

SIMPLE EXPLOSIVE PLANE WAVE BOOSTER DESIGNS FOR 1-D SHOCK EXPERIMENTS

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The gold standard 1-dimensional shock wave source is a flyer plate driven by a gas or powder gun. However, not all experimenters have access to such a gun, and some experiments that require large input areas (>80 cm²) and high input pressures (>15 GPa) are out of reach for most of those that do. An attractive alternative to gun-driven flyers in these cases is an explosive plane wave booster (PWB). The PWB uses an explosive train to produce a 1-D wave that can throw a flyer plate or be used directly. Shock pressure levels can be adjusted as needed through the use of attenuator plates or an explosive booster pad on the output of the PWB. Unfortunately, traditional ‘dual velocity’ PWBs using two explosives require precision machining of the energetics, and as such can be difficult to produce and prohibitively expensive to purchase. This work explores three PWB designs that use cast explosives to keep costs down, and are easily scalable to the size of the required experiment. Their relative simultaneity and peak pressures are quantified using streak photography and photon Doppler velocimetry (PDV), and compared with typical values for the dual velocity lens and gun driven flyers. While these PWBs are not as precise as a gun-driven flyer plate, they are appropriate for many explosive characterization experiments.