



Capabilities-Based Assessment (CBA) User's Guide

Version 2

**Force Structure, Resources, and Assessments Directorate
(JCS J-8)**

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Foreword

The Joint Capabilities Integration and Development System (JCIDS) was established in 2003 to overcome several shortcomings in the existing requirements process. While much has been published on *administering* JCIDS, there was a lack of written advice on how to assess the DOD's needs and recommend solutions in terms of operational capabilities.

The initial version of this paper (January 2006) was the first document to offer practical advice on how to conduct such an assessment. Since that version was released, the instructions and manuals governing JCIDS have been revised, and the DOD has done many more Capabilities-Based Assessments (CBAs). This update addresses both the regulatory changes and what we have learned about doing these analyses.

This document does three things: first, it advises an action officer on how to organize and execute a CBA; second, it connects the CBA process to both the overarching strategic guidance and the proven analytical methods available in the DOD; and third, it is readable. As a result, this paper discusses bureaucratic realities that would not be addressed in an instruction, points out the occasional area where strategic guidance is immature, inconsistent, or conflicting, and uses an informal style aimed at engaging the reader.

This guide will provide you with a great deal of advice on how to assemble an assessment that meets the aims of JCIDS. While the guide is not directive or prescriptive, it captures important lessons from the CBAs conducted to date, and discusses the techniques and practices that have worked. Doing a good CBA is difficult, and this guide will not change that. But, a CBA should not be mystifying, and this paper is aimed at demystifying the inputs, best practices, and desired outcomes of such an assessment.

An electronic version of this guide is available on the unclassified J-7 Joint Experimentation, Concept Development, and Training web site (<http://www.dtic.mil/futurejointwarfare/>), as well as the Joint Requirement Oversight Council's classified Knowledge Management and Development System (<https://jrockmids1.js.smil.mil/guestjrcz/gbase.guesthome>).

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1. What Is a Capabilities-Based Assessment?

On 20 October 2003, the Joint Requirements Oversight Council (JROC) issued a memorandum on a recently completed study of forcible entry operations. This memorandum directed that

“...The Director, J-8, Joint Staff, in coordination with the Commander, US Joint Forces Command, and the Services, develop a Forcible Entry Joint Operating Concept (JOC) by 31 December 2003.

...The Director, J-8, Joint Staff, in coordination with the Services, use the JOC-derived tasks to conduct a capabilities-based assessment by 30 September 2004.” [JROCM 199-03, 2003]

Suppose that this memo made its way to your desk, with a handwritten note telling you that you would lead the assessment. Your first thought might be one of self-satisfaction, since the four-star generals and admirals charged with determining the needs of the DOD have chosen *you* to lead an analysis of a critical mission area.

More likely, however, your first thoughts would be:

1. What’s the background?
2. What’s the issue? What’s the *real* issue?
3. What’s a capabilities-based assessment?
4. How am I going to do this?

Uncovering the answers to the first two questions is necessary for *any* staff action, and we will reinforce the importance of knowing the answers to these questions. But, the thrust of this paper is to help you answer the last two questions.

You may think that Question 3 should be easy, and there is a short, authoritative answer available. CJCSI 3170.01F, *Joint Capabilities Integration and Development System* (JCIDS), states that

The CBA is the JCIDS analysis process that includes three phases: the FAA [functional area analysis], the FNA [functional needs analysis], and the FSA [functional solutions analysis]. The results of the CBA are used to develop a JCD (based on the FAA and FNA) or ICD (based on the full analysis). [2006, p. GL-5]

Unfortunately, this definition introduces three types of analyses and two output documents that you’ve never heard of, all of which appear to be couched in terms of an unstated set of capabilities. The short answer isn’t really an answer; it just generates $3 + 2 + 1 = 6$ *more* questions.

So yes, there is a compact answer to the question “what is a CBA?” But *understanding* what a CBA is requires a bit more discussion.

1.1. Origins and Intent of JCIDS

The first step in comprehending a CBA is learning why we have something called JCIDS. Prior to 2002, the DOD had a requirements process to determine needs, which was operated by the Joint Staff and featured the JROC as the highest-level decision body.

But, there was widespread dissatisfaction with this process, as evidenced by the memo issued by the Secretary of Defense shown in Figure 1.

March 18, 2002 7:17 AM

TO: Gen. Pace
CC: Paul Wolfowitz
Gen. Myers
Steve Cambone
FROM: Donald Rumsfeld
SUBJECT: Requirements System

As Chairman of the JROC, please think through what we all need to do, individually or collectively, to get the requirements system fixed.

It is pretty clear it is broken, and it is so powerful and inexorable that it invariably continues to require things that ought not to be required, and does not require things that need to be required.

Please screw your head into that, and let's have four or five of us meet and talk about it.

Thanks.

Figure 1. Memo from the Secretary of Defense that began JCIDS.

Predictably, a considerable amount of activity followed (led by the decision to banish the word “requirement” from the new process). This effort resulted in three principles that form the foundation of JCIDS:

- **Describing needs in terms of capabilities, instead of systems or force elements.** One of the major frustrations of the previous requirements processes was that solutions were introduced to the system without any higher-level rationalization. The intent was to replace statements such as “we need a more advanced fighter,” with “we need the capability to defeat enemy air defenses.” The latter statement provides the rationalization for needs, and also allows for competition among solutions.
- **Deriving needs from a joint perspective, from a new set of joint concepts.** The JCIDS architects recognized that a new set of documents would be necessary to link strategic ends to warfighting means. Furthermore, these documents would have to go beyond doctrine, which are beliefs about the best way to do things with existing resources. The joint concepts would have to challenge existing approaches and provide impetus for improvement. Also, these documents would broaden the strategic view and force the DOD to consider the needs of a variety of military problems, not just one or two canonical conflicts.
- **Having a single general or flag officer oversee each DOD functional portfolio.** One problem with the existing requirements process was that no one organization had responsibility for knowing what DOD was doing in, say, command-and-control systems. As a result, senior DOD decision makers became involved only after an unacceptably small set of options were defined. In JCIDS, each Functional Capability Board (FCB) is directed by a general or flag officer who has that responsibility.

