Appendix B) and the uncertainty of ± 1 count in the counter reading which determined the camera's rotor speed.

The total error in the magnification was determined by the length of the precision grid used and the uncertainty of ± 0.05 mm in measuring the image of the grid with a precision eyepiece.

The total error in the mirror angle α was determined by the scatter in the readings and the uncertainty of ± 1 min of arc in measuring the angle with a Shadowgraph instrument.

The error in determining the trace angle γ and the tilt angle ω is more difficult to ascertain. They require an understanding of the camera operation, experimental design, and record reading technique. A detailed treatment of this error is given in Section C.2.2.

Table C.1 summarizes the total contributions to the error in u_{fs} for a typical experiment. The largest and most important error is in the trace angle γ.

TABLE C.1.--Various contributions to the error in u_{fs}

$\frac{\varepsilon_{u_c}}{u_c}$	$\frac{\varepsilon_{M_f}}{M_f}$	$\frac{2\varepsilon_\alpha}{\sin 2\alpha}$	$\frac{\varepsilon_\gamma}{\cos^2\gamma(\tan\gamma - \tan\omega)}$	$\frac{\varepsilon_\omega}{\cos^2\omega(\tan\gamma - \tan\omega)}$
0.006	0.005	0.008	0.028	0.003

C.2.2. Errors in Determining the Trace Angle and the Wave Tilt Angle

It was shown above that the error in determining the trace angle on the film is the largest contributor to the total error in u_{fs}. Therefore, a detailed discussion on the systematic part of this error is given here. The estimates of the systematic errors in determining the trace angles on the camera records are similar to those of Dubovik.[64] There are four separate contributions to this error: (1) the film alignment in the reader instrument, (2) the fuzziness of the trace, (3) the reader instrument accuracy, and (4) the spatial resolution. Each is treated as independent of the other, which is not strictly true. It is a reasonable assumption to make since the sole purpose is to obtain a reasonable estimate of the error.

The first contribution to the systematic error in γ is due to the alignment of the film parallel to the time axis for reading. This error is ≤ 0.001 rad based on a graphic accuracy of ± 0.1 mm per 100 mm which can be realized in practice.

The second and largest contribution to the error in γ is due to the fading and fuzziness of the trace, which depends on the camera slit width and response of the film to different exposure times. The recording of the motion of an opaque half-plane moving at a constant speed parallel to the slit plane (along the length of the slit) results in a cut-off of the light to the camera. The cut-off is not recorded as a sharp loss of light because of the finite width of the slit. Rather, it is a