

Establishing and Implementing Cost Estimating Standards



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Agenda

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- **Introduction**
- **Cost estimating techniques across government agencies**
- ***Missile Defense Agency (MDA) Cost Estimating and Analysis Handbook***
- ***Missile Defense Agency (MDA) Cost Assessment Manual***



Introduction

MDA – Missile Defense Agency

- **As part of MDA's efforts to create a world-class cost estimating capability that supports effective and efficient program planning for the Missile Defense Programs:**
 - **The MDA Director for Operations (DO) published the MDA Cost Estimating and Analysis Handbook**
 - **Established the Program Evaluation and Cost Assessment team (PC) team to ensure credible and supportable cost estimates**
- **As a result, MDA:**
 - **Has more accurate budget estimates**
 - **Strengthen contract negotiations**
 - **Improved credibility of estimates**
 - **Affirmation of best cost practices**
- **This presentation describes in detail the processes and procedures that MDA developed**



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Cost Estimating Techniques Across Government Agencies

Ms. Danielle Spencer



Agenda

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- **References**
- **Key Attributes**
- **Evolution of MDA's Cost Estimating Processes**
- **Conclusions**



References

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- **Government Accountability Office (GAO) Cost Estimating and Assessment Guide, March 2009**
- **NASA Cost Estimating Handbook, Version 4.0 February 2015**
- **International Society of Parametric Analyst (ISPA) Parametric Estimating Handbook, Fourth Edition April 2008**
- **Naval Center for Cost Analysis (NCCA) Joint Agency Cost Schedule Risk and Uncertainty Handbook, March 2014**
- **U.S. Air Force Cost Risk and Uncertainty Analysis Handbook, April 2007**
- **International Cost Estimating and Analysis Association (ICEAA) Cost Estimating Body of Knowledge (CEBoK), 2002-2013**
- **MDA/DO Software Cost Estimating and Analysis Handbook, February 2016**



Key Attributes

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- **Steps of the cost estimating process**
- **Comprehensive, Accurate, and Credible:** Estimate is comprehensive, includes the full costs, technical and programmatic scope
- **Documentation:** Documentation describes the cost estimating process, data sources, methods used
- **Ground Rules & Assumptions:** GR&As were developed with technical input and approved through upper management
- **Data:** Appropriate data were collected, analyzed and applied in the construction of the estimate
- **Methodology:** Appropriate method was used to develop the estimate
- **Sensitivity Analysis:** Identifies the effects of changing key cost driver assumptions and factors
- **Cost Risk Uncertainty & Analysis:** Risks were identified and quantified with their associated impacts on key cost drivers



Evolution of MDA's Cost Estimating Processes

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- **2012 MDA INS 4250.02 BMDs Cost Estimates**
- **2012 MDA Cost Estimating and Analysis Handbook**
- **2013 Directorate of Program Evaluation & Cost Assessment (PC) established**
- **2014-2015 Cost Assessment Manual developed**
- **2015 PC Program Assessment Tool (PAT) developed**
- **2016 lessons learned updates:**
 - **Updated MDA Cost Estimating and Analysis Handbook Draft 2017**
 - **Updated PC Cost Assessment Manual in 2017**
 - **Updated the Program Assessment Tool (PAT)**



Conclusions

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- ***GAO Cost Estimating and Assessment Guide*** provides the framework for establishing the characteristics of a high-quality cost estimate and the steps in the estimating process
- ***NASA Cost Estimating Handbook*** provides insight on the steps of the cost estimating process and the characteristics of a high-quality estimate
- ***ISPA Parametric Estimating Handbook*** provides details on the parametric estimating process
- ***NCCA Joint Agency Cost Schedule Risk and Uncertainty Handbook and U.S. Air Force Cost Risk and Uncertainty Analysis Handbook*** both provide all necessary information for cost risk and uncertainty analysis



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MDA Cost Estimating and Analysis Handbook

Ms. Denise Dulee



MDA Cost Estimating and Analysis Handbook - Purpose

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- **Standardizes the Missile Defense Agency (MDA) Cost Analytics and Parametric Estimating Directorate (CP) cost analysis requirements and procedures regarding the preparation, documentation, and presentation of high quality cost estimates**
- **Identifies and defines a set of standard data requirements for MDA cost estimates**
- **Provides information and guidance to cost analysts that supports preparation and use of cost estimates**