By the summer of 2003, JCIDS was up and operating. The FCBs began functioning, and the production of joint concept documents began.

We do not claim that this transition has been straightforward or painless. CJCSI 3170.01, the governing instruction for JCIDS, has been revised six times in its first three years. Also, debate continues on what exactly a capabilities-based approach is, what task structures should be used,

the role of future planning scenarios and current operations plans, and the exact relationship between JCIDS and the formal DOD acquisition system.

One early principle that has not survived is the idea of mandating integrated architectures as the sole basis for capabilities assessments. Early JCIDS work asserted that the emergent DOD Architecture Framework (DODAF) [DODAF Working Group, 2004] should be the basis for functional assessments, interoperability assessments, and assessment of mission areas. The DODAF, which provides a variety of systems engineering tools, was originally oriented towards command, control, and communication interoperability. It was later expanded to portray a variety of military functions, and JCIDS originally featured architectures as a central mechanism.

Architectures are useful (and probably essential) once you have decided *what* to do, as they provide a framework to help determine *how* to do it. JCIDS capability assessments, however, tend to be concerned more with *what* to do, and a DOD study concluded in July 2004 that architecture development was more appropriate *after* a JCIDS assessment was complete [J-8, 2004]. It is true that architecture production is still a fundamental principle of JCIDS, and many key JCIDS documents must contain certain DODAF products. Nonetheless, producing architectures is not a requirement for a CBA.

More recently, JCIDS implemented a lexicon for capabilities. This lexicon, called the Joint Capabilities Areas (JCAs) [J-8, 2005], divides joint operations into a hierarchy that is not tied to particular force elements or platforms. JCAs have been given high-level endorsement [Secretary of Defense, 2005] and are becoming common in JCIDS analyses.

JCIDS is both ambitious and evolving. Consequently, executing most JCIDS processes requires flexibility and creativity, because the DOD must continue to change to fully implement a system based on the principles listed above. Regardless, it is important for you to understand the aims of JCIDS. For further information on the motivations behind JCIDS, an excellent source is the *Joint Defense Capabilities Study Final Report* [Aldridge, et. al., 2003].

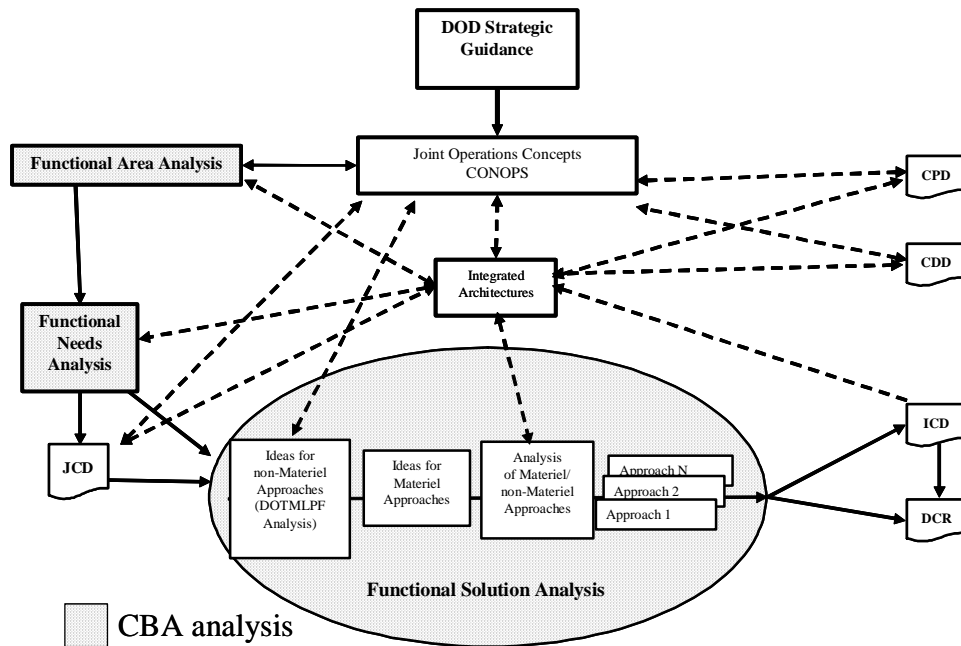


Figure 2. JCIDS analysis process.

1.2. Major Elements of a CBA

CJCSM 3170.01C, *Operation of the Joint Capabilities Integration and Development System* [2006, p. A-3], offers Figure 2 as the portrayal of a JCIDS CBA.

Although it is not obvious, this diagram contains the major elements of a CBA: the Functional Area Analysis (FAA), the Functional Needs Analysis (FNA), and the Functional Solutions Analysis (FSA).

Figure 3 reduces Figure 2 to the simplest depiction possible.

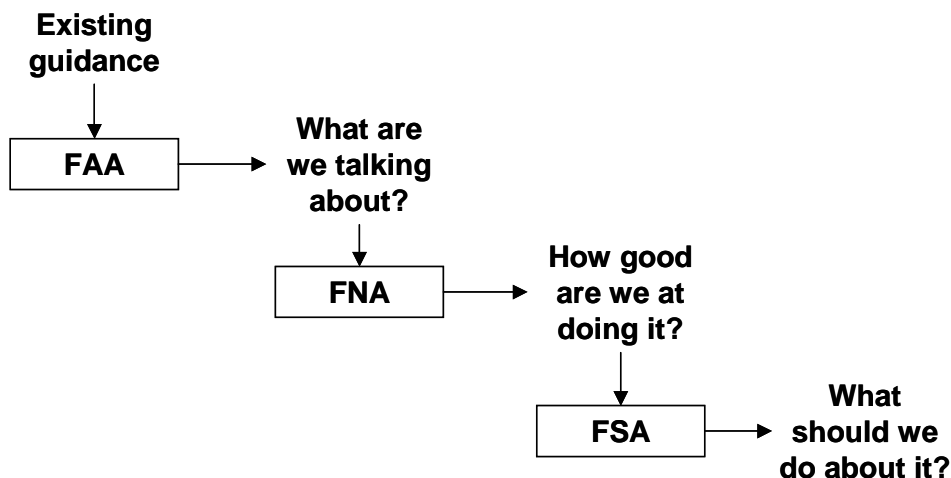


Figure 3. Simplified diagram of major CBA inputs, analyses, and outputs.

