



Acquisition Management System Guidance

Guidelines for Documenting Cost Basis of Estimate

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**Office of Investment Planning and Analysis
AFI-1**

Federal Aviation Administration
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Guidelines for Documenting Cost Basis of Estimate

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Guidelines for Documenting Cost Basis of Estimate

1.0 INTRODUCTION

The common theme conveyed in various directives pertaining to documenting cost estimates is the ability to replicate the estimate. Developing the cost Basis of Estimate (BOE) in a manner that allows an independent cost estimator to understand the methodology and models adequately to reconstruct and verify the estimate, is the keystone to high quality cost estimates. The GAO Cost Estimating and Assessment Guide, Chapter 16, “Documenting the Estimate” provides general guidelines for documenting cost estimates.

This guidance outlines a process for providing visibility into the various aspects of cost estimate in order to satisfy the replication criteria. Emphasis is placed on the FAA prerequisite, not only to document the methodology employed in developing the estimate, but also to fully document the rationale for having selected a particular methodology.

The cost BOE provides a record of the procedures, ground rules and assumptions, data, environment, and events that underlie a cost estimate’s development or update. Good documentation provides credibility to the cost estimate, aids in analysis of changes to program cost, enables reviewers to effectively assess the cost estimate, and populates FAA data bases for estimating costs of future programs.

The methodology used and the appropriate cost detail, or Work Breakdown Structure (WBS) level, are determined by decision point and ACAT as shown in Business Case Analysis Guidance, Appendix A, Table A-1: Business Case Analysis Requirements.

While documentation is typically in the form of a written document (Appendix A: “Template for Documenting FAA Cost Estimates”), documentation can be completed in other acceptable ways. Some cost models automatically develop documentation; other models use detailed MS Excel spreadsheets with cell notes and hyperlinks to other documents. Either way is acceptable so long as the information is available to a reviewer and the documentation allows a reviewer to trace the data, calculations, modeling assumptions, and rationale back to the source documentation for verification and validation.

2.0 BASIS OF ESTIMATE CONTENT

The following paragraphs briefly describe the documentation structure and content requirements for the cost BOE. More detail is presented in Appendix A: Template for Documenting FAA Cost Estimates. Not every estimate will be documented to this level of detail. Documentation must be tailored to align with the ACAT and nature of the decision requested. When documenting smaller programs or projects, this tailoring provision would be employed to down scope the content structure provided below. Specifics of this down scoping would be dictated by the size and nature of the program or project involved. However, enough detail to support replication must be provided in the tailored documentation.

2.1 Executive Summary

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This portion of the BOE document provides a thumbnail sketch of the program, who performed the estimate, how the estimate was performed, and the data used in developing the estimate. The executive summary is a highly valuable overview for managers and an extremely useful reference for cost estimators attempting to determine applicability to another estimate or research study.

The executive summary should provide a complete summary of the cost estimating effort, and should also contain links (including page numbers) that denote locations where reviewers can obtain further details. This feature is a great help to reviewers; especially those who only want to pursue large dollar value items or some other selected items.

It should be remembered that many higher-level reviewers will read only the executive summary. If accomplished properly, this section alone can do much to establish the credibility of the estimate. Therefore, it is critical that the executive summary be written well and summarizes the entire estimate completely. This can be done best by having one person responsible for writing the entire executive summary. This assures a consistent style and lessens the probability of omissions or double coverage. In an ideal situation, the team leader should be responsible for preparing the executive summary since he generally is free from specific estimating responsibilities (as well as the corresponding documentation preparation).

2.2 Ground Rules and Assumptions

List all technical and programmatic conditions that formed the basis for the estimate.

2.3 Methodology Summary

Identify the primary methodology and techniques that were employed to construct the estimate, along with a general statement that relates the rationale for having selected these particular methodologies and techniques.