Agenda

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- **Key Characteristics**
- **Process Overview**
- **Score Card Criteria**
- **Summary**



Key Characteristics of a High-Quality Cost Estimate

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- The *MDA Cost Estimating and Analysis Handbook* is tailored to the way business processes are conducted at MDA
- CP drew upon several external cost estimating organization’s “Key Characteristics of a High-Quality Cost Estimate”

**Cost Framework
(GAO, NASA, Navy, Air Force)**

1. Steps of the cost estimating process
2. Comprehensive, Accurate, & Credible
3. Documentation
4. Ground Rules & Assumptions
5. Data
6. Methodology
7. Sensitivity Analysis
8. Cost Risk Uncertainty & Analysis

MDA Cost Estimating and Analysis Handbook, July 2012

1. Comprehensive & Credible
2. Well-Documented
3. Accurate
4. Ground Rules & Assumptions
5. Data
6. Methodology
7. Sensitivity Analysis
8. Cost Risk & Uncertainty

MDA Cost Estimating and Analysis Handbook, Draft 2017

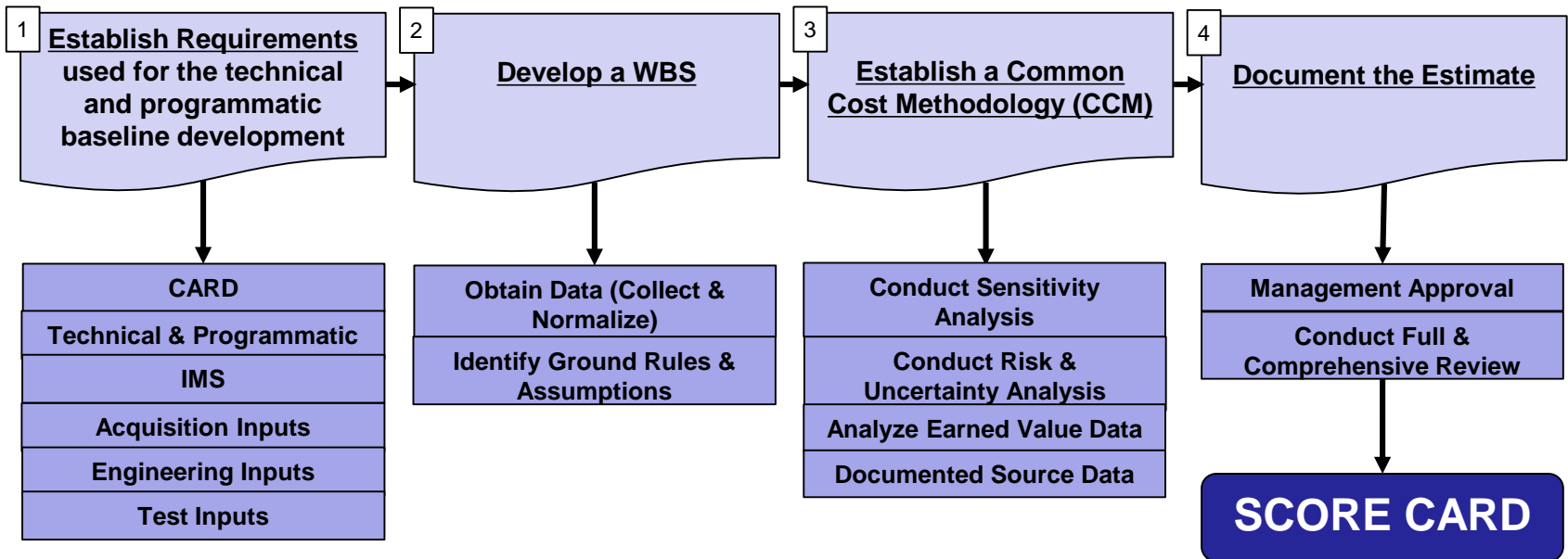
1. Comprehensive, Accurate, & Credible
2. Well-Documented
3. Ground Rules & Assumptions
4. Data
5. Methodology
6. Sensitivity Analysis
7. Cost Risk & Uncertainty