The FAA synthesizes existing guidance to specify the military problems to be studied. The FNA then examines that problem, assesses how well the DOD can address the problem given its current program, and recommends needs the DOD should address. The FSA takes this assessment as input, and generates recommendations for solutions to the needs.

Of course, these simplified inputs and outputs decompose into much more complicated sets of products, and the analyses themselves require much more examination. The point is, however, that a JCIDS CBA is not really different than any other analysis. It must specify the issues, estimate our current and projected abilities, and recommend actions.

Note that your CBA may not include an FSA. The current trend in JCIDS for jointly-initiated assessments is to do an FAA and an FNA, and then produce a “Joint Capabilities Document” (JCD), which is sent to the JROC. If the JROC opts to act on the needs identified in the assessment, they will assign a sponsor (typically a Service), to do one or more FSAs.

This also means that you may do a CBA which consists of nothing but an FSA. In these cases, you will have to rely on someone else’s FAA and FNA, to include repairing any defects and reacting to subsequent changes in guidance.

1.3. Types of CBAs

To conclude this introductory section, we offer a CBA taxonomy. CBAs commissioned under JCIDS cover a broad spectrum, and the type of CBA will significantly influence how you structure and conduct the assessment. This taxonomy is not outlined in any formal JCIDS

documents, but is a synthesis of what has been directed to date, and also reflects our experience with DOD mission area assessments. The types of CBAs in this taxonomy are:

- CBAs based on operational shortcomings we have already experienced;
- CBAs based on perceived future needs;
- CBAs to provide a unified look at a mission area;
- CBAs to provide joint examination of an operational concept proposed by a particular community;
- CBAs to provide a broad examination of a functional area; and
- CBAs to provide answers on extremely compressed timelines.

The reason we suggest this taxonomy is that the six different types have different implications for what the CBA must emphasize. For example, a CBA based on an actual operational failure will likely spend little (or no) time in the FAA, as the “what” has already been demonstrated.

Conversely, a CBA based on a perceived need, such as a study result, will still require considerable work in the FAA. The fact that the needs are forecast, and not demonstrated, indicates that there is still some question about the exact definition of the problem, its scope, or whether the stated problem really is a problem.

CBAs aimed at unified examinations of mission areas support a primary objective of JCIDS. If the mission area is not wholly within the province of a particular community (particularly a Service), then it is likely that either multiple communities are addressing the problems without much coordination, or no one is addressing it.

CBAs may also examine the utility of a proposed concept or solution. While this seems contrary to the fundamental principle of having needs come from top-down concepts, the fact is that good ideas can come from below, and may have much broader application than the originators thought. Seabasing, which potentially addresses a wide range of military problems, is the best current example of this type of CBA.

A CBA may be concerned with a broad look at a functional area. Again, this seems contrary; for example, the Joint Chiefs of Staff (JCS) Tank has commissioned a CBA on joint distribution, but JCIDS already has a Focused Logistics FCB whose entire mission is assessing joint logistics. The answer is that the CBA should take a crosscutting look at the function, to include assessing its affects on a variety of military problems. FAA scoping is very important in this type of CBA, because attempting to examine the impacts of one functional area on everything else is unmanageable.

Finally, this paper also discusses something called a “Quick Turn” CBA (Section 9). The functional taxonomy of CBAs we list above still applies to these types of CBAs. However, we discuss them separately because they normally must be executed in 30 to 60 days, and the tremendous time compression requires modifying the approaches we recommend for less frantic efforts.

2. Initial Preparation for a CBA

Your chain of command will probably know that a CBA is coming. For example, the JROC or the Joint Chiefs choose CBAs from a list of proposals gathered annually by JCS/J-7, so your leadership will have participated in the call for topics. The Combatant Commands and the Services have been very aggressive about proposing CBA topics, so the candidates will have been under consideration for several months.

However, a CBA may be commissioned by another source such as a Combatant Command (COCOM) or a Service. So, you may not get all the warning time you would like and you may be tempted to skip some of the advice we offer below on initial preparations. You will be under some pressure, as organizations campaign aggressively to lead JCIDS CBAs, and your management likely expended considerable political capital to put your organization in charge. So, your bosses will want you to move out rapidly and get on with the analyses.

Be warned, though: you will do all the things listed below eventually, and doing them later in the process will be *very* painful.

2.1. Do You Know Why You're Doing this CBA?

This is a fundamental question, and the answer is *not* “the 4-stars said to do it.” You will not receive a formal description of what you are supposed to do, or why; the forcible entry example cited in Section 1 is as probably as much as you will get. The typical CBA tasking memo makes a five-paragraph order look like a textbook.

You will have to discover who wanted this assessment done, what motivated them to be concerned about it, and why this particular CBA topic prevailed. If you are lucky, your chain of command will tell you. If not, you will have to find out.

Learning the answers to these questions is not just a Machiavellian journey to collect gossip about high-level DOD conversations. It is essential that you know as much as possible about why this CBA is of concern and what the people who commissioned the work are expecting. Our experience has been that the results of these efforts can differ substantially from what the decision makers expected to see. Now, there is nothing wrong with that; confirming or denying notions about military problems is precisely why we conduct studies.

Politics, however, are inescapable. JCIDS CBAs inevitably raise questions that challenge major programs, major concepts, and even core Service competencies. Questions such as these generate resistance, and you must be able to deal with this resistance if you expect to do a decent assessment. We cannot overemphasize the value of knowing *who* championed your CBA topic, *what* caused them to promote it, and *why* (as well as who opposed its selection, and why). You will see these people again!

Furthermore, JCIDS CBAs (other than the Quick Look variety) are time-consuming. None of the JROC-commissioned CBAs done to date have been able to finish in less than 11 months. During that time, the major decision makers in the JROC will inevitably change, and the strategic environment may change as well. At least one of the new players will ask you for the history, and not being able to provide it will be a failure.