2.4 Estimate Description (by WBS Element)

Provide a detailed description of the primary methods, techniques, and data used to generate each element of the estimate. For each primary approach employed, the rationale for having selected it, along with the crosscheck approach used for substantiation, must be included to convey the competence of estimate results. The descriptions contained in this section will, at a minimum, address the specific topics contained in Table 2. It should be noted that, in some cases, not all of the topics identified in Table 2 will be used in performing the estimate.

Table 2. Topics Addressed Under Estimate Description

TOPIC	REQUIRED DESCRIPTION
Data	Show all data used, its source (e.g., actuals on current contract/analogous program), and normalization procedure.
Labor Rates	Identify direct and indirect labor rates as industrial averages or contractor specific, their content, and how they were developed.
Labor Hours	Discuss how functional labor hours were developed (e.g., contractor proposal, build-up from analogous program, engineering assessments).

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Material/Subcontracts	Depict the material, purchased parts, and subcontracted items that are required, and the development of their cost (e.g., vendor quotes, negotiated subcontracts, catalog prices).
Cost Improvement Curves	Include method used to develop T1 values and describe the curve selected in terms of its slope, source, and relevance to the cost element and program being estimated. Any unique aspects of curve application must be included in this section.
Factors and Cost Estimating Relationships (CERs)	Provide the basis, development, and/or source of all factors and CERs used for areas such as support equipment, data, training, etc. This discussion must include a description of how the factor was applied (e.g., against recurring manufacturing labor costs) and its relevance to the program being estimated.
Cost Models	Describe all models used and their relevance to the estimate, along with complete details regarding parametric input and output (include detailed runs here or as an appendix to the documentation package) and any calibration performed to ensure the model served as an appropriate estimating tool for the cost element and program involved.
Inflation Index	Document the specific indices and computations used in the estimate including those employed to normalize historical data. A detailed table portraying the rates used can be included either here or as an appendix to the documentation package.
Time phasing	Identify/describe the approach used to phase the estimate.
Sufficiency Reviews and Acceptance	Discuss the process used for reviewing an existing cost element estimate to determine its sufficiency and acceptability for incorporation into the estimate. This process should be applied to existing government and contractor estimates that are accepted as throughput to the estimate.
Estimator Judgment	Document the logic and rationale that led to specific conclusions reached by the estimator regarding various aspects of the estimate.
Risk and Confidence	Show the details of all risk analysis conducted and how it formed the basis for reaching conclusions regarding estimate confidence.

2.5 Cost Estimate Detail

The discussion in this portion of the documentation package should follow a logical flow that moves from cost element to cost element as depicted in the WBS for the program being estimated. Where appropriate, functional breakouts should be made to assist in describing how the estimate was developed. The actual time phased estimate, in constant year dollars for each cost element, should be included with the description of how it was developed. Each of these cost elements will become an input to the time phased estimate summarization that will be provided in both constant year and current year dollars at the end of this section. If the estimate is an update to a prior Life Cycle Cost Estimate (LCCE) or an Independent Government Cost Estimate (IGCE), a track between the two should also be provided at the end of this section along with an explanation of differences. This explanation must address not only where the differences reside, but also why they exist.

2.6 Cost Traceability

When a prior cost estimate exists (for example, when the current estimate supports a program re-baseline) a cost track should be prepared. The cost track should provide a concise explanation for any change to a WBS element from the prior estimate, in “Then Year” dollars.

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2.7 Appendices

These should be used to append any pertinent information that, due to size, would be disruptive to the executive summary and/or main body of the documentation package. Appendices can include a copy of estimate briefing charts, model runs, inflation rates, tables, etc.

2.8 References

Source documents/data should be identified where used in the documentation package, with its citation (author, title, date, page numbers, etc.) listed in the reference section.

