Digital human figure models are a useful tool for simulation of driver ingress and egress for passenger cars, light trucks, and heavy commercial trucks. Simulation allows evaluation of the suitability of steps and handholds as a system. Accurate simulation requires detailed, validated algorithms to predict driver motions. One critical component of such an algorithm is the accurate prediction of foot trajectories. This paper presents an approach to foot trajectory simulation based on statistical analysis of driver motions from a laboratory study. The movements of 20 truck drivers were recorded as they entered a reconfigurable truck mockup. The foot trajectories were parameterized using Bézier curves, which accurately represent the important characteristics of the trajectories with relatively few parameters. Statistical analysis of the fitted parameters showed that the shapes of the trajectories, after normalizing for overall displacement, were independent of truck step configuration but affected by driver characteristics. The resulting models are designed for use with the Human Motion Simulation Framework, a software system previously applied to simulating a wide range of task-oriented human behavior, including passenger car ingress and egress.