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High Energy Density Z-Pinch Plasmas using Flow Stabilization: ZaP-HD U. SHUMLAK, R.P. GOLINGO, M.C. HUGHES, S.D. KNECHT, B.A. NELSON, M.C. PALIWODA, M.P. ROSS, H.C. STANKEY, Aerospace and Energetics Research Program, University of Washington — The ZaP Flow Z-pinch experiment at the University of Washington investigates the effect of sheared flows on MHD stability. Z-pinch plasmas scale to high energy density by reducing the pinch radius through any combination of lower linear density and higher pinch current. The ZaP experiment generates 100 cm long plasma pinch columns approximately 1 cm in radius. Experimental results show a period of low fluctuation levels when a sheared plasma flow is present. The quiescent period lasts for approximately 40 μs, approximately 2000 classical growth times. The length of the quiescent period is over four flow-through times for the 100 cm pinch. The experiment has focused on developing diagnostics that measure radial profiles of the plasma equilibrium (including velocity) and that measure the three-dimensional magnetic topology to determine plasma stability. The experiment could be modified to significantly increase the plasma energy density by decreasing the linear density of the pinch and by increasing the pinch current. The modified experiment, ZaP-HD, will produce plasma columns with smaller radii and, therefore, higher energy density. Experimental plans and scaling analyses will be presented.

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