3.0 GENERAL REQUIREMENTS

Documentation must be organized logically with clearly titled, easy to follow sections. The following considerations will contribute toward achieving high quality, useable cost estimate documentation:

- The documentation package should include the program name, reason for the estimate, the identity of both the tasking organization (and office symbol) as well as the organization that accomplished the estimate, and the “as of” date.
- A table of contents should be included that identifies the titles of each numbered section and subsection along with page numbers.
- Pages should be numbered either sequentially or sequentially within each section.
- Where the same data or method is used repeatedly, it should be described in detail at the point of original use, and referenced by page number thereafter.
- All terms and acronyms should be defined fully at the point of first use.
- All figures and tables should be identified by numbers and clear descriptive titles (the numbering and titling convention used in this handbook would be appropriate for cost documentation).
- Cross-references should be used to assist the reader in understanding where areas addressing the same subject are located in the document.
- The first time documented information is used, its source should be cited and added to the reference list contained at the end of the documentation package. When the same source is used thereafter, only the reference number needs to be cited.

4.0 DOCUMENTATION PROCESS

The FAA has adopted the perspective that documentation is not a final chore but rather one of the most important aspects during compilation of the estimate. Integral to this perspective is the fact that the only correct way to document the cost estimate is to parallel the estimate itself. Because of this, it is critical that documentation requirements be a topic during the initial planning phase of the cost estimate (see FAA *Guidelines for FAA Cost Estimating*). With early emphasis on estimate documentation requirements, the team is organized to write down clear, orderly notes as the estimate progresses. This ensures that the data, analysis, and rationale that

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underlie the estimate are captured at their freshest moment rather than depending on recollection weeks later.

To carry out the documentation process effectively, the team leader should develop an outline from the guidelines provided in Section 2. This outline will provide a road map that depicts the structure and content of the final documentation package. If executed properly, the time to clean up and refine the cost estimator's notes into final documentation form will be minimized.

By following this real-time documentation process, two distinct benefits accrue immediately:

- The team is postured to convey readily its reasons for having selected the specific rationale that underlies study results, and
- The draft product is produced in a manner that minimizes time invested while maximizing the quality and timeliness of study documentation and delivery to review authorities.

5.0 BRIEFING THE ESTIMATE

The template for briefing the estimate can be found on the IP&A web site at <http://www.ipa.faa.gov> . Product teams will use this template for briefing cost estimates at IP&A reviews.

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APPENDIX A

Template for Documenting FAA Cost Estimates

Cost Basis of Estimate for (Name of Initiative)



**Federal
Aviation
Administration**

Version X.X

POC:

(Date)

**Cost Basis of Estimate for
(Name of Acquisition)**

Approved By:

_____ Date: _____
Investment Analysis Team Lead

Cost Basis of Estimate for (Name of Initiative)

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Cost Basis of Estimate for (Name of Initiative)

1.0 EXECUTIVE SUMMARY

Many higher-level reviewers will read only the executive summary. If accomplished properly, this section alone can do much to establish the credibility of the estimate.

1.1 Overview

Provide an overview of how the document is organized and describe any of its aspects that may facilitate its use.

1.2 Technical Description

Provide a brief technical and programmatic description of the system or alternative whose costs are being estimated. Identify any program documents used to prepare the estimate.

Characterize significant aspects of the acquisition and status in terms of work accomplished, current position, and work remaining. Include information such as detailed technical and programmatic descriptions, pictures of the system and major components, performance parameters, support concepts, contract types, acquisition strategies, and other information that will assist the document user in fully understanding the system estimated.

1.3 Objective

Describe the purpose of the cost estimate being documented (e.g., Initial Investment Decision (IID), Final Investment Decision (FID), or program re-baseline, etc.). Identify the organization that requested the estimate, briefly describe the specific tasking for the estimate, and cite any relevant correspondence.

If the estimate updates a prior estimate, identify the prior estimate. A prior estimate is normally available when a program is being re-baselined. [Note: A cost track between the current and prior estimates may be presented in Section 6.]

1.4 Scope

List the standard WBS elements involved in the estimate. State whether the estimate covers prime contractor costs, other contractor costs, Activity 5 costs, and/or costs for other FAA organizations.

Describe acquisition phases, appropriations, and time periods encompassed by the estimate. Describe the years covered by the estimate, and explain the rationale for selecting the start and end years.

Identify any program costs that are excluded from the estimate. Examples of excluded costs may include costs that have been covered by other programs, costs covered by other government agencies, or sunk costs.

