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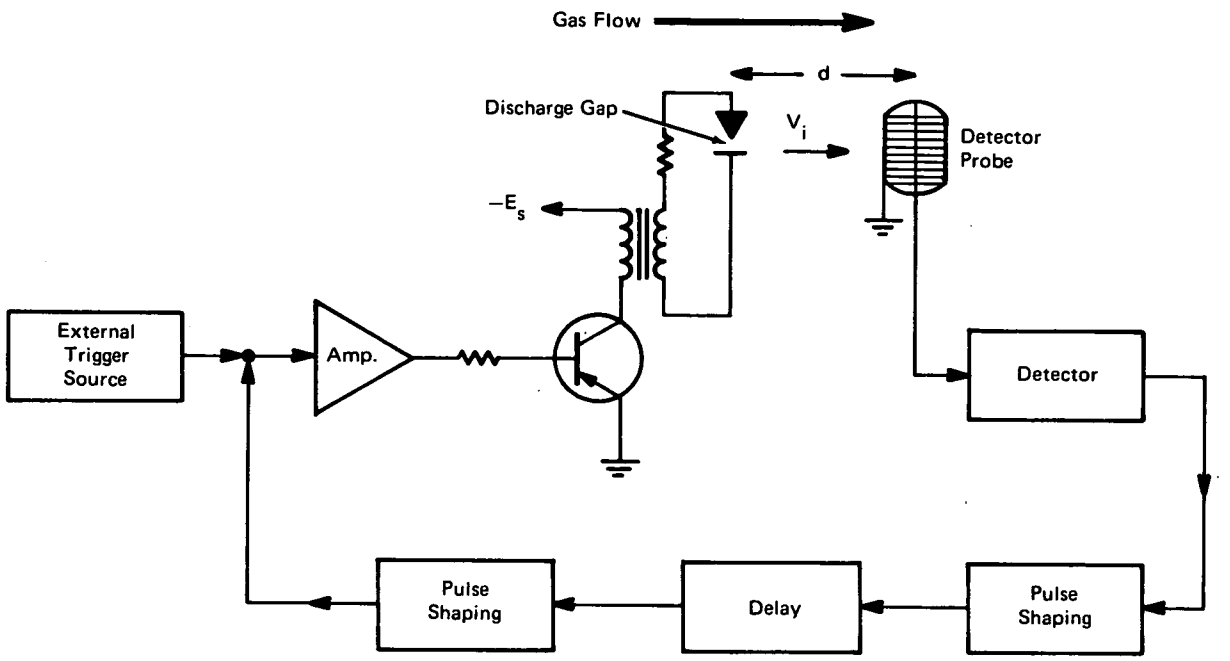
NASA TECH BRIEF

Marshall Space Flight Center

Ion-Tracer Anemometer



Adequate ventilation and circulation of air in living and working quarters in what we consider our normal environment is easily maintained through modern methods. In an alien environment, however, where proper air circulation is not maintained, low gravity can cause gas stagnation. Monitoring of low velocity gas streams with present techniques is difficult because the measuring devices are not sensitive or accurate enough for use in the system. A gas velocity measuring instrument capable of measuring gas velocities from 0 to 46 cm/sec (1.5 fps) has been designed and developed that utilizes a modified ion-tracer anemometer. The instrument operates on the basis of measuring the transport time of an ion-trace that travels a fixed distance between an ionization probe and detector probe. An electric field is used to superimpose a drift velocity onto the flow velocity so travel times can be reduced to minimize ion diffusion effects. Also, a time delay in the signal processing is provided so that individual pulse signals may be accurately detected.

In an experimental pulse regenerative ion-tracer anemometer, the pulse circuit (as shown) receives a trigger signal from the starting or shaping circuit and causes the ionization probe to pulse discharge. The resultant cloud of ionized gas is carried by the flow to the detector probe located a distance downstream. This transport process ideally requires a time $t = d/v_i$ where v_i is the ion velocity and d is the distance from the discharge gap to the detector. Upon sensing the ion cloud, the detector circuit will cause retriggering or regeneration of the pulse circuit. Thus, a regeneration pulsing frequency is established. If the regenerative action is broken, the starting circuit may be used to provide a periodic triggering of the pulse circuit until the regenerative action is restored.

(continued overleaf)

Results obtained from the experimental model show that an ion-tracer anemometer can be built into a compact, omnidirectional instrument which can accurately measure gas flows over the 0-51 cm/sec (0-100 fpm) range under environmental conditions ranging from 21-103 kN/m^2 (3-15 psia) and 16-27°C (60-80°F).

Notes:

1. Information concerning this innovation may be of interest to users, designers, and manufacturers of anemometers.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Marshall Space Flight Center
   Code A&PS-TU
   Marshall Space Flight Center, Alabama 35812
   Reference: B73-10151

Patent status:

NASA has decided not to apply for a patent.

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Marshall Space Flight Center
(MFS-21399)