MDA Cost Estimating Process Overview

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- MDA program offices require life-cycle cost estimates for all programs, including those in the early stages of development



- An annual cost review assesses the quality and comprehensiveness of the cost estimating key characteristics developed for programmatic requirements and efficient budgeting



MDA Cost Estimating Score Card

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- **Score cards are developed to capture the soundness and completeness of the cost estimate and the process used to derive the estimate. This includes measuring the degree to which the data, including its limitations and risks, are understood**
- **It also includes:**
 - **A review of how the data was segregated into nonrecurring and recurring costs**
 - **Credible and valid data sources**
 - **The level of which data has been analyzed**
 - **Whether or not the data normalization process accounted for:**
 - **Cost/Size**
 - **Mission/Application**
 - **Technological maturity and content**
 - **Compensated for inflation**



MDA Cost Estimating Score Card Criteria

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- Score cards include “Met”, “Substantially Met”, “Partially Met”, “Minimally Met”, “Not Met”, and “Not Applicable”

Definition	Overall Score	Description
Not Met	0.0 – 0.9	Provided little to no evidence that satisfies any of the criteria.
Minimally Met	1.0 – 1.9	A minor part of the requirements necessary to satisfy the criteria are included.
Partially Met	2.0 – 2.9	A reasonable portion of the requirements necessary to satisfy the criteria are included.
Substantially Met	3.0 – 3.9	A majority of the requirements necessary to satisfy the criteria are included.
Met	4.0	The estimate fully satisfies the criteria under consideration.



MDA Cost Estimating Score Card Criteria Description

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Key Characteristic	Description
Comprehensive, Accurate and Credible	The estimate is comprehensive, includes the full costs, technical and programmatic scope.
Well-Documented	The documentation describes the cost estimating process, data sources, methods used.
GR&A	GR&As were developed with technical input and approved through upper management.
Data	Appropriate data were collected, analyzed and applied in the construction of the estimate.
Methodology	The appropriate method was used to develop the estimate.
Sensitivity	The cost estimates were accompanied by a sensitivity analysis that identified the effects of changing key cost driver assumptions and factors.
Cost Risk & Uncertainty	Risks were identified and quantified with their associated impacts on key cost drivers.

Program X Cost Review	Met (4)	Substantially met (3)	Partially met (2)	Minimally met (1)	Not met (0-1)	Not Applicable
Comprehensive, Accurate, & Credible						
Well-Documented						
Ground Rules & Assumptions						
Data						
Methodology						
Sensitivity Analysis						
Cost Risk						
Estimate Average Score =						



MDA Cost Estimating and Analysis Handbook - Summary

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- **MDA received constructive comments and positive feedback from external agencies and the cost estimating community for instantiating cost estimating best practices (GAO, NASA, OSD CAPE, NCCA)**
- **Standardized and validated cost estimating efforts across the agency (score card)**
- **Provided a guidance and resources for ALL employees**



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MDA Cost Assessment Directorate

Ms. Hetal Patel



PC Purpose

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As part of MDA's efforts to create a world-class cost estimating capability, the MDA Director for Operations (DO) established the Program Evaluation and Cost Assessment team (PC)

- Develops independent cost assessments and implements the score card described in the *MDA Cost Estimating and Analysis Handbook***
- Ensures credible and supportable cost estimates**
- Supports effective and efficient planning for the Missile Defense for our Nation**



PC Agenda

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- **Cost Assessments**
- **Spot Checks**
- **Program Assessment Tool (PAT)**
- **Other Products/Services**
 - **PC Manual**
 - **Program Office Support**
 - **Independent Cost Estimates**



Cost Assessment Process

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- **Select program or projects for assessment in collaboration with the Cost Directorate and Director for Operations**
- **Notify Program Office (PO)**
 - **Send memo to PO notifying them of the assessment**
 - **Provide an in-brief: schedule, list of documents, etc.**
- **Gather documentation**
 - **To include most recent cost review supporting the most recent BMDS Accountability Report (BAR)* submission (estimate documentation)**
- **Analyze, assess, and score the cost estimates and related documentation**
- **Report findings**
- **Track implementation of recommendations**

*MDA is required to provide Congress an annual BAR on specific programs. The BMDS is reported as a single program to the Department.