Cost Basis of Estimate for (Name of Initiative)

If specific areas were not addressed by the estimate, state the reason (e.g., this estimate was accomplished to support a development budget update; therefore, production costs were not addressed).

1.5 Team Composition

Identify those who contributed to the cost estimates. For each contributor, include their organization, contribution, and areas of responsibility, routing symbol, telephone number, and email address.

Be sure to identify all technical and programmatic experts who contributed to the cost estimate.

1.6 Program Schedule and Quantities

List the key acquisition events and milestones for the years covered by the cost estimate. Include the master schedule for development, production, and deployment, as well as a detailed delivery schedule.

Summarize the quantities to be purchased and installed by fiscal year. [Note: Presenting schedule information in tabular format facilitates comparison with prior estimates, other alternatives, etc.]

1.7 Acquisition Strategy and Cost-Relevant Contractual Information

Reference any acquisition strategy documents used to prepare the cost estimate, and describe how the acquisition strategy affected the estimate. If the cost estimate was adjusted for type of contract award, contract options, or other contractual features, explain how such information was used to construct the estimate.

1.8 Inflation Rates

State which set of inflation rates were used for the basic estimate. It is not necessary to identify in this section other rates that may have been used to normalize historical data, since they will be described in the main body. A detailed table portraying the rates used can be included as an appendix.

2.0 GROUND RULES AND ASSUMPTIONS

List key technical and programmatic conditions, estimating ground rules, and assumptions that underpin the estimate as a whole. Identify specific cost elements that have been excluded from the cost estimate.

Identify whether ground rules and assumptions pertain to Facilities & Equipment (F&E), Operations and Maintenance (O&M) or both. [Note: Details, ground rules and assumptions applicable to individual WBS elements are documented in Section 4.]

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3.0 METHODOLOGY SUMMARY

3.1 Cost Estimation

Identify the primary methodology and techniques, by WBS, that were employed to construct the estimate, along with a general statement that relates the rationale for having selected these particular methodologies and techniques. Also, briefly describe the actual cost data and its sources that were used to develop or verify the estimate.

To facilitate the documentation, parameter values and factors that are used consistently throughout the estimate (e.g., labor rates, overhead factors, contract award fee percentages, quantities, scrap rates, etc.) can be presented in a summary table. The table should list the values of the parameters and factors, and it should explain how values were determined.

3.2 Risk Adjustment

Describe how the high-confidence cost estimate was generated. Specifically, summarize how the standard cost methodologies were adjusted for cost estimating, technical, schedule, and other risks. Describe any risk analyses conducted by the Product Team or Investment Analysis Teams (e.g., Monte Carlo simulation, identification of risk mitigation strategies) and how their results were used to create the most likely cost estimate. Describe the process used to distribute risk dollars among WBS elements and over fiscal years. Specify the percentile confidence of the risk-adjusted estimate.

4.0 ESTIMATE DESCRIPTION [BY WBS ELEMENT]

For each WBS element, describe the derivation of its estimated cost in sufficient detail to allow an independent reviewer to determine whether the estimate is complete, accurate, and realistic. The following information should be provided:

WBS Number and Title.

WBS Element Description. Include the definition from the FAA-standard WBS and any tailoring used for this estimate.

Assumptions and Judgment Factors. Describe the assumptions and judgment factors applicable to each cost element.

Estimated Cost. Present the WBS element's estimated cost in Constant Year (CYXX) dollars, both total dollars and distributed across fiscal years. Be sure to identify the base year of calculation.

Methodology. Describe how the WBS element costs were estimated. Depending on the choice of methodology, the estimator should include one or more of the following data:

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- IF Labor Rates, then identify direct and indirect labor rates, what costs are included in the rates, and how the rates were determined.
- IF Labor Hours, then describe how labor hours were estimated.
- IF Material Purchases, then list the materials and purchased parts, the source of estimated prices and any crosschecks performed.
- IF Subcontracts, then summarize the work to be performed, how the price was determined.
- IF Cost Factors or Cost Estimating Relationships (CERs), then describe their source and how they were applied.
- IF Cost Models, then describe any estimating models used and how they were applied.
- IF System Analogs, then identify the analogous systems and explain how and why they were used.
- IF Estimator Judgment, then specify who provided the estimate and any justification.
- If Contractor Cost Estimates¹, then identify whether contractor estimates were used and describe any crosschecks that were performed.

