The development of several fluid mechanics applications lead to inverse problems. Given a required distribution of flow variables one has to find the corresponding geometry which provides such distribution. Since the fluid governing equations do not allow explicit inversion, iterative methods are used. A linear auxiliary equation, which is a simplified model of the flow governing equations, can be used to develop a fixed point iterative method. Such equation is used to compute the geometrical correction required to minimize the difference between the required and actual flow variable distributions. The auxiliary inverse problem is coupled to a flow solver (from Potential Flow to Navier-Stokes, the method is solver independent) to iterate the correction until convergence. An auxiliary equation method, the Modified Garabedian Mc-Fadden, is analyzed. It involves a certain number of arbitrary parameters whose choice affects the rate of convergence. The present work aims to study how to find adequate parameters for different families of airfoils in transonic flow. A 2D Euler/Navier-Stokes flow solver will be used as an analysis tool and a series of studies, which demonstrate the accuracy and robustness of the technique, are presented.