# NASA TECH BRIEF



## Cleanroom Air Sampler Counts, Categorizes, and Records Particle Data

**The problem:**

To develop an instrument for monitoring particles in a cleanroom. The system must count, categorize, and record the particles in the air according to size and be able to function simultaneously in three separate areas.

**The solution:**

A light scattering particle counter in which a transducer head transforms light signals into electrical signals. The size/count data are coded at each of three samplers and conveyed by cable to a central data station where the information is decoded and printed out on paper tape.

**How it's done:**

The particle counter consists of a light source, an optical lens arrangement, and a photomultiplier tube. In operation, the filament of a lamp is focused on an opening, or slit, of known size in a light shield plate. The illuminated slit is imaged, via the optics, in the center of an aerosol stream.

A light scattering system is used, in which the light scattered from the incident light by the particles in the aerosol stream is collected by a similar receiving lens arrangement containing a slit of the same size with its focal points at the center of the aerosol stream. This arrangement optically defines an illuminated "cube" in space. The photomultiplier tube only "sees" light when a particle passes through this "viewing volume." The light intensity is a function of particle size; the larger the particle, the greater the intensity. The photomultiplier converts the light scattered by the particle into an electrical pulse. The voltage level of the pulse is directly proportional to the intensity of the light. Thus the pulses from any particles can be directed to specified channels according to voltage level and can be calibrated for particle size.

**Notes:**

1. The aerosol stream is conveyed through the transducer with a pumping system. A concentric tube arrangement provides an air sheath traveling down the annular space at the same linear velocity as the sample in the inner tube. This arrangement prevents loss of particles into the sample chamber, ensuring that the particles are counted only once and that the lenses remain clear.
2. Three samplers of the type described above were located inside a clean room. Each transmitted particle size data to the data center, located outside the clean room. The data center recorded size data on printed tape at preset times, providing a permanent record of the quality of air in the clean room at all times at three locations simultaneously.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10076

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: M. B. Nelson
of IIT Research Institute
under contract to
Marshall Space Flight Center
(M-FS-2221)
Category 01