## Methodology

The task at hand is to try to find a Life Cycle Cost Estimate (LCCE) for a piece of commercial off-the-shelf (COTS) military equipment. We were given a sample of ten products with data corresponding to Operating Capacity, Horse Power, Weight, and Unit Price. We took the approach of trying to create a prediction model using regression analysis given the data from the sample.

Since our goal is to create a LCCE, Unit Price was identified as the response variable and Operating Capacity, Horse Power, and Weight were identified as potential predictors. We first utilized MiniTab to receive feedback on the data. We keyed in on two analysis tools, the Coefficient of Determination (R^2) and the R^2 Adjusted. The R^2 value measure how well future outcomes are likely to be predicted by the model. An R^2 value of 0 represent no correlation and an R^2 model of 1 represents perfect correlation. The R^2 adjusted takes the analysis a step further by factoring in how well a predictor improves the model against what would be expected by chance.

MiniTab optimizes for the highest R^2 value based on Multiple Linear Regression. This yielded and equation using Operating Capacity, Horse Power, and Weight as predictors with an R^2=67.3 and R^2 Adjusted=50.9. Since MiniTab does not optimize for R^2 adjusted we then proceeded to test the additional five combinations of predictors to try to find the highest R^2 Adjusted. This method would not be realistic in many large data sets with a high number of possible predictors, in those cases a heuristic would need to be utilized. The results of we found interesting but not completely surprising. We found that only using the predictors of Operating Capacity and Horse Power was able to obtain a model with an R^2=65.4 and an R^2 Adjusted=55.6.

We continued further in our testing and modeled each individual predictor using a quadratic regression model and a cubic regression model. Our results netted only R^2 and R^2 Adjusted values that were smaller than we found using multiple linear regression models. The last thing we tried was to duplicate our results and for this we used Excel and R. Our results matched so we were confident with our results such that we proceeded to look further at the output data we received.