NASA TECH BRIEF

Marshall Space Flight Center

Photography of Random Motion with a Holographic Camera

The problem:

Conventional holography cameras could not record three-dimensional holograms with good front surface detail. A recently developed real-time moving-scene holographic camera (see NASA Tech Brief B73-10421) has provided a means for three-dimensional photography, but is limited to objects with a one-dimensional velocity.

The solution:

Random three-dimensional motion may be holographically photographed by using three mutually-perpendicular elliptical holograph arrangements, all having a common object focus.

How it's done:

The basic elliptical holograph arrangement as described in NASA Tech Brief B73-10421 is shown in Figure 1. The three-dimensional system uses two additional mirrors and path compensators. It is essentially three mutually-orthogonal one-dimensional systems with a common focus. The laser beam is split into four parts, three of which are object beams; and the fourth is a reference beam. Figure 2 depicts the three object-beam paths, each of which goes from one of three elliptical foci to the object and then to the film recorder. The film recorder is at a point (f_2) that is a common focus for all three ellipses. The solid line from f_1, via the object, to

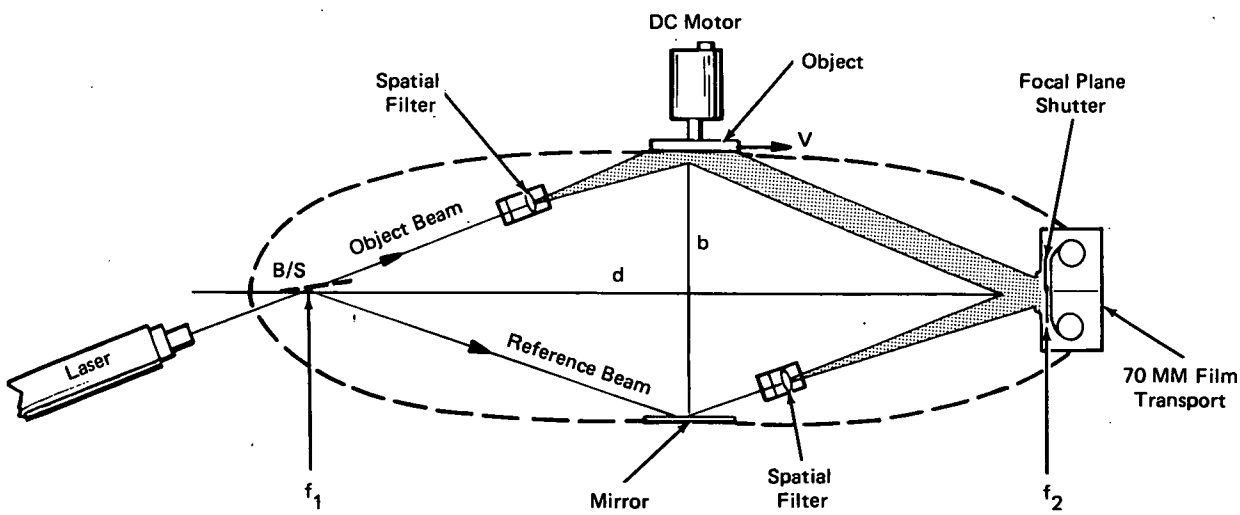

Figure 1. Holograph Motion Camera for Motion in One Direction

(continued overleaf)

