Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Correction of Flyer Velocimetry Traces for Experiments with Large Taylor Angles JASON LOISEAU, Royal Military College of Canada, XIAOCHENG MI, University of Cambridge, ANDREW J. HIGGINS, McGill University — When a confining metal is accelerated by a grazing detonation it is launched outwards at an angle relative to its initial orientation. Consequently, the metal velocity vector contains both a lateral and longitudinal component. Since photonic Doppler velocimetry (PDV) can only resolve the component of velocity aligned with the collimated beam, recorded velocities must be corrected for this angular and longitudinal motion to obtain actual velocity and casing shape. Correction is particularly important for fitting detonation product equations of state. For standardized configurations like the cylinder test, the angle of tilt is small (typically less than 15 degrees). The error involved in approximative corrections in these configurations is thus negligible. However, if very thin flyers are launched, the tilt angles can approach 45 degrees and thus the magnitude of the correction becomes large. In the present study, we consider tilt-correction of PDV histories for explosively driven flyer experiments where large tilt angles were observed. We adapted the vector decomposition from Taylor's tubular bomb model, in addition to a Galilean transformation to account for translation of the steady, detonation-fixed wall expansion past a stationary, laterally observing PDV probe. Additionally, multiphase numerical simulations were used to validate the assumed relationship between the longitudinal and lateral components of the wall velocity, especially early in detonation product expansion.

Jason Loiseau
Royal Military College of Canada

Date submitted: 19 Mar 2019 Electronic form version 1.4