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Current Sheet Formation Near a Hyperbolic Magnetic Neutral Line in a Variable Density Plasma BHIMSEN SHIVAMOGGI, DAVID ROLLINS, University of Central Florida — *Current-sheet formation* near a *hyperbolic* magnetic neutral line has been investigated by including the effects of sweeping and shearing of the magnetic field lines by the plasma flow and *exact* solutions of the MHD equations appropriate for these situations were given by Shivamoggi [1], [2]. The *current-sheet* evolution described by this solution is in agreement with laboratory experiments (Kirii et al [3]). For the case with no *shearing* of the field lines, this solution exhibits a *finite-time* singularity. The *shearing* of the magnetic field lines tends to *impede* the *current-sheet* formation. Investigation of the *integrability* aspects of the system of nonlinearly-coupled differential equations governing these dynamics has been made (Rollins and Shivamoggi [4]) which indicated the possibility of shear-induced chaotic evolution in the dynamical system in question. The investigation is extended to include the effects of density variation of the plasma (Shivamoggi and Rollins [5]). The *current-sheet formation* process is found to *speed up* in the presence of a plasma density *build-up* near the current sheet in agreement with the numerical simulation of Brunnel et al. [6] which described an enhanced reconnected magnetic flux when there is plasma density build up near the magnetic neutral point. This plasma density *build-up* produces a new *finite-time* singularity in the *variable-density* MHD solution.

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