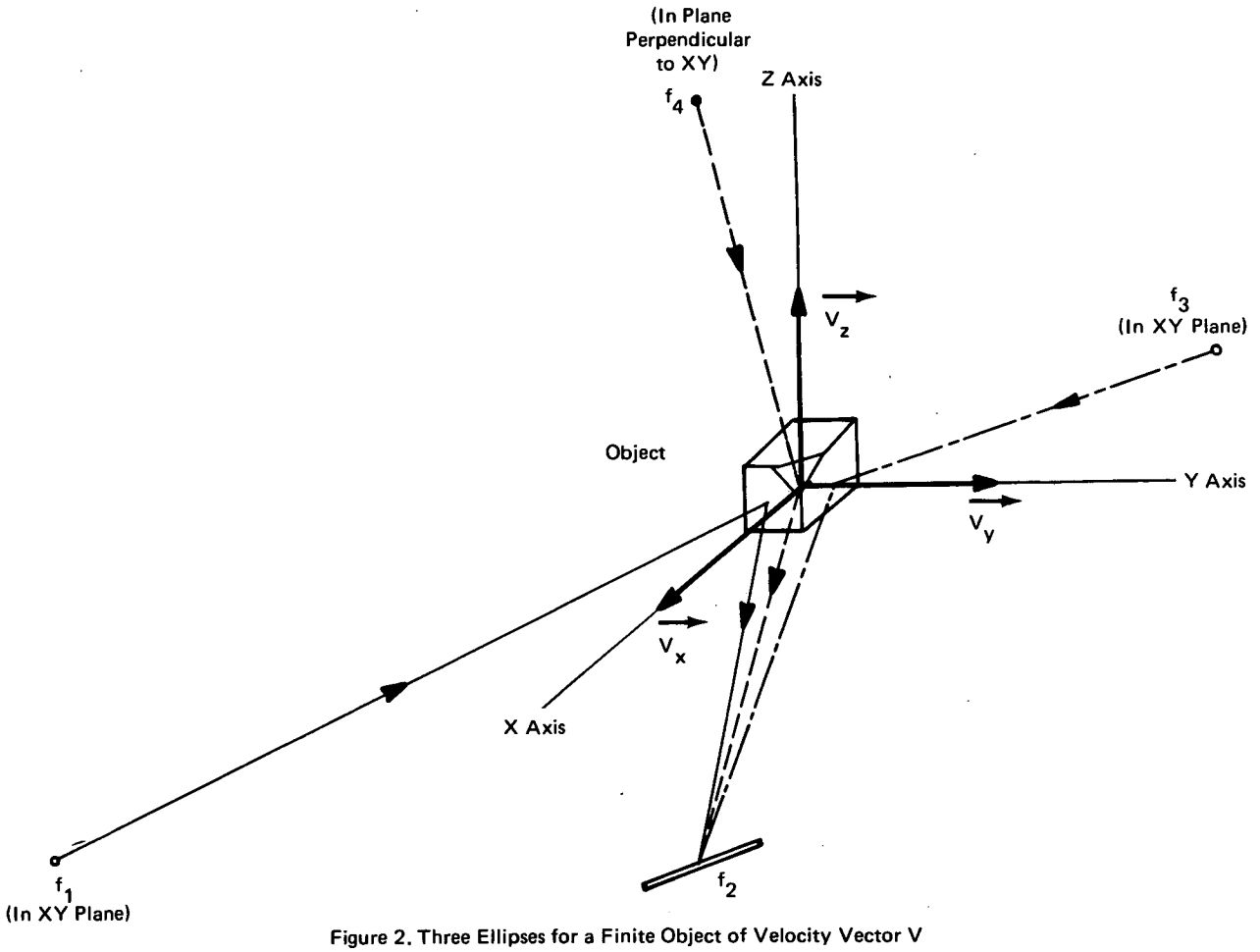

Figure 2. Three Ellipses for a Finite Object of Velocity Vector V

f_2 represents the path of the object beam necessary to record the velocity component V_x. In Figure 2, the dot-dash line from f_3, via the object, to f_2, is in the same plane and represents the system used to measure V_y. The dashed line, f_4-object-f_2, is in a plane perpendicular to the other two systems, and represents the measurement of V_z.

The reference beam common to all three systems, is not shown in Figure 2. The size of each ellipse depends on the magnitude of the velocity vectors.

Notes:

1. Similar and related systems are described in NASA Tech Briefs B73-10421 and B73-10434.
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: B73-10435

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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