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Explosive formation of coherent particle jets DAVID FROST, JEAN-FREDERIC RUEL, ZOUYA ZAREI, SAM GOROSHIN, YANN GREGOIRE, McGill University, FAN ZHANG, DRDC Suffield, ALEC MILNE, AARON LONG-BOTTOM, Fluid Gravity Engineering Ltd. — A high-speed jet of solid particles may be formed by detonating an explosive layer lining the outside of a conically-shaped volume of particles. Experiments have been carried out to determine the velocity history and the coherency of a particle jet formed using this shaped-charge arrangement. Important parameters include the cone angle, the ratio of the masses of the explosive and particles, and the particle size and density. Dense particles (e.g., iron) form thin, stable, coherent jets, whereas lighter particles (e.g., glass or Al) lead to more diffuse jets. The jet velocities observed experimentally were close to the predictions from a Gurney velocity formulation for conical geometry. The effects of cone angle and particle density on the jet formation and development were explored with calculations using a multimaterial hydrocode. The simulations indicate that the converging shock and Mach disk within the particle bed have a strong influence on the uniformity of the particle density field. With iron particles, the particle volume remains coherent whereas for glass particles, during the particle acceleration phase, the shock interactions within the particle bed cause the particles to be concentrated in a thin shell surrounding a low density region.

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