Analyze, Assess, & Score

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- **Assessment Ground Rules:**

- **Verify all costs align to the values presented in the latest BMDS BAR**
- **Overall assessment rated by assigning a score to the individual criterion used to define the seven key characteristics**

- **Assessment Method:**

- **PC reviews documentation from the estimates and assesses the extent, to which, each key characteristic met best practices by scoring individual estimates against each criterion in the MDA handbook**
- **Assessments are conducted, at a minimum, on the 25 WBS line items with the highest dollar value and an additional 15 randomly selected WBS line items**



Example Report - Program Results

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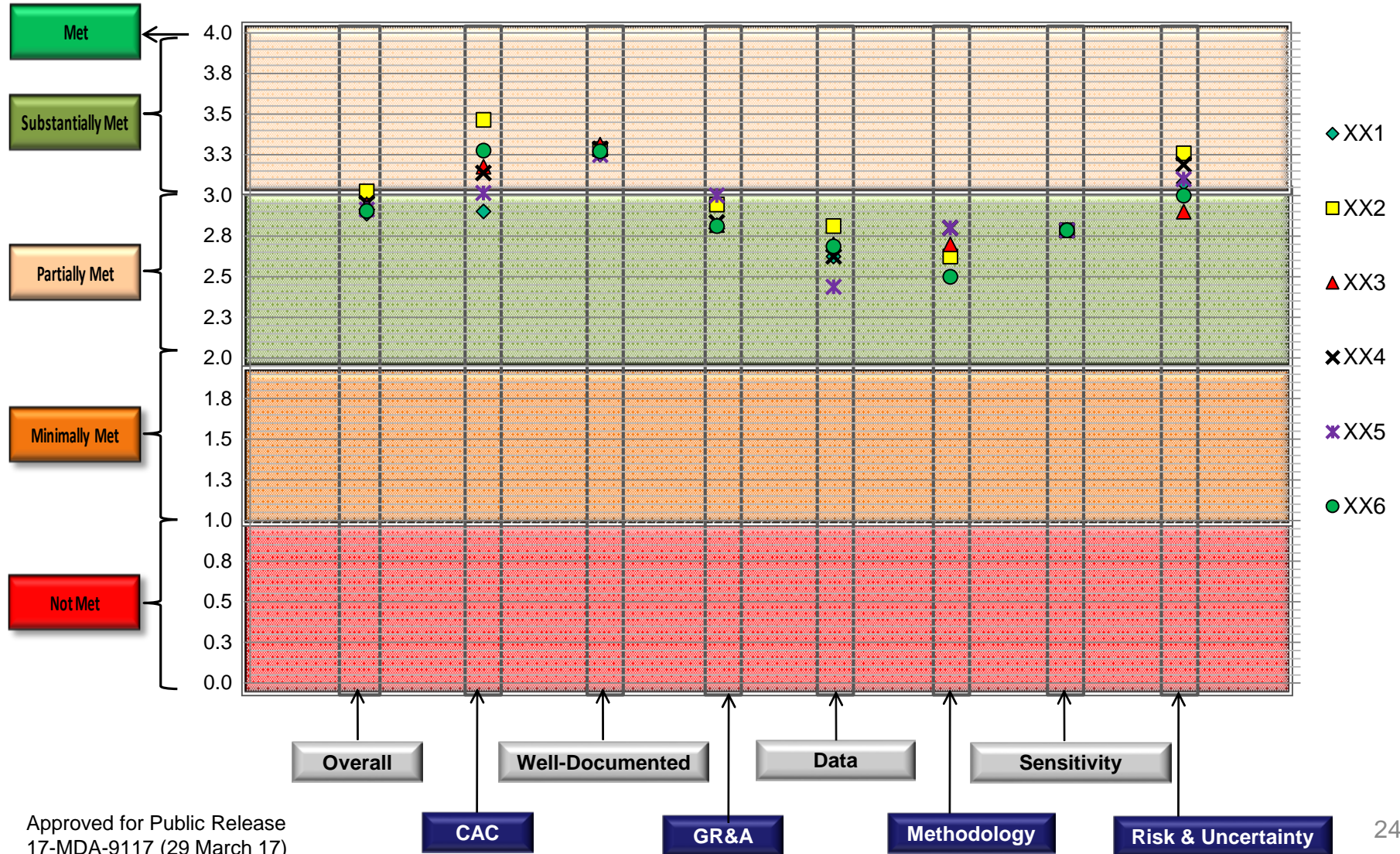
Product Offices with Program

