

# **GAO Cost Estimating & Scheduling**

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***Best Practices and Audit Findings***

***Karen Richey***

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April 9, 2015

# Presentation Overview

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- Background on GAO
- Overview of the GAO Cost and Schedule Guides
- GAO-08-388 Joint Strike Fighter Case Study

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# Government Accountability Office

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- Named changed from General Accounting Office to underscore mission
  - Independent, nonpartisan agency reporting directly to Congress
  - Conducts audits to evaluate economy, efficiency, and effectiveness of government programs (all agencies)
- Known as the Investigative arm of Congress, GAO exists to support Congress in meeting its constitutional responsibilities. To that end, GAO works to
  - Improve the performance of federal government
  - Ensure government agencies and programs are accountable to the American people
  - Examine the use of public funds, and
  - Evaluate federal programs by providing analyses and recommendations to help Congress make informed oversight and funding decisions

# GAO's Role in Government and How It Relies on Best Practice Guides to Develop Audit Findings

- GAO assists Congress in its oversight of the federal government including agencies' stewardship of public funds
  - Legislators, government officials, and the public want to know
    - Whether government programs are achieving their goals
    - What these programs are expected to cost and when they will be finished
  - Developing reliable program cost and schedule estimates are critical to
    - Effectively using public funds
    - Meeting OMB's capital programming process
    - Avoiding cost overruns, missed deadlines, and performance shortfalls
- We developed the GAO Cost and Schedule Guides to
  - Establish consistent best practices that can be used across the federal government
  - Provide auditors with a standardized approach for analyzing program costs, earned value management (EVM) data, and schedules

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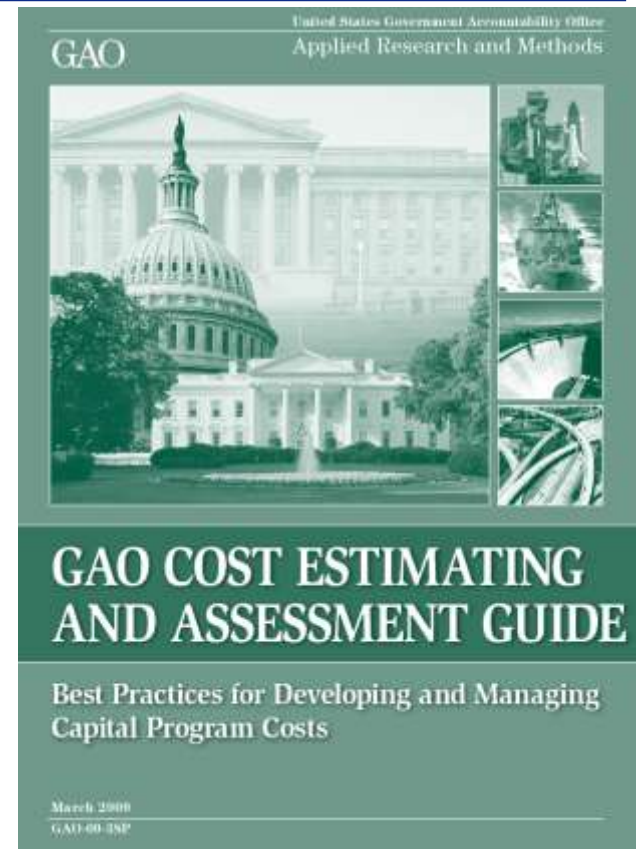
# Why the GAO Cost Assessment Guide is Important

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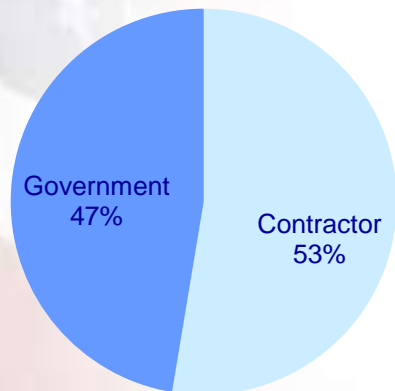
- Purpose of the Guide is to
  - Address best practices for ensuring credible program cost estimates for both government and industry
  - Provide a detailed link between cost estimating and EVM
    - OMB has endorsed EVM for measuring cost, schedule, and technical performance
    - Guide demonstrates how realistic cost and schedule estimates are necessary for setting achievable program baselines and managing risk
- Original intent was to provide auditors with a standardized approach for analyzing program costs
  - Our research, however, found federal guidelines to be limited on the processes, procedures, and practices for ensuring credible cost estimates
    - We decided to fill the gap and shifted the intent of the Guide from an auditor's manual to a best-practice manual
    - To help GAO auditors fully utilize this Guide, we included a number of "auditor checklists" for use on program assessments