2.2. The Relationship of Joint Concepts

Recall that one of the fundamental principles of JCIDS is the determination of needs from a set of joint concepts. To support that principle, the Joint Staff formalized the production of these concept documents at the same time JCIDS was designed. Although some of these documents

are written by FCBs, producing joint concepts is *not* a JCIDS function; it is a separate process, managed by JCS/J-7 and US Joint Forces Command/J-9.

Consequently, this paper will not describe joint concepts and their production in detail. Nonetheless, you will have to be familiar with the applicable joint concepts, particularly one called the Joint Integrating Concept (JIC). To date, all JROC-directed CBAs have been accompanied by a JIC, which was tasked at the same time as the CBA (in the case of the forcible entry example in Section 1, the document at that time was called a JOC). So the JIC has fundamental relationship to a CBA.

But what exactly is a JIC?

Recall that doctrine is a statement of beliefs about the best way to do something with the resources we currently have. Joint concepts, however, are ideas about how something *might* be done with resources we may not have yet. The Chairman of the Joint Chiefs of Staff (CJCS) issued a series of “Joint Vision” documents through the 1990’s as a means to drive progress in the DOD; joint concepts documents have now assumed that role.

So, a JIC is a statement of how something might be done; in particular, it states how we would *like* to do that thing in the future. Furthermore, the JIC is the lowest level of a *family* of concept documents collectively called the Joint Operations Concepts. These are shown in Figure 4.

So, the “integration” the JIC performs is to use a set of general operational and functional concepts to produce a description of how some *specific* operation or function might be done in the future.

This may lead you to believe that the JIC that comes with your CBA will contain complete guidance, and your job will be reduced to executing the quantitative assessment. After all, CJCSI 3010.02B, *Joint Operations Concepts*, says:

JICs are narrowly scoped to identify, describe and apply specific capabilities, decomposing them into the fundamental tasks, conditions, and standards required to conduct a CBA ... Additionally, a JIC contains an illustrative vignette to facilitate understanding of the concept. [2005, p. A-3]

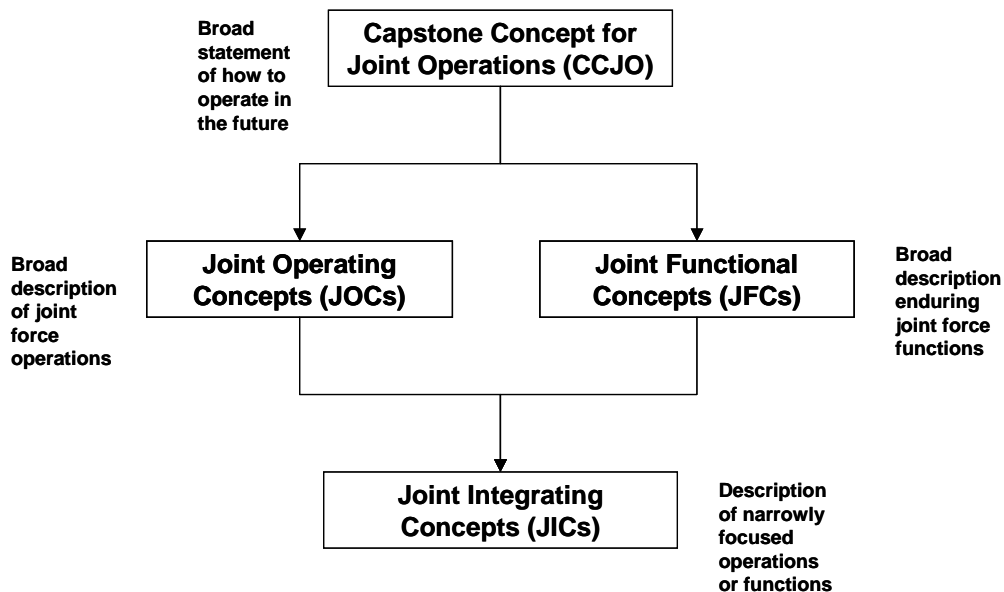


Figure 4. Documents comprising the Joint Operations Concepts.

Unfortunately, this has not been the case. The first set of JICs (Global Strike, Joint Logistics Distribution, Joint Command and Control, Seabasing, Integrated Air and Missile Defense, Joint Undersea Superiority, and Joint Forcible Entry Operations) range from immensely detailed lists of necessary tasks to Clausewitzian discussions of military operations, and nearly everything in between.

We are not disparaging the authors of the current set of JICs. On the contrary, it is *extraordinarily* difficult to write something that induces progress without making the document either fanciful or vacuous. Formal joint concept development was established at the same time as JCIDS, and has been subject to the same growing pains.

The most honest advice we can give you is that first, you should participate in (or at least follow) the development of the JIC, and second, you must respect what the JIC says in the execution of your assessment. But, the JIC will *not* be a statement of work for your CBA. The concept development staffing process will ensure that the JIC contains at least the elements cited above, but you will have to sharpen *and* augment the JIC to conduct your analysis.

You may find yourself doing a CBA that does not have a JIC. In this case, you will have to provide what the JIC provides, particularly the statement of the military problem and the specific operation or function being considered. Since a JIC does not exist, you will likely have to come up with justification from some strategic guidance document (see Section 2.3) that describes the operation or function and the need to examine it. You can fill in the other elements that a JIC would contain in the course of doing your FAA.

2.3. Identifying Relevant Strategic Guidance

The Joint Concept documents are tied to an even broader chain of strategic documents, which are illustrated in Figure 5.

The **National Security Strategy (NSS)** is a document required by law after a Presidential election, and is signed by the President. While the NSS is the foundation document for national security, it will likely not contain advice directly applicable to your CBA.

The **National Defense Strategy**, however, is signed by the Secretary of Defense and does contain information relevant to your CBA. The current Defense Strategy contains substantial guidance on security challenges, key operational capabilities, and operational priorities, all of which will influence your analyses. The **National Military Strategy (NMS)** is signed by the CJCS and provides operational context to the Defense Strategy, and the joint concepts add detail to both the Defense Strategy and the NMS.