Program XX Overall Score 2017	XX1	XX2	XX3	XX4	XX5	XX6	Total
	2.9	3.0	2.9	3.0	2.9	2.9	2.9
Comprehensive, Accurate, Credible	2.9	3.5	3.2	3.1	3.0	3.3	3.2
Well-Documented	3.3	3.3	3.3	3.3	3.3	3.3	3.3
GR&A	2.9	2.9	2.8	2.8	3.0	2.8	2.9
Data	2.6	2.8	2.7	2.6	2.4	2.7	2.6
Methodology	2.6	2.6	2.7	2.8	2.8	2.5	2.7
Sensitivity Analysis	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Cost Risk & Uncertainty	3.1	3.3	2.9	3.2	3.1	3.0	3.1



Example Program Assessment Scores

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Example Data Score Take Away

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• Condition

- **Cost Estimator – source data is not sufficiently documented or non existent**
 - This calls into question the credibility and accuracy of the data set used to generate the estimate and hence the budget
- **Program – data is non-existent because program manager failed to request cost data reporting**
 - This leaves the PO and future similar programs in a weak position for negotiations

• Recommendation

- **Cost Estimator – to maintain a credible estimate completely document the source data used to generate the estimate or use a different source with cross checks**
- **Program - to receive a score of “Substantially Met” cost reporting is required as part of the contract deliverable**



Tracking

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- **PC and CP follow up on program implementation in one of two ways:**
 - **CP conducts annual cost estimate reviews**
 - **PC conducts spot checks and may re-assess**



Spot Checks – Purpose and Goal

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- **Purpose:** provides routine maintenance to ensure that cost estimates are continually refined and are applying the best practices in order to produce valid and accurate estimates
- **Situation: Baseline Assessment facts:**
 - 6 to 9 months to complete
 - Require multiple analysts to complete
 - Formal scores and report submitted to Agency
 - Multiple in-brief and out-briefs conducted
- **Goal:** develop streamlined process for “Spot-Check” assessment(s) to reduce resources needed to conduct cost re-assessments, while effectively ensuring cost estimate meet Agency standards for compliance and maintenance
 - The end result is a summary level report and a detailed comment matrix (no score is provided).



Purpose of PAT

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- **Provides a consistent format for all cost analysts to use when assessing cost estimates**
- **Aids in performing complete and objective assessments**
- **Covers ground rules & assumptions for scoring**
- **Organizes scores and keeps track of documentation**
- **Creates an understanding of rationale behind the scores**
- **Helps analysts be able to properly defend and justify results**



Other Products/Services

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- **Other products/services**
 - **PC manual – serves as a standard operating process for performing cost assessments**
 - **Program Office Support**
 - **Independent Cost Estimates**



Summary

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- **In compliance with MDA wide standards and processes as documented in the *MDA Cost Estimating and Analysis Handbook***
 - Provides comprehensive documentation essential for a high quality estimate
 - Creates a process that is rigorous and repeatable
- **Since the implementation of the *Cost Estimating and Analysis Handbook* and *Cost Assessment Manual*, MDA has already seen dividends:**
 - Identified areas of improvement for more accurate program estimates and budgets
 - Provides effective training for new and current employees
 - Enables government to negotiate favorable contracts
 - Improved quality of cost estimates
 - Of the eight program offices assessed six now have scores of substantially met
 - Program X increased scores from partially met of 2.6 in 2014 to substantially met of 3.0 in 2016
 - Program Y increased scores from minimally met of 1.5 in 2014 to partially met of 2.4 in 2016