# How the March 2009 GAO Cost Guide was Developed

- We developed this Guide in consultation with a “community of experts” from the federal government and industry.
  - Formal kick-off began at the Society of Cost Estimating and Analysis conference in June 2005
  - Since then, the community of experts helping to review and comment on the Guide has grown
    - Their contributions have been invaluable both in
      - Providing historical information and experience
      - Keeping the Guide current with industry trends
- Together with these experts, we developed a Guide which
  - Clearly outlines GAO’s criteria for assessing cost estimates and EVM during audits
  - OMB has cited as a key reference document for use by federal agencies in its June 2006 Capital Programming Guide
- The Guide can be downloaded for free at:
  - <http://www.gao.gov/products/GAO-09-3SP>
- Comments are always welcome
  - We continually strive to keep the Guide updated and relevant to changes in policy and methods



# The expert group's vast experience, both governmental and private



AACE International	Dept. of Interior	Johns Hopkins APL	Parsons Brinckerhoff
Aberdeen Proving Ground	Dept. of Treasury	Johnson Space Center	Performance Results Corporation
Accenture	DNDO	Kaiser Permanente	Pinnacle Management Systems, Inc.
Acumen	DOT	Kalman & Company, Inc.	Pratt & Whitney
AFCAA	Edwards Project Solutions	Kearney & Company	Price Systems
Agilekiwi	FAA	KPMG	Price Waterhouse Coopers
Department of the Army	FLOUR	L-3 Stratis	Project Pro
AzTech International	Galorath Incorporated	Learning Tree	Rand
Bath Iron Works	George Mason University	Legis Consultancy	Raytheon
Battelle	German Aerospace Center	Lockheed Martin	Robbins Gioia
Boeing	Grant Thornton	ManTech Team	Rockwell Collins
Booz Allen Hamilton	GSA	Marathon Oil	SAIC
CDC	GWU	MBP	ServQ
Census	Herren Associates	MCR Federal, LLC	Sikorsky
Center for Naval Analysis	HNTB Corporation	MDA	SPAWAR
Chevo Consulting	HPTI	Microsoft	SRA International
Computer Sciences Corp.	HUD	Ministry of Defense - Japan	SSA
DAU	IntePros Federal	MITRE	Steelray
DCMA	iParametrics	NASA	TASC - DNDO support
Deloitte Consulting LLP	IRS	National Defense University	Technomics
Deltek	GWU	National Science Foundation	Tecolote Research, Inc.
Department of Education	Herren Associates	NAVAIR	Textron
Department of Interior	HNTB Corporation	Naval Center (NCAA)	The Rehancement Group, Inc.
Department of Navy	HPTI	NAVSEA	Transportation Security Administration
Department of State	HUD	Navy Postgraduate School	UK MOD
Department of Veterans Affairs	IntePros Federal	NNSA	US Army Corps of Engineers
Dept of Energy - Oakridge	iParametrics	NOAA	US Coast Guard
Dept of Labor	IRS	Northrop Grumman	USPS
Dept. Homeland Security	Japan Defense Research Center	OMB	VA
Dept. of Commerce	JAXA - Japan	OSD PARCA	Wyle

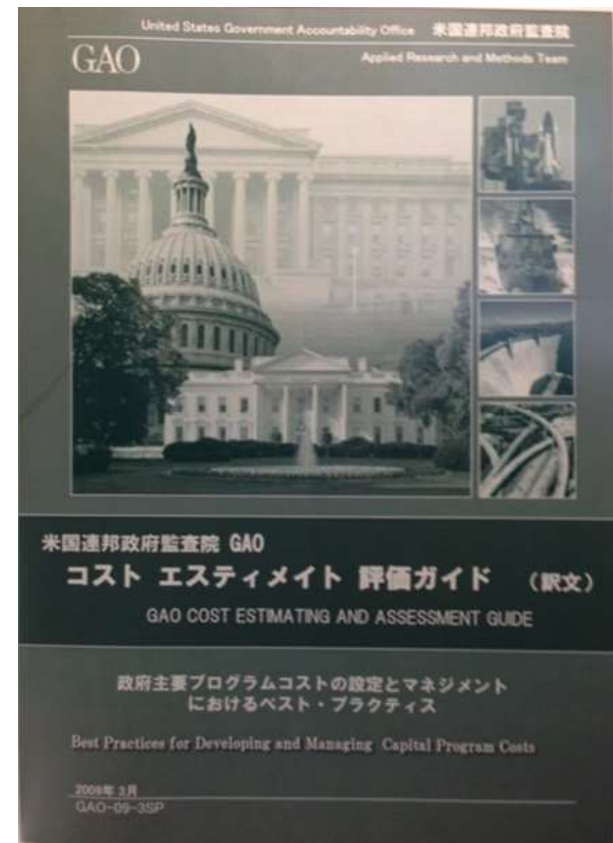
# Foreign government interest in the GAO cost guide

In 2009, Japan translated the entire guide into Japanese and had it bound and professionally published.

Other foreign governments showing great interest in the guide include:

- Canada
- Great Britain
- India
- Peru

These countries recognize that GAO's Cost Guide is based on long-standing industry and government cost estimation best practices that existed before GAO published them in the guide's concise form.