There are several other Secretary of Defense-level documents that may impact your CBA. The first two are operational documents called the **Unified Command Plan (UCP)** and the **Contingency Planning Guidance (CPG)**. As opposed to the documents listed so far, the CPG is classified.

The UCP provides basic guidance to the Combatant Commanders. It defines their roles, missions, geographic responsibilities, and functional responsibilities, and also establishes command relationships. The reason the UCP is relevant (or even central) to your CBA is that the mission or function you are assessing will be executed by a COCOM, and the UCP will provide advice on which combatant commands must be able to execute that mission or function. The UCP may also implicitly define the mission or function and set standards for its execution, making it a potentially important source of guidance.

The CPG is signed by the Secretary of Defense and is approved by the President, and establishes strategic priorities and directs the combatant commanders to prepare certain

contingency plans. It is not a well-known document, and many members of the DOD have never heard of it. Nonetheless, it is extremely important, because it defines the current challenges that the DOD must plan for, and gives advice on priorities.

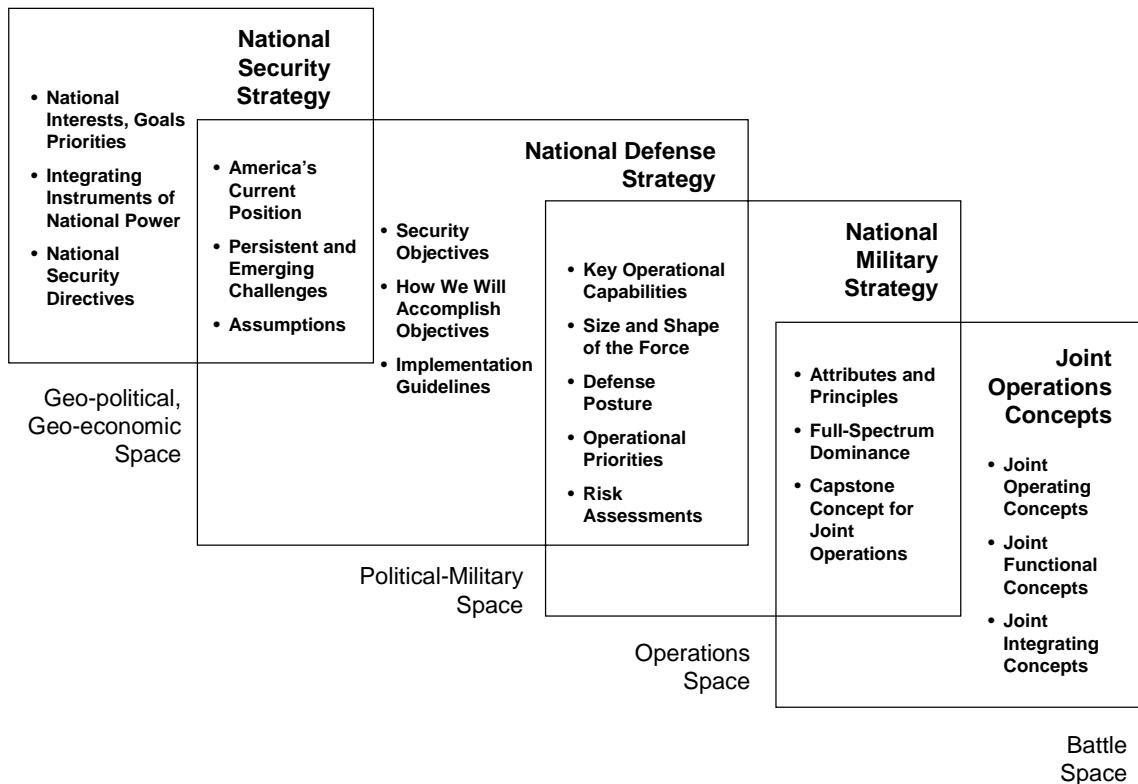


Figure 5. Relationships of Key Strategic Documents.

While the UCP and CPG are purely operational documents, the **Strategic Planning Guidance (SPG)** provides the bridge between the Defense Strategy and the planning, programming, and budgeting world. The SPG is a classified document signed by the Secretary of Defense, and gives overarching direction on strategic and budget priorities. In particular, the SPG (which is published biennially) is a central source for guidance on where the DOD should reduce risk or accept risk.

The SPG leads what is now known as the Enhanced Planning Process, which results in a set of documents known as the **Joint Programming Guidance (JPG)**. The JPGs provides guidance to the military departments and defense agencies on building their program proposals, and may contain specific program information that will be useful for your assessment.

Another bridging document is the **Transformation Planning Guidance (TPG)**. The first TPG was signed by the Secretary of Defense in April 2003, and was designed to reinforce the current Administration's interest in substantially changing the direction of DOD. As with the joint concepts documents, it describes what the DOD might be and sets directions for change. In fact, the 2003 TPG directed the preparation of the family of joint concepts documents.

The final document that you should examine is the most recent published **Quadrennial Defense Review (QDR)** report. The QDR is mandated by law and requires the DOD to undertake a comprehensive examination of its strategy and performance. To date, QDRs have

been conducted in 1997, 2001, and 2005, and each of those reviews has resulted in substantial strategic and program changes. Many of the ideas that appear in the documents above first appeared in a QDR report; for example, the notion of a capabilities-based approach (which ultimately led to JCIDS) was first described in QDR 2001. Also note that a QDR report may substitute for that year's SPG or TPG.

You still may not be convinced that you need to study these documents for a CBA. If you are not, here's a short list of very compelling reasons to study them.

- **To find an organizing framework.** The mission or function you are assessing probably covers an enormous range of potential military operations. The documents above offer a number of organizing frameworks (particularly the security environment framework in the Defense Strategy) that will help you make your assessment manageable.
- **To identify overarching priorities.** The SPG in particular has been quite aggressive in specifying areas where the DOD should improve, and areas where the DOD can take risk. If these documents offer such advice on areas related to your CBA, you should use them.
- **To help set performance standards.** A central issue you will have to settle in your CBA is setting the criteria for the assessment of how well DOD does (or should) perform a mission or task. These documents contain authoritative advice on such criteria, such as friendly losses and collateral damage.
- **To secure unchallengeable guidance.** You will face a number of serious bureaucratic challenges when conducting your CBA – that is inevitable. If your position is supported by a document signed by the Secretary of Defense, you greatly increase your odds of winning the argument.

