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Simulation, Construction, and Experimental Evaluation of a Twice-Augmented Railgun JUSTIN SALVIA, Naval Post Graduate School — Multi-rail augmentation is a simple method of improving railgun performance and achieving high projectile speeds from short railguns with moderate currents. Augmentation improves overall energy transfer efficiency by helping match the impedance of small railguns to laboratory power supplies. This paper presents the design and tests of a 50cm, easily assembled twice-augmented square-bore railgun. The design, consists of relatively thin, flat conductor and insulator plates held together with strong bolts. The plates to which the rear augmentation bolts are attached must be strong enough to withstand reaction forces that are transferred to the augmentation bolts when the projectile is launched. Prevention of surface electrical flash over across the thin insulator plates will be discussed. The 50-cm railgun reported here has accelerated 12-g projectiles to speeds greater than 1100 m/s with an overall efficiency of 8 percent; better performance is anticipated with further tests. The design is easily adapted to longer guns and larger bores. This design achieves higher speeds and better overall energy transfer efficiencies when compared to a 60-cm long gun with a single rail augmentation. Simulations of magnetic fields show that the field in the barrel is 39 percent higher for the 50-cm gun than for 60-cm gun at the same current. Simulations of the magnetic fields between the rails and the effect of rail configuration on performance will be discussed.

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