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# The Cost Assessment Guide's Layout

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- The Guide consists of 20 chapters with supporting appendices
    - Chapters 1-17 address the importance of developing credible cost estimates and discuss in detail a 12-step cost estimating process for developing high quality cost estimates
    - Chapters 18-20 address managing program costs once a contract has been awarded and discuss
      - EVM
      - Risk management
      - Other program management best practices
  - The Guide also provides case studies of prior GAO audits to showcase typical pitfalls that can occur in the cost estimating process
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# A Reliable Process for Developing Credible Cost Estimates

- Certain best practices should be followed if credible cost estimates are to be developed.
- These best practices represent an overall process of established methods that, if followed correctly, will result in high-quality cost estimates that are comprehensive, accurate, and easily updated / replicated.
  - In searching for documentation on best practices, we found a 1972 GAO report on cost estimating
    - We reported that cost estimates were understated and causing unexpected cost growth
    - Many of the factors causing this problem are still relevant today

## Initiation and research

Your audience, what you are estimating, and why you are estimating it are of the utmost importance

## Assessment

Cost assessment steps are iterative and can be accomplished in varying order or concurrently

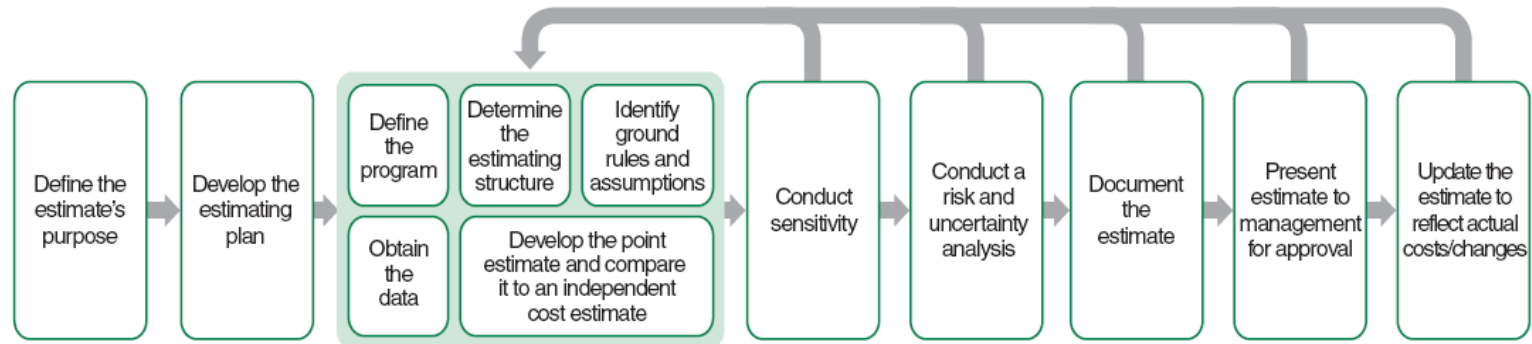
## Analysis

The confidence in the point or range of the estimate is crucial to the decision maker

## Presentation

Documentation and presentation make or break a cost estimating decision outcome

Analysis, presentation, and updating the estimate steps can lead to repeating previous assessment steps



Source: GAO.

