On the Relation Between 3-D Equilibrium and Stability[1] A.D. TURNBULL, General Atomics — 3-D perturbations can arise from error fields, imposed non-axisymmetric coils, or saturated instabilities. In each case, the plasma response is a key to determining the consequences. The problem can be treated as a dynamic or stability problem or from a nearby perturbed equilibrium approach and the relation between these is considered. The nearby equilibrium approach aims to bypass the detailed evolution and search for the appropriate final state. Since multiple nearby equilibria exist, the key is to assure accessibility of the final state. The simplest approach is to add a perturbation from a stability code or external field to the equilibrium and solve for 3-D force balance. This is an example of the "Almost Ideal MHD" idea, where one looks for invariants relating the 2-D and nearby 3-D system; the invariants are buried in the numerical details of the equilibrium code, for example imposition of nested surfaces. There is no guarantee the new state is physically accessible. The dynamic approach can guarantee accessibility but is numerically time consuming. However, the constraints can be informed from dynamic simulations.

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