# A Case Study on the Impacts of Cost Estimating Within Acquisition Program Decision-Making

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## Abstract

The use of cost estimating is critical to the continuation of acquisition programs due to full funding requirements. Cost estimates are developed and updated throughout the acquisition life cycle of nearly every defense acquisition program. This project analyzes all methods used by the Department of Defense for cost estimating and the trade-offs associated with each method. Understanding these methodologies, a real-life case study is developed based on the Joint Common Missile program and its cost estimates in order to facilitate acquisition professionals with the ability to analyze various cost estimates and understand the associated risks of cost estimating in order to make more prudent decisions or recommendations.


## Methods

- Use of the Joint Common Missile Program to analyze impacts of cost estimates on acquisition programs and provide materials for case study execution
- Literature review on cost estimates, their methods and effectiveness; the use of case study as a teaching tool
- Analysis conducted on the comparison between the Services cost estimate and the Independent Cost Estimate, specifically breaking down learning and production rate effects

## Research Summary

- Cost estimates utilize various methods to predict the future costs of programs. General information on each method and its applicability are discussed.
- JCM Program had two different cost estimates with over 20% variance
  - JCP used aggressive learning and production rates; also adopted the shortest EMD timeline projected
  - ICE is overly cautious with extended duration for EMD and more conservative learning and production rates
- Having thorough understanding of learning and production rate formulas facilitate decision-makers to unpack the data in order to make better affordability decisions.

**JCM Estimates Data Provided**

| | JCP | ICE |
|---|---|---|
| Recurring Production Costs | $4,790,000,000 | Unknown |
| T1 | Unknown | Unknown |
| Learning Rate | 93% | 88% |
| Production Rate | 83% | 90% |
| Missiles to be Produced | 48,613 | 48,613 |
| | | |
| JCP Data as variables | | Notes |
| Y= | $4,790,000,000 | Given in JCP |
| A= | Unknown | |
| X= | (1;48,613) | Given in JCP and ICE |
| b= | -0.1047 | (Log(0.93)/Log(2)) |
| Q= | (quantity of lot size) | Given in JCP. Ref. Table 5. |
| r= | -0.2688 | (Log(0.83)/Log(2)) |
| | | |
| ICE Data as variables | | Notes |
| Y= | Unknown | ICE(Y)= JCP(Y)*1.25 |
| A= | Unknown | ICE(A)= JCP(A)*.84 |
| X= | (1;48,613) | Given in JCP and ICE |
| b= | -0.1844 | (Log(0.88)/Log(2)) |
| Q= | (quantity of lot size) | Given in JCP. Ref. Table 5. |
| r= | -0.1520 | (Log(0.90)/Log(2)) |

**Production Rate Effect Formula**

$$Y = AX^{b}Q^{r}$$

## Results

- All unknown variables within the chart can be determined through the application of the production rate formula.
- The summation between the two estimates is rife with inconsistencies if MDA was able to dig into the numbers.
- Despite differences between the JCP and ICE learning and production rates, the T1s were marginally different.
- Assumptions within cost estimates drive affordability risks
- Teaching through case study will increase the acquisition professionals' ability to better understand cost estimates

## Recommendations

- All PM decision-makers must be capable of dissecting cost estimates in order to best identify the inherent assumptions that drive affordability
- Teaching through case study significantly increases student learning outcomes and should be increased at DAU educational courses.
- For JCM, and all programs, cost estimates can and should be used to assess affordability with respect program design. If current design is unaffordable given estimates provided, attempt to adjust in order to deliver a product to the warfighter.


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