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This paper proposes a sequential design methodology for a combined physical system and computer simulator experiment having multiple outputs, when the goal is to nd the Pareto Front and Set of the means of the physical system outputs; the methodology is based on a statistically-calibrated simulator. In thispaper, the simulator is a computer implementation of a deterministic mathematical model of the physical system; it contains the same set of control(able) inputs as those used to represent the physical system, plus additional calibration inputs for adjusting the simulator output to better mimic the mean of the physical system. A minimax tness function is proposed for guiding the sequential search for new vectors of control input settings when additional observations on the physical system are to be taken. Based on a Bayesian calibrated model, the update step maximizes the posterior expected minimax tness function over untried control inputs. When additional runs of the simulator are to be taken, the control input settings are cho- sen as above; then calibration input settings are selected to minimize the sum, over the set of predicted output means, of the posterior mean squared prediction errors. Using the Hypervolume Indicator function to assess Pareto Front accuracy, the performance of the sequential procedure is evaluated using analytic test functions from the multiple-objective optimization literature.