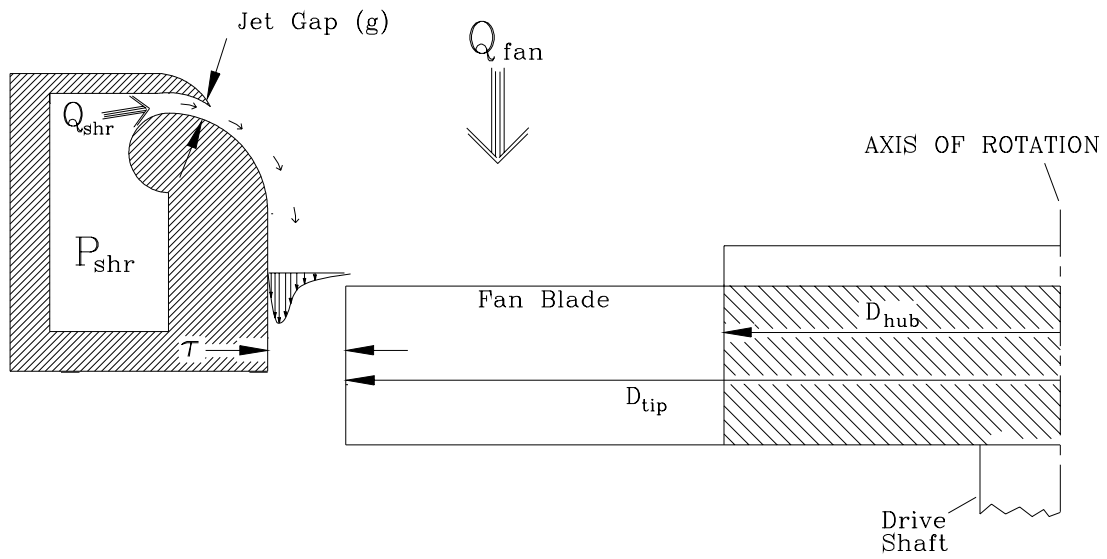


Figure 10. A schematic representation of the aeroshroud. Note, a typical engine mounted fan is shown in this figure.

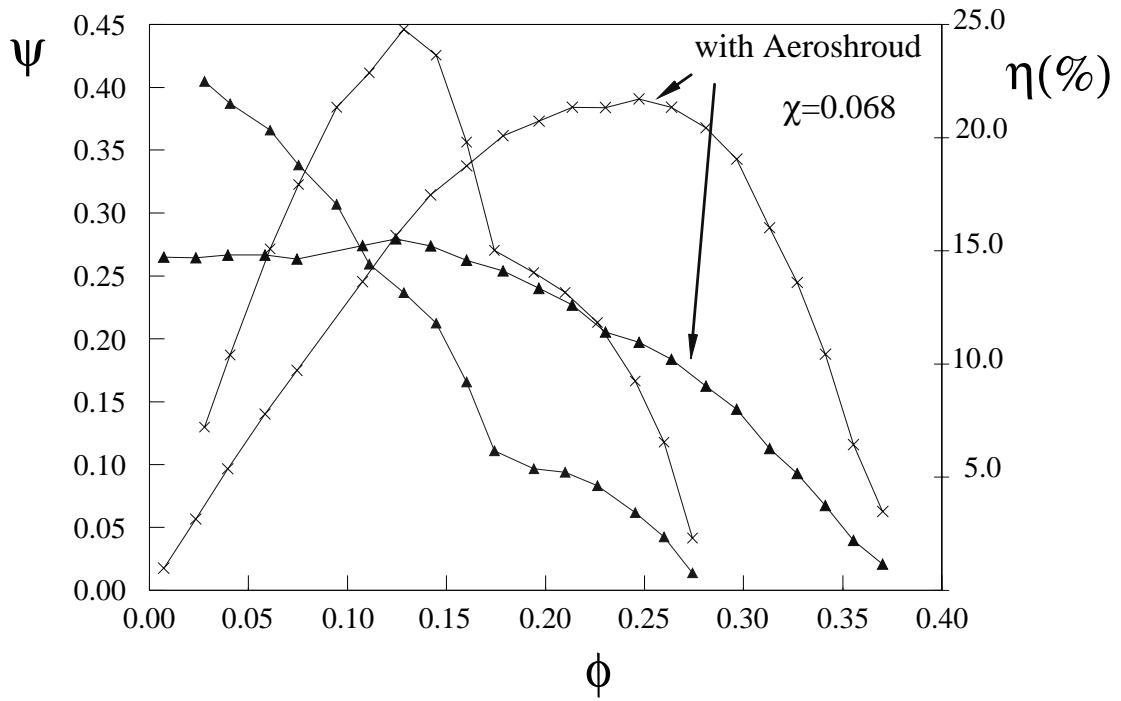
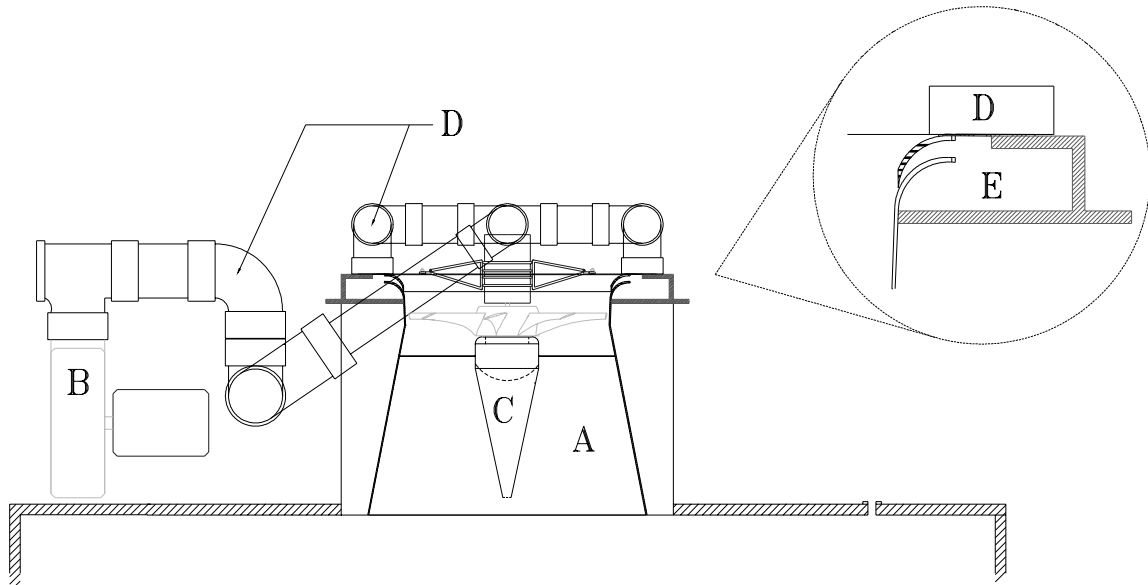


Figure 11. Enhanced cooling fan performance with the aeroshroud of Figure 10. Note, χ is defined in equation 5.



- Notes: A Aerotech Fan Assembly
B Centrifugal Blower for Aeroshroud Flow
C Centered Cone in the Diffuser
D Delivery System for the Aeroshroud
E Aeroshroud Plenum

Figure 12. Aeroshroud configuration for the 26 inch fan of Figure 2.