# Mapping the 12 steps to the four characteristics of a credible cost estimate

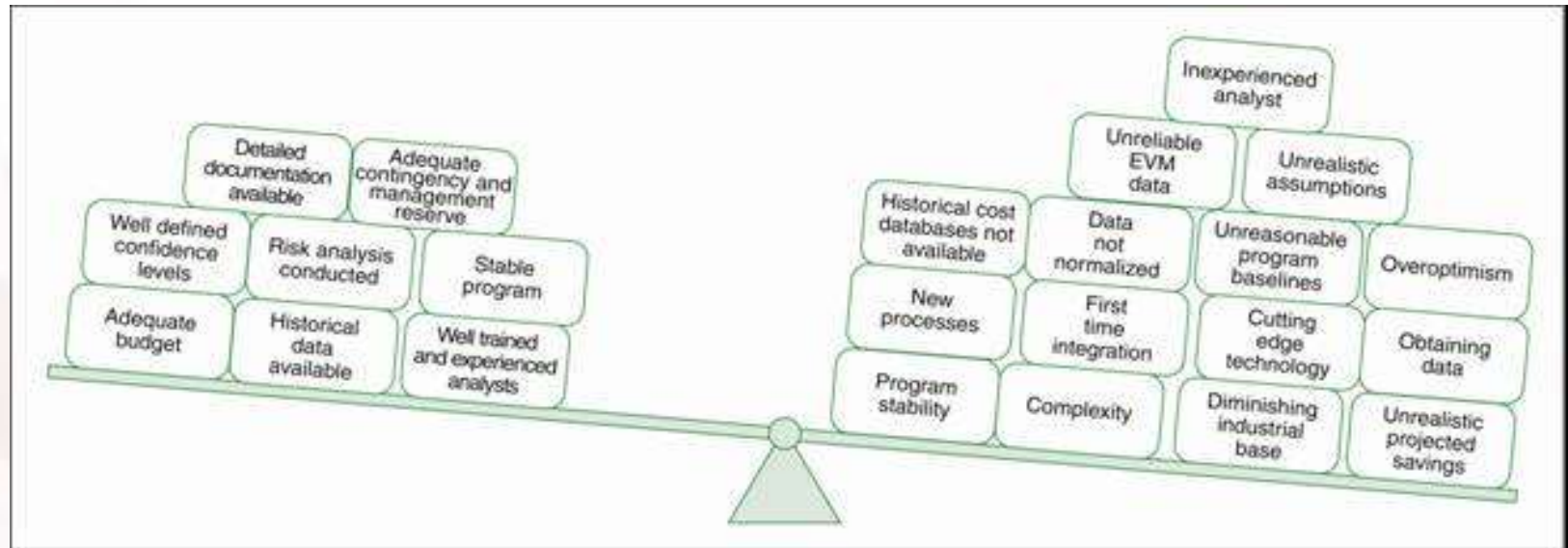
Characteristic	Related step
<p><b>Well documented</b></p> <ul style="list-style-type: none"> <li>• The estimate is thoroughly documented, including source data and significance, clearly detailed calculations and results, and explanations for choosing a particular method or reference.</li> <li>• Data have been traced back to the source documentation.</li> <li>• A technical baseline description is included.</li> <li>• All steps in developing the estimate are documented, so that a cost analyst unfamiliar with the program can recreate it quickly with the same result.</li> <li>• All data sources for how the data was normalized are documented.</li> <li>• The estimating methodology and rationale used to derive each WBS element's cost are described in detail.</li> </ul>	<ul style="list-style-type: none"> <li>1. Define the estimate's purpose</li> <li>3. Define the program</li> <li>5. Identify ground rules and assumptions</li> <li>6. Obtain the data</li> <li>10. Document the estimate</li> <li>11. Present estimate to management</li> </ul>
<p><b>Comprehensive</b></p> <ul style="list-style-type: none"> <li>• The estimate's level of detail ensures that cost elements are neither omitted nor double counted.</li> <li>• All cost-influencing ground rules and assumptions are detailed.</li> <li>• The WBS is defined and each element is described in a WBS dictionary; a major automated information system program may have only a cost element structure.</li> </ul>	<ul style="list-style-type: none"> <li>2. Develop the estimating plan</li> <li>4. Determine the estimating approach</li> </ul>

## Mapping the 12 steps (continued)

Characteristic	Related step
<b>Accurate</b>	
<ul style="list-style-type: none"> <li>• The estimate is unbiased, not overly conservative or overly optimistic, and based on an assessment of most likely costs.</li> <li>• It has few, if any, mathematical mistakes; those it has are minor.</li> <li>• It has been validated for errors like double counting and omitted costs.</li> <li>• Cross-checks have been made on cost drivers to see if results are similar.</li> <li>• The estimate is timely.</li> <li>• It is updated to reflect changes in technical or program assumptions and new phases or milestones.</li> <li>• Estimates are replaced with EVM EAC and the Independent EAC from the integrated EVM system.</li> </ul>	<ul style="list-style-type: none"> <li>7. Develop the point estimate and compare it to an independent cost estimate</li> <li>12. Update the estimate to reflect actual costs and changes</li> </ul>
<b>Credible</b>	
<ul style="list-style-type: none"> <li>• Any limitations of the analysis because of uncertainty or biases surrounding data or assumptions are discussed.</li> <li>• Major assumptions are varied and other outcomes recomputed to determine how sensitive outcomes are to changes in the assumptions.</li> <li>• Risk and uncertainty analysis is performed to determine the level of risk associated with the estimate.</li> <li>• An independent cost estimate is developed to determine if other estimating methods produce similar results.</li> </ul>	<ul style="list-style-type: none"> <li>7. Develop the point estimate and compare it to an independent cost estimate</li> <li>8. Conduct sensitivity analysis</li> <li>9. Conduct risk and uncertainty analysis</li> </ul>

# Challenges in developing credible estimates

Chapter 2 of the GAO Cost Guide discusses a 1972 GAO report that found that estimates of the cost to develop and produce weapon systems were frequently understated with costs increasing \$15.6 billion over early development estimates. Many factors causing those cost increases are still relevant today.



## Program management's success requires reliable schedules

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Developing an integrated schedule is key for

- Managing program performance and
- Determining the work that remains and its expected cost.

Therefore, a program's success depends on its having a reliable schedule of:

- When its set of work activities and milestone events will occur
- How long they will take, and
- How they are related to one another.

