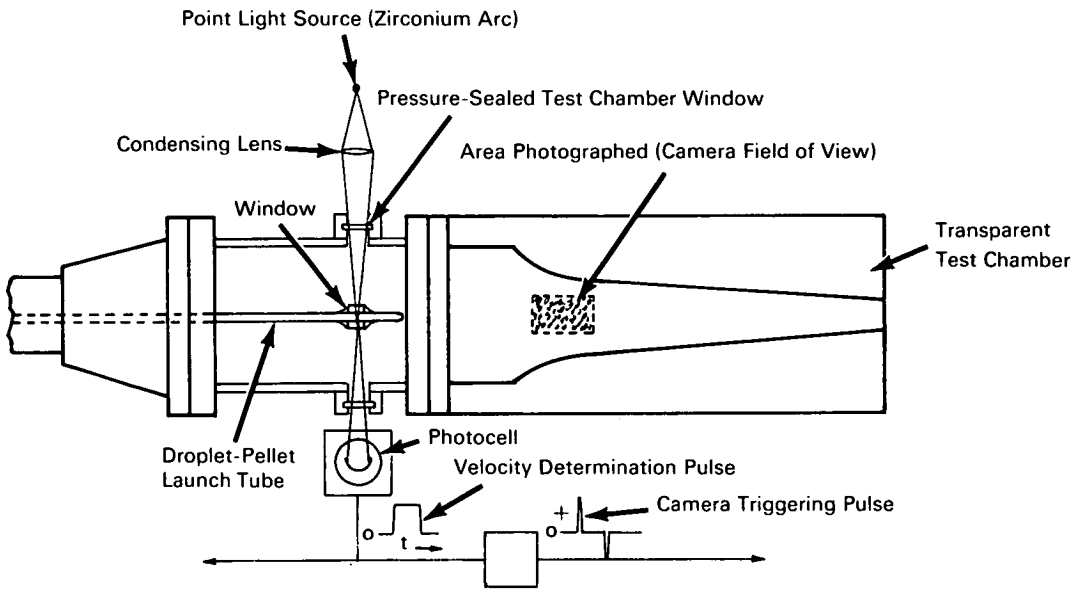
NASA TECH BRIEF

High-Speed Camera Synchronization



The problem:

It was necessary to synchronize the rotating mirror in a high-speed framing camera with the passage of a very-high-velocity droplet in a prescribed field of view to obtain direct photographic data on droplet breakup. The framing speed required was in excess of 250,000 frames/second.

The solution:

A photoelectric sensor is located upstream of the camera's field of view to detect the transit of the accelerating particle across a high-intensity light beam and generate a signal which is subsequently conditioned to provide a timing pulse to control the rotating mirror.

How it's done:

Droplets are launched into a high-velocity gas stream by a pneumatically driven pellet gun. Opposing windows are provided in the pellet gun barrel (launch tube) and in the outer walls of the test chamber. A point light source (zirconium arc) provides a high-intensity light beam through the windows to an external photoelectric sensor (photocell). Transit of the pellet during the droplet launching cycle interrupts this light beam, modifying the output signal of the sensor.

Conditioning of this modified signal provides a high-amplitude pulse which is used for camera triggering. The camera produces a gating pulse during opera-

(continued overleaf)

tion, and electronic matching of these two pulses is adjusted to the flight velocity of the droplet, ensuring that the camera mirror (shutter) is in the correct position when the droplet enters the field of view. The camera must be operating prior to the initiation of the triggering pulse, as at least one rotation of the mirror assembly is required to accomplish the matching of the two pulses.

Notes:

1. This technique should be a useful tool for investigations of high-velocity interactions, where an optically discrete element can be isolated to provide the camera triggering pulse. Atomization, mixing, impact, deflection, and shock interaction phenomena can be readily recorded for visual evaluation by this technique.
2. Complete details may be obtained from:
   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B68-10282

Patent status:

No patent action is contemplated by NASA.

Source: E. A. Rojec
of North American Rockwell Corporation
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