Time Phasing. Describe the analytic approach used to distribute the WBS element's estimated costs across fiscal years.

Calculations. Present the inputs and algorithms or equation for each WBS element so reviewers can understand the basis for the cost estimate. Describe how WBS element costs were aggregated into the summary tables shown in Section 5 (if applicable).

Data Sources. Identify WBS-element-unique sources of cost and technical data and parameter values. Describe procedures, if any, used to normalize those data.

Risk Adjustments. Describe any WBS-element-specific procedures used to adjust the WBS element's most likely estimated cost for risk. State in constant-year dollar terms the amount of the risk adjustment.

5.0 COST ESTIMATE DETAIL

Include tables for constant-year (CYXX) dollars and then-year dollars by fiscal year that track to the WBS methodology descriptions. Include a summary table of estimated costs by fiscal year by appropriation in then-year dollars. The table formats are shown below.

¹ Note: Contractor Rough Order of Magnitude (ROM) estimates and non-negotiated contractor proposals should not be used for FAA cost estimating unless absolutely necessary.

Cost Basis of Estimate for (Name of Initiative)

**Table 5-1. Most-Likely Cost Estimate, By WBS Element
(Constant-Year 20XX Dollars)**

	FYXX	FYXX	FYXX	FYXX	...	Total
WBS 3.0						
WBS 3.1						
WBS 3.2						
Etc.						
Etc.						
Etc.						
Etc.						
Total						

**Table 5-2. High-Confidence Cost Estimate, by WBS Element
(Constant Year 20XX Dollars)**

	FYXX	FYXX	FYXX	FYXX	...	Total
WBS 3.0						
WBS 3.1						
WBS 3.2						
Etc.						
Etc.						
Etc.						
Etc.						
Total						

**Table 5-3. Most-Likely Cost Estimate, by WBS
(Then-Year Dollars)**

	FYXX	FYXX	FYXX	FYXX	...	Total
WBS 3.0						
WBS 3.1						
WBS 3.2						
Etc.						
Etc.						
Total						

**Table 5-4. High-Confidence Cost Estimate, By WBS
(Then-Year Dollars)**

	FYXX	FYXX	FYXX	FYXX	...	Total
WBS 3.0						
WBS 3.1						
WBS 3.2						
Etc.						
Etc.						
Total						

Cost Basis of Estimate for (Name of Initiative)

**Table 5-5. Most Likely Cost Estimate, By Appropriation
(Then-Year Dollars)**

	FYXX	FYXX	FYXX	FYXX	...	Total
F&E						
O&M						
Activity 5						
Total						

**Table 5-6. High-Confidence Cost Estimate, By Appropriation
(Then-Year Dollars)**

	FYXX	FYXX	FYXX	FYXX	...	Total
F&E						
O&M						
Activity 5						
Total						

6.0 COST TRACEABILITY

When a prior cost estimate exists (for example, when the current estimate supports a program re-baseline), a cost track should be prepared. The cost track should provide a concise explanation for any change to a WBS element from the prior estimate, in then-year dollars. An effective format for documenting a cost track to a prior estimate is shown in Table 6.1.

**Table 6-1. Comparison of Program Cost Estimates
(Then-Year Dollars)**

	[1]	[2]	[3]	[4]	[5]
	Current Estimate (Dollars)	Prior Estimate (Dollars)	Change ([1]-[2])	Percent Change ([3]/[2])	Reason for Change
WBS 3.0					
WBS 3.1					
WBS 3.2					
Etc.					
Etc.					

7.0 APPENDICES

Include copies of estimate briefing charts, model runs, inflation rates, tables, etc.