Reliable schedules provide”

- A road map for the program's systematic execution
  - The means by which to gauge progress, and
  - A way to identify and address potential problems and promote accountability.
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## GAO's May 2012 Schedule Assessment Guide

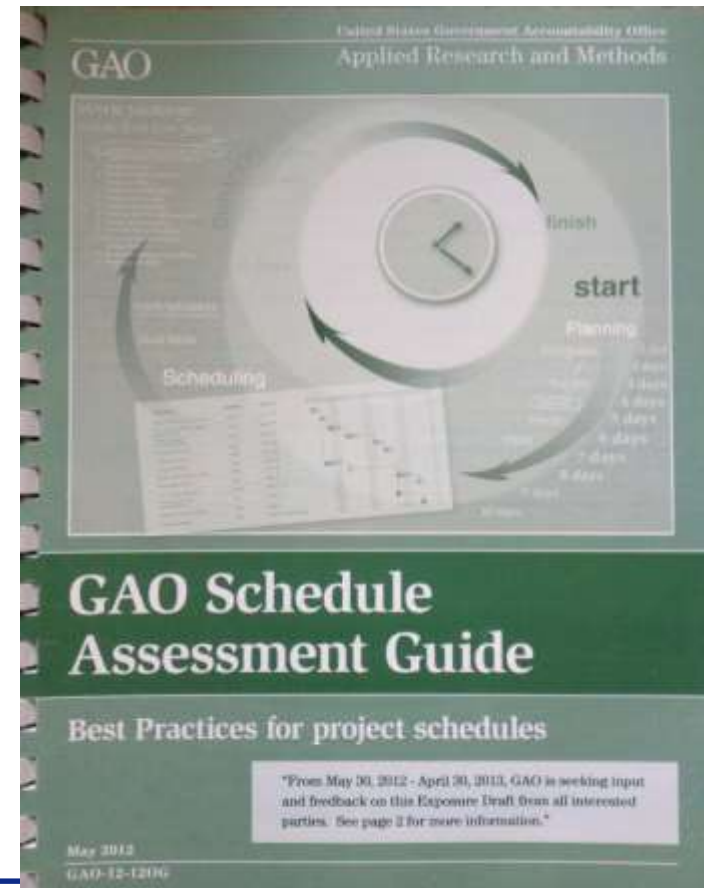
The GAO Schedule Guide further develops the scheduling concepts introduced in the GAO Cost guide. It

- Outlines 10 scheduling best practices for developing and maintaining high-quality schedules that forecast credible dates
- Contains explanatory text, illustrations, and detailed case studies to help program staff identify a schedule's logic and risk elements
- Includes appendixes of key questions and documentation.

Project teams that develop a project's schedule will find the guide indispensable

The guide will inform agencies that have no formal policy for creating schedules of GAO's criteria for assessing a schedule's credibility.

It can be downloaded for free at [www.gao.gov/products/GAO-12-120G](http://www.gao.gov/products/GAO-12-120G).



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## GAO's May 2012 Schedule Assessment Guide (continued)

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An exposure draft was developed from Nov. 2010 through May 2012 from

- Five cost expert meetings and
- Comments from 548 expert readers.

Work on the final draft began May 2012 with

- Additional expert meetings in Sept. 2012 and March 2013
- The receipt of 575+ additional comments
- Input from a subgroup of experts developing an appendix on scheduling in an Agile environment
- Reviews from private industry (80), government departments and agencies (29), and trade groups and universities (4).

The final draft will include updated figures, schedule risk analysis, and an appendix on scheduling in an Agile development environment.

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# Best practices identified in GAO's schedule assessment guide

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GAO's research has identified 10 best practices in developing and maintaining a reliable schedule:

1. Capturing all activities
2. Sequencing all activities
3. Assigning resources to all activities
4. Establishing the duration of all activities
5. Verifying that the schedule can be traced horizontally and vertically
6. Confirming that the critical path is valid
7. Ensuring reasonable total float
8. Conducting a schedule risk analysis
9. Updating the schedule using actual progress and logic
10. Maintaining a baseline schedule.

## **How Is the Government Performing?**

**To What Extent are Agencies Meeting Established Cost and Schedule Goals Reported to Congress**

# How is the government performing in developing cost estimates?

	Comprehensive	Well Documented	Accurate	Credible
Veterans Affairs (VA)	Substantially	Substantially	Minimally	Minimally
DOT	Substantially	Substantially	Substantially	Minimally
DOD	Substantially	Substantially	Substantially	Partially
Missile Defense (MDA)	Partially	Minimally	Minimally	Minimally
IRS	Substantially	Partially	Partially	Minimally
DHS	Substantially	Substantially	Substantially	Partially
DOE	Substantially	Substantially	Partially	Minimally
Agriculture	Minimally	Not Met	Not Met	Not Met
Commerce	Substantially	Minimally	Partially	Not Met

Fully Met	Substantially	Partially	Minimally	Not Met
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Data based on agencies and departments with three or more GAO cost estimate assessments

# GAO's high-level summary of cost estimate assessments

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In general, government program offices

- Exclude all program life cycle costs and do not break out costs into sufficient detail
- Rarely use standardized product-oriented work breakdown structures with common support elements
- Do not reflect historic or risk data and do not assess the risk impacts if major assumptions fail
- Do not document the cost estimate to a level that would allow a cost analyst unfamiliar with the program to replicate the results
- Conduct limited sensitivity analyses based on engineering judgment rather than historic data
- Do not perform cost risk and uncertainty analysis and fail to document the risks associated with assumptions
- Cannot show that their estimates are unbiased (i.e., do not identify a level of confidence along with contingency)
- Fail to crosscheck estimating methodologies or reconcile with an independent cost estimate
- Cannot demonstrate that management has understood and approved all facets of the cost estimate
- Fail to update the cost estimate to reflect actual costs and reasons for variances