2.4. Identifying Strategic Analysis Guidance: the DOD Analytic Agenda

A CBA is a strategic analysis, because it examines the effectiveness and sufficiency of current and planned forces. It turns out that DOD has a policy for such analyses:

The Department shall institute a comprehensive and systematic process to provide data for strategic analyses, using approved scenarios and ensuring that data are available, easily accessible, integrated, [and] pedigreed ... The Department will develop, in a joint, transparent, and collaborative manner, appropriate, up-to-date, traceable, and integrated baselines [packages consisting of a scenario, concepts of operation, and integrated data] suitable for strategic analyses [DODD 8620.1, 2002, P. 3].

The processes that this directive mandates are collectively known as the DOD Analytic Agenda, and are overseen by an organization called the Joint Analytic Data Management Steering Committee (JADMSC). This committee has representatives from all parts of OSD, the Services, the DIA, and the Joint Staff, and has the job of scenario, baseline, and data production.

Knowledge of available scenarios, baseline, and data is very important to your CBA, so you need to know what the suite of Analytic Agenda scenarios contains and how to get them. Much of the information is catalogued by Joint Data Support (JDS), an OSD organization that maintains a repository accessible via the SIPRNET (<https://jds.pae.osd.smil.mil>). You should also find out your organization's contact with the JADMSC, as this will provide you a way to find out the current state of scenario and data availability. The Analytic Agenda's scenario production schedule is heavily influenced by guidance in the SPG, so scenario analyses (usually called analytic baselines) produced by the Analytic Agenda will probably be an important source for your CBA.

2.5. Collecting Relevant Analyses

This step begins with a literature search. If your area is important enough for senior leaders to commission a CBA, then it is almost certain that several major studies have been conducted on the topic. For example, both the Joint Forcible Entry Operations and Joint Undersea Superiority CBAs were directed as an outcome of prior DOD studies.

If you have done what we suggest in Section 2.1, you will already know which studies, if any, convinced the JCS to begin your CBA. Those studies, if properly documented, will reference other studies, and you will soon build up a large library.

One important source is the reports issued by the Defense Science Board (DSB). These reports are readily available on the Internet (<http://www.acq.osd.mil/dsb/>), and the DSB will have likely considered some portions of your topic in the last several years. DSB reports are prepared by national experts at the very highest levels of their fields, and have considerable influence.

Study the available joint doctrine on your CBA topic. Doctrine is the statement of how we do things now, and you will have to thoroughly understand our current approaches to assess where we are.

Another important set of documents to study are the Combatant Commanders' integrated priority lists (IPLs). The Combatant Commanders use IPLs as their primary means to communicate their near-term operational needs and priorities to the planning and programming community, and result from considerable analysis done by COCOM staffs. You will probably find several IPLs related to your CBA.

You should also collect op-ed articles written in the defense literature about your topic. You might think that articles that appear in places such as *Defense News*, *Armed Forces Journal*, and *Foreign Affairs* aren't relevant to your assessment, but they actually are. For one thing, they are good indicators of the range of debate about your CBA topic. Do the commentators think we need more? That we have too much? That our current plans make no sense? Also, such articles are written and edited by professional authors, and communicate the arguments much more effectively than a typical DOD study report.

A substantial challenge that you will face in this era of stripped-down PowerPoint presentations is that many important efforts are *not* documented properly. As a result, you may uncover only a very thin, 3-bullets-per-slide decision brief with no accompanying notes. Such briefs are impossible to interpret unambiguously, so in these cases you must find the original authors and interview them about what they did.

2.6. Identifying Relevant Expertise

Interviewing these authors will also help you with a necessary step, which is identifying experts – *real* experts – that can help.

Doing a CBA well is a challenge. To date, the typical JCIDS CBA has been led by an O-5 action officer with no previous large-scale study experience. In addition, most of the study leads were on their first tour in a joint, Service, or COCOM staff. Yet, they were expected to perform a comprehensive analysis of a broad mission or functional area, provide defensible quantitative results, and function in an extremely contentious bureaucratic environment. So how did they do it? And how will you do it?

You will have to find expertise of the following types.

- **Adversary expertise:** who can credibly estimate the range of options open to an enemy?

- **Analytical ability:** who has the tools, techniques, and track record that can support my CBA?
- **Bureaucratic agility:** who knows how to navigate among all the competing interests safely?
- **Communications ability:** who can communicate the results with brevity, clarity, and believability to senior decision makers?
- **Cost estimation:** who can forecast the costs of the options of interest?
- **Doctrinal knowledge:** who can describe how we do these things now?
- **Study design:** who can build a study plan that satisfies the tasking, provides appropriate linkage to the strategy, and is executable in the time allotted?
- **Study management:** who knows how to organize and execute the CBA?
- **Technical knowledge:** who knows what technology options are realizable as CBA solutions?
- **Policy knowledge:** who knows what policy options are realizable as CBA solutions?

Too often, we believe that to do a successful CBA on, say, integrated air and missile defense, we just need to unearth a set of experts on air and missile defense doctrine, and the rest will take care of itself. Unfortunately, history has shown this to be untrue; you will need all ten of the types of expertise shown above, and you will not find all of them in one person.

Consequently, you need to explore the community and find out who is good at these things. If they are available, you should note that for the eventual composition of your study team. If not, you get advice from them on how to execute your assessment.

The difficult part of this job is finding out who is really good, as opposed to those who merely claim to be good. The answer is not earthshaking; as you would with, say, a home improvement project, you have to gather and check references.

This is where the literature search can come in very handy. If a study is deemed successful and induces the DOD to make a substantial move, then many things went right. So find out who made things go right. You can combine this search with your literature search, and you will end up with a list of both useful study products and real experts.

This approach also helps you avoid being overwhelmed with people who find out you are looking for help. Important studies attract many potential providers, but you cannot allow yourself to be consumed with unsolicited proposals in the preparation phase. You have to lead the search for expertise.