# Many government program offices lack effective internal controls

Program offices generally have no

- Centralized cost estimating organization that includes experienced and trained cost analysts to develop high-quality cost estimates
- Policy or guidance for developing high-quality cost estimates that include steps to follow, time that is needed, and how estimates will be updated
- Infrastructure or staff for collecting and storing historic cost and technical data
- Independent cost estimating organization that can test whether the cost estimate is accurate and realistic

Program offices generally do not

- Link cost and schedule variances to risks in the cost uncertainty analysis
- Update cost estimates regularly (e.g., monthly)
  - with actual cost data from an earned value management system,
  - to capture the reasons for variances with links to risks identified in the risk register,
  - at major milestones.

# How is the government performing in developing and maintaining schedules?

	BP 1 All effort	BP 2 Logic	BP 3 Resources	BP 4 Durations	BP 5 Traceable	BP 6 Critical Path	BP 7 Float	BP 8 Risk	BP 9 Statusing
Veterans Affairs (VA)	Fully Met	Fully Met	Fully Met	Fully Met	Fully Met	Fully Met	Fully Met	Not Met	Fully Met
DOT	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Not Met	Partially
DOD	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Partially
Missile Defense (MDA)	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Partially
DHS	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Not Met	Not Met
DOE	Fully Met	Partially	Partially	Fully Met	Fully Met	Fully Met	Partially	Partially	Fully Met
NASA	Fully Met	Partially	Not Met	Partially	Partially	Fully Met	Partially	Not Met	Fully Met

Fully Met	Substantially	Partially	Minimally	Not Met
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Results reflect agencies and departments with three or more GAO schedule assessments

## GAO's high-level findings on schedule assessments

In general, government program offices fail to

- Include all effort in the IMS for the entire program or provide traceability of activities to the statement of work
- Set a schedule baseline (or track against one)
- Properly sequence activities using correct logic to ensure the schedule is dynamically networked (e.g., missing relationships and dangling activities)
- Use constraints and lags moderately to force activities to occur on predetermined dates
- Document their justification
- Include activities of long duration that are difficult to objectively status and manage
- Perform schedule risk analysis

Further, government program offices

- Appreciate the concept of a critical path but not the consequences of unrealistic float
- Assume unlimited resources by failing to resource load their schedules
- Do not consistently update schedules or record a status/data date
- Miss distinct start and finish milestones.

## Additional schedule assessment findings

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- Contractor schedules are usually more reliable than government program office schedules
    - Many contract deliverables require an integrated network schedule
    - Government program offices typically have a 1-page IMS developed in PowerPoint
  - Program offices resource-load schedules only at the prime and subcontractor levels, believing that resource loading a schedule is overkill
  - Government program office IMSs usually fail to span an entire program, regardless of how many increments, steps, blocks, contracts, or milestones the program is divided into
  - Activity names in government programs tend to be too general, causing problems when filtering the schedule to look for missing logic or status issues
  - Schedules are not created by the critical path method and therefore cannot be
    - Used to conduct schedule risk analysis
    - Relied on by management to evaluate progress and make decisions
  - Schedulers -- rather than the program manager -- are too often held responsible for updating and managing schedules.
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# **GAO Report on the Joint Strike Fighter**

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**Recent Decisions by DOD Add to Program  
Risks  
(Report # GAO-08-388)**

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## JSF Congressional Request

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- Under congressional mandate, GAO has annually reviewed the JSF program since 2005.
- JSF is DOD's most complex and ambitious aircraft acquisition
  - It will simultaneously produce and field three aircraft variants for the Air Force, Navy, and Marine Corps as well as 8 international partners
  - JSF will cost almost \$1 trillion dollars
    - \$300B to acquire 2,458 aircraft and \$650B to operate and support
- In response to the annual mandate, GAO
  - Determined the JSF program's progress in meeting cost, schedule, and performance goals
  - Assessed plans and risks in development and test activities
  - Evaluated the JSF program office cost estimating methodology, and
  - Identified future challenges for the program

## JSF GAO Findings

- JSF total acquisition cost estimate increased by more than \$23B since our report in March 2007
  - Increases due to rising procurement costs
  - Development costs did not increase
    - Instead requirements were reduced, funding for the alternate engine was cut, and management reserves were used to cover cost variances
    - Rather than request additional funds for development, the program office opted to reduce test resources to replenish \$600M in management reserves

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## JSF GAO Findings (cont'd)

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- We found the \$299.8B acquisition cost estimate for JSF to be unreliable when judged against our best practices.
- Specifically we determined that the cost estimate was not sufficiently:
  - Comprehensive
  - Accurate
  - Well documented, or
  - Credible
- As a result, we reported that JSF program costs will likely increase and the schedule will worsen
  - Development will most likely need to be extended and initial testing and evaluation and full-rate production delayed
  - A major program restructure seems inevitable