3. Organizing to Conduct a CBA

Organizing your CBA consists of two tasks: forming your team, and deciding how you will operate. As with all things in your CBA, you will get plenty of direction on both, but you will still have many decisions to make.

3.1. Study Team Composition

We suggest that you use the list of expertise areas in Section 2.6 to help determine whether you have all the help you will need. Figure 6 shows an example of a matrix you might use as you are building your team.

	Study director	Director's chain of command	Organization A	Organization B	Contractor A	Contractor B
Adversary expertise			X			
Analytic team					X	
Bureaucratic advisor		X				
Communicator	X					
Cost estimator			X		X	
Doctrinal Experts	Area 1			X		
	Area 2				X	
	...					X
Study designer				X		
Study organizer	X					
Policy experts			X			
Technical experts				X		X

Figure 6. Notional organization matrix for a CBA.

In addition to the types of expertise shown above, you'll have to designate someone to function as your deputy – essentially, someone who stands in when you are unavailable.

Within the expertise chart, there are many choices of providers. You may use some combination of:

- government personnel in your own organization;
- government personnel in other organizations;
- personnel on contract to your organization;
- personnel on contract to other organizations; and
- informal advisors who are neither in the government nor are on contract to the government.

We cannot give you a precise answer on whom to use as providers, because different CBAs require different mixes of skills. We can, however, offer some considerations.

First of all, government organizations can and are often redirected to other higher-priority tasks. If you have a commitment from a government organization to provide help for your CBA, then your chain of command will have to enforce it. And, since CBAs are often viewed as long-term efforts that can tolerate delays, redirections away from CBA work are common.

Also, recognize that your CBA will largely be an additional duty for anyone helping you in an external organization. The original JCIDS vision was that the JIC would divide the topic into functions, those functions would be passed to each owning FCB for assessment, and the results would be consolidated by the CBA lead. Unfortunately, the CBAs that have attempted this

method have found that it doesn't work very well. First, FCBs have a large routine workload, and second, these assessments aren't easily partitioned; they really have to be done by an integrated team.

Of course, you can use contractors. In this case, you have a formal contract, along with formal avenues for redress if the work is unsatisfactory. But, to use contractors, you will have to get funding, and allocate time to the competitive bidding process. Also, getting someone on contract tends to take at least 60 days. More importantly, you must also ensure that any for-profit contractors you use do not have a financial interest in the outcome of the analyses. CBAs result in findings that are acquisition-sensitive, as they prioritize needs and inform future budgets and investments.

Another option is to use Federally Funded Research and Development Centers (FFRDCs) or University Affiliated Research Centers (UARCs). These are not-for-profit organizations that have a special relationship with DOD, and you can hire them directly. Understand, though, that public law limits the amount of support FFRDCs can provide to DOD, so FFRDC man-years are formally allocated. If you have identified an FFRDC as a source of expertise you want to employ, you will have to get a man-year allocation.

You should try to get your core team together at the start. In several CBAs, certain elements of the study team were not brought into the CBA until considerable work was done, due to funding delays or the feeling that they weren't needed early on. This is an enormous mistake. If you want a team that functions well, they have to be in on the whole effort, from end to end.

As a final note, when we say "study team," we are talking about the *small, core* team that takes direction from you, and you alone, on what will be done and when. We are not referring to the larger working group that you will form to deal with Combatant Commands, Services, Defense Agencies, and other communities. Representatives from these groups will work with you, but they report to other chains of command and have a primary task of monitoring your effort for their organizations. This is not a pejorative distinction; these organizations have a right to know what you are doing, and working group members are a valuable source of input. But, they are *not* a part of your core team.

3.2. Internal Work Processes

Since CBAs are wide-ranging assessments, you, as the study director, will have to deal with a large group of people. But, you also have to deliver an assessment on time.

Consequently, you should try to organize your team so that the group that is putting out products is shielded from meetings. Indeed, the best organization is "front desk" group that works with external organizations, and a "back shop" team that produces analyses, written documents, and briefings. If you are constantly dragging your best analytical and doctrinal experts to what-are-you-guys-doing-and-how-might-that-affect-us sessions, your progress will suffer. Save yourself some trouble and find someone that can monitor the back shop team and answer questions in meetings.

Be careful, however, that you do not create a problem by walling off your back shop team from the outside world. They need to understand the entire landscape of the CBA, because the inputs and issues that you confront affect the content of the analyses.

The important characteristic of the core team is that you command it; it is not subject to any guidance other than yours. It should contain all the expertise shown in Figure 6, and it also must contain a person (other than you) who is the *internal team lead*. This person is the executive officer who runs the operation day in and day out while you deal with the outside world.

This team will accomplish the bulk of the work in the CBA. They will do all the fundamental analysis and all the integration, and will generate all the supporting information for your presentations. You will meet with them frequently, but remember that you are *commanding*, not *controlling*. Unless you are a quantitative or policy analyst yourself, it is likely that your core team is doing things that you are not trained to do. So resist the urge to tinker with them beyond obtaining what you need to know to coherently present their work. This team is your most valuable resource, so do not waste their time (e.g., don't make ten people come to your overcrowded workspaces twice a week when you could go to their offices once a week).

On the other hand, you have to give your team overarching direction. You have to ensure that they are helping you stay on track, that they are addressing the issues and not becoming too focused on a narrow set of scenarios or analytical tools, and that their work reflects external changes that you bring to them. You also have to ensure that they give you an accurate and usable set of project management options when you have to react to (inevitable) schedule or scope changes.

Finally, if your CBA is looking at issues at higher classification levels, you have to ensure at the outset that the critical members of this team either have or can get the appropriate clearances. Several CBAs have had significant problems with clearances, so much that they led to delays of up to *one year*.

3.3. External Work and Staffing Processes

This raises the question of how to work with the outside world. You may believe that the “collaborative analysis process” that so many DOD documents talk about is truly collaborative, and that anyone who shows up at your meetings has committed to your search for truth.

Unfortunately, most of these “collaborative” efforts are actually competitions in which the participants are playing by an unstated set of rules. CBAs ultimately result in advice on the allocation of resources, and *everyone* in DOD competes for resources.