# JSF Cost Estimate is not Comprehensive or Accurate

- The JSF development cost estimate is not comprehensive because it excluded several costs totaling more than \$10B:
  - \$6.8B for the alternate engine program,
  - \$1.5B of military construction for specific basing needs for JSF fleet,
  - \$2.1B for additional tooling costs through 2015,
  - Potentially billions of dollars in deferred development capabilities
- The cost estimate is not accurate because it is based on optimistic assumptions
  - Weight growth, staffing head counts, commonality savings for cousin parts, and outsourced labor rate savings were too optimistic when compared to similar programs
    - JSF will be even more complex than the F-22A and F/A-18 E/F
      - JSF will develop and produce 3 variants running on 3 different engines (cruise, alternate, and lift)
      - Multiple customer needs with the US forces and internationally
      - Two to four times the amount of operational flight software than legacy aircraft
    - As a result, JSF may not merit assumptions that are even as optimistic as existing historical data due to its substantial complexity

## JSF Cost Estimate is not Accurate or Well Documented

- Program cost estimators relied on Lockheed Martin's unreliable EVM data to create the JSF development cost estimate
  - DCMA identified the EVM data as being of very poor quality and not useful for managing program risks
    - The contractor was using management reserve funds to alter its own and subcontractor performance levels and cost overruns
      - This invalidated key cost and schedule performance metrics needed to accurately estimate costs at completion
      - It also had the effect of underreporting costs
- The JSF cost estimate is not well documented because the cost model is highly complex and the level of documentation is not sufficient for someone unfamiliar with the program to easily recreate it
  - No formal documentation exists for the development, production, and operations and support cost models
    - Instead the program office has briefing slides that describe the methodology and data sources used, but they do not provide detailed documentation such as quantitative analysis to support assumptions used to create the estimate
      - For development, there is no cost model to update with actual costs
      - JSF cost estimators stated they rely on the EVM data but provided no documentation to back up this claim

# JSF Cost Estimate is not Credible

- Several independent organizations reviewed JSF and predicted much higher costs than the program office

Assessing organization	Impact on cost	Impact on schedule
CAIG	\$5.1 billion more for development, over \$33 billion more for procurement	12 months slip
NAVAIR	\$8 billion to \$13 billion additional development costs or trade-offs adding to cost in procurement	19-27 months slip
DCMA	\$4.9 billion additional cost to complete Lockheed Martin contract, including the cost of a 12-month schedule slip	Up to 12 months slip

Source: CAIG, NAVAIR, DCMA.

- The CAIG’s estimate was higher based on less engineers available to support the program resulting in the schedule shifting to the right
  - The program office assumed that it could get the same effort accomplished with fewer people
- NAVAIR’s cost estimate is based on removing artificial constraints on the JSF schedule and projected forward combining the additional cost with trends in current cost performance
- DCMA’s cost estimate is based on poor cost and schedule performance to date and assuming schedule slips of up to 12 months

## JSF Cost Estimate is not Credible (cont'd)

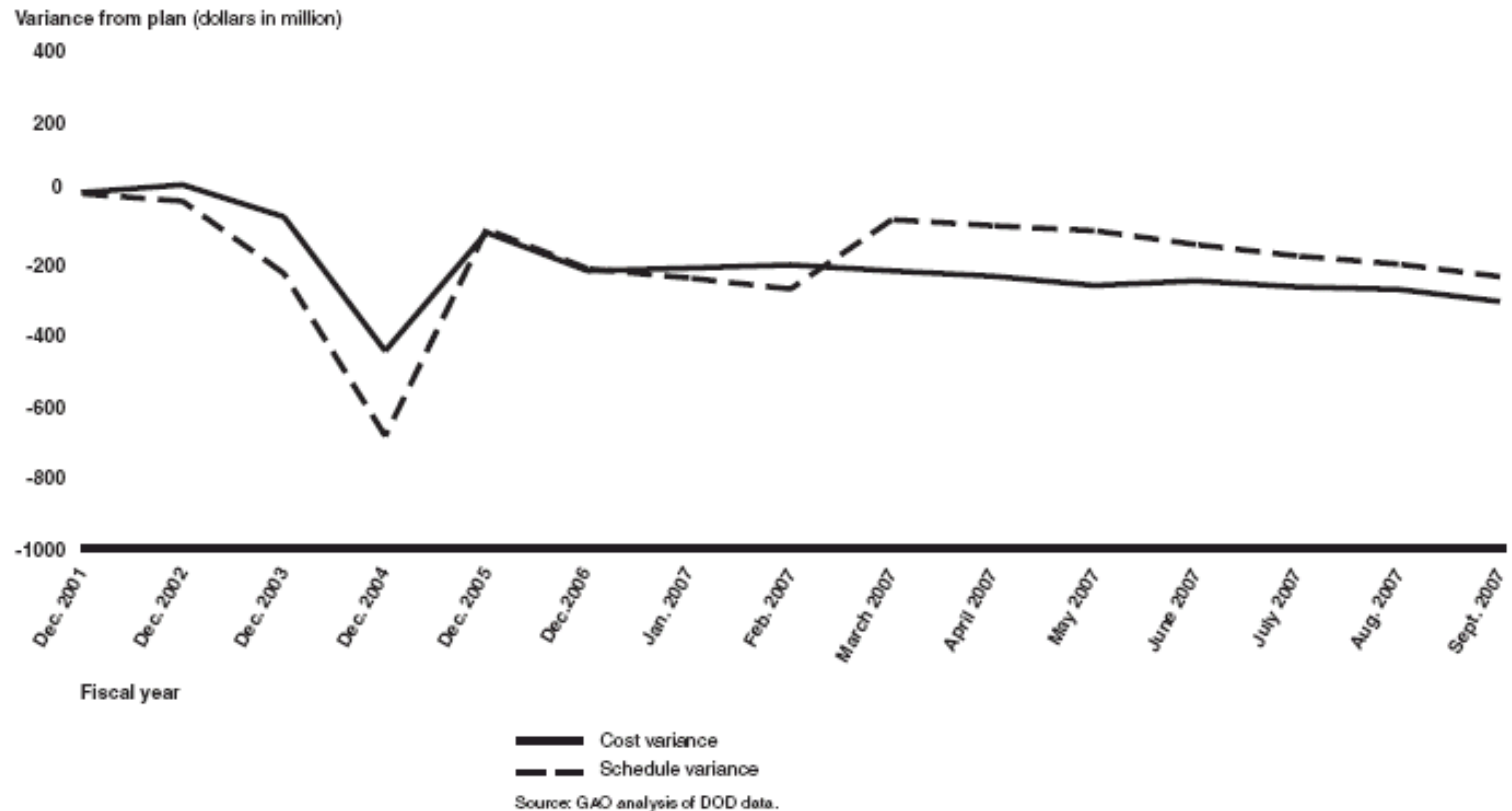
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- In 2001, Lockheed Martin agreed to develop JSF for \$16.5B (excluding fee)
- In April 2005, the development program was rebaselined
  - More than \$6B was added to account for weight growth issues in 2003
  - This raised the JSF development contract cost estimate to \$23.2B (excluding fee)
- Despite additional funding to cover preexisting cost and schedule overruns, Lockheed Martin's development cost and schedule has continued to decline over time
  - As of September 2007, Lockheed Martin was reporting cumulative cost overruns of \$305.7M and was behind schedule by almost \$251.3M.



# JSF Cost Estimate is not Credible (cont'd)

## JSF Development Contract Cost and Schedule Variances



## JSF Cost Estimate is not Credible (cont'd)

The program office has not conducted an uncertainty analysis on its cost estimate despite the complexity of the program and associated risk and uncertainty

- JSF is significantly more complicated than comparable aircraft development programs

Complexity factor	F/A-18E/F	F/A-22	JSF
Program participation by multiple military services	No	No	Yes
Aircraft variants	One	One	Three
Avionics	Off-the-shelf	New	New
Stealth	Minimal	Yes	Yes
Software (operational flight program source lines of code)	1.1 million	2.2 million	5.0 million <sup>a</sup>
Engine(s)	One	One	Two cruise, one lift
International participation	No	No	Yes

Source: CAIG

<sup>a</sup>This assumes approximately 30 percent growth in lines of code by completion of development (F-22 included 34 percent growth and F/A-18, 60 percent growth).

This complexity makes it all the more necessary to fully account for the effects various risks can have on the overall cost estimate

- Instead the program office offers only a single point estimate with no associated range and offer no technical analysis of the likelihood that this estimate is credible

## JSF GAO Recommendations

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GAO made recommendations to the Secretary of Defense:

- The JSF program office should update its cost estimate using best practices so that the estimate is comprehensive, accurate, well documented and credible. Specifically, the JSF program office should:
  - Include costs that were inappropriately omitted from the estimate
  - Identify performance requirements that have been traded off in development
  - Fully document assumptions, data sources, and methodologies in the cost model, and
  - Perform a risk and uncertainty analysis to focus on key cost drivers and reduce the risk of cost overruns.
- Conduct a full Schedule Risk Analysis to ensure that its schedules are fully understood, manageable, and executable
- Conduct a full independent cost estimate according to the highest standards of any DOD cost estimating organization, based on a comprehensive review of program data
  - Have this estimate reviewed by a third party such as the CAIG and briefed to all interested parties in DOD and Congress

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## JSF DOD Response

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DOD substantially agreed with our recommendations and indicated that it will implement all elements except the risk and uncertainty analysis which it felt was unwarranted.

- We believe that a risk and uncertainty analysis is an important tool that establishes a confidence interval for a range of possible costs.
- This information would facilitate good management decisions and oversight more so than a single point estimate ever could.

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## Invitation to Participate in Further Updates and Discussion about Best Practices

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- GAO invites interested parties to meet with us and other experts to discuss further updates to the Cost and Schedule Guides so that they continually reflect best practices
  - If interested, please e-mail your contact info to:
    - Karen Richey: [richeyk@gao.gov](mailto:richeyk@gao.gov)