You will have to conduct regular meetings with an external working group. This working group will consist of people who:

- are monitoring your CBA and reporting to their organizations if it appears the CBA supports or refutes any of their organizations' equities (enforcers);
- have been directed to slow down your CBA so that it doesn't interfere with initiatives being promoted by their organizations (saboteurs);
- are waging personal campaigns to cure certain areas they believe to be defective in DOD, and view your CBA as a means to those ends (zealots);
- give long philosophical speeches that may or may not make any sense, but prevent your meetings from accomplishing anything (bloviators);
- are attending your meetings because their organization has no idea what else to do with them (potted plants);
- are convinced that your assessment is a cover story for a secret plot to destroy their interests (conspiracy theorists);
- are attending your meetings to as a means to generate work for their organizations (war profiteers);
- have been directed to ensure that your CBA doesn't result in additional work for their organizations (evaders); and

- are forthright and competent individuals who want to get you relevant information and useful advice that will help you succeed (professionals).

In a perfect world, your working group would consist only of professionals. But it will not. Furthermore, you can't pick your working group; they are ambassadors chosen by their owning organizations, and they can only be replaced under extraordinary circumstances. So, what can you do?

- First, you and your core team should stay several weeks ahead of the working group. A CBA cannot be conducted as a journey of discovery in which you and a mixed crew (which may contain mutineers) *simultaneously* discover what is around the next bend of the river. You must plot the course.
- Second, you should provide read-aheads to your working group a respectable time prior to any meeting, set the meeting agenda and duration, and adhere to both with *no* exceptions. Furthermore, you should minimize the number of meetings, and work with individual organizations individually, on individual issues, as much as possible.

Another issue with working groups is that the comments of a working group participant, in general, do not represent his organization's formal position. So, for certain critical questions (large data calls, scenario selections, CONOPS solicitations) you will have to staff the questions *formally*. JCIDS CBAs are littered with cases in which the study lead thought he had concurrence, but was overturned later with a formal response. What you have to do is pick the critical requests for which you want ironclad responses, and ask for a formal organization position. If you are on the Joint Staff or are working within the FCB structure, the Joint Staff Action Package (JSAP) is the best mechanism for doing this.

You have to provide a mechanism for integration among the FCBs (or affected functional organizations if you are working on a Service or COCOM CBA). As we mentioned in Section 3.1, the original notion of partitioning the CBA among FCBs has not worked well. Nonetheless, you still need to know what is going on in those functional areas – after all, the FCBs are responsible for knowing the DOD portfolio in their functional area. Furthermore, the FCBs need a way to examine your analyses of their function as it relates to the CBA.

Probably the best way out of this dilemma is to have people on your core team who have relationships with the relevant FCBs and can accurately represent and analyze their capabilities. This doesn't create more work for the other FCBs, and provides the visibility they need.

Finally, you will also have to consider what sort of governance your CBA will have. If you are in a FCB working on a JROC-directed CBA, you will likely use FCB-JCB-JROC oversight procedures for staffing. There may, however, be different oversight groups that you must include, or you may be doing a CBA within a Service or Combatant Command. In that case, you must decide what your governance structure will look like.

Oversight is a tradeoff between getting and maintaining senior leader support and being over-managed. Consequently, you do not want to set up a huge structure. Most studies work quite well with a single working group and a general officer steering group; some add an additional integration group at the O-6 level. You should try to avoid having more than two levels of oversight above your external working group.

3.4. Information Exchange

A lot of people will want to subscribe to your CBA's progress. By far the most efficient way to do this is to maintain a classified website where you post all your briefings and key documents. All the CBAs currently in work maintain websites.

You may think it's a good idea to limit access to your site via passwords, but this really doesn't work; it just means that someone who wants your products has to be a bit cleverer about getting it. Site passwords do not prevent someone else from using the password, nor do they prevent redistribution. So don't bother. If you don't want something distributed, don't put it on the site.

3.5. Scheduling and Major Decision Points

It's time to start your CBA, so you will have to present a satisfactory plan to your chain of command to convince them that you're ready to get started. Figure 7 below shows both precedent relationships (tasks which must be done prior to starting another task) and the degree of overlap you can tolerate in the early phases of a CBA.

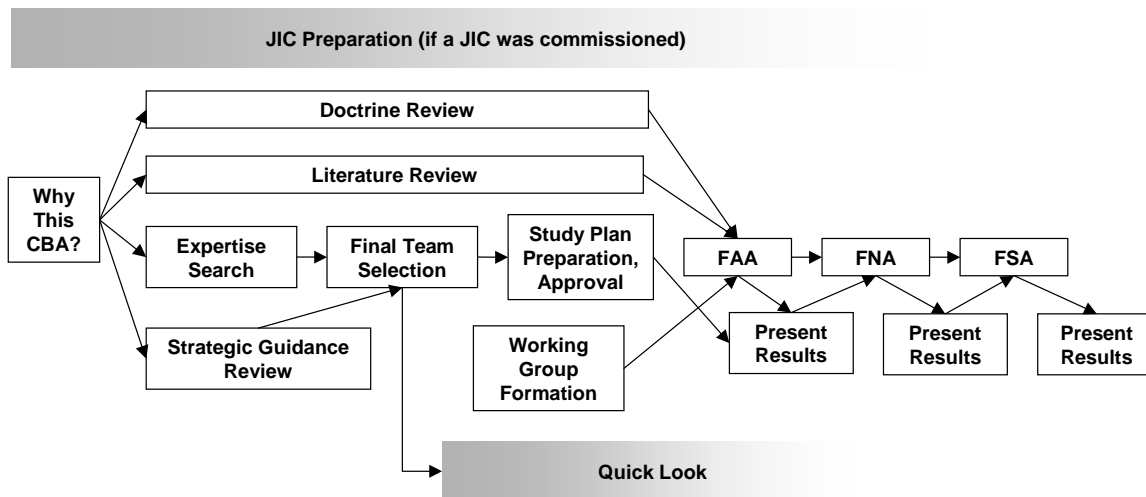


Figure 7. Task relationships and overlap for a CBA.

The precedent relationships in Figure 7 follow what we have discussed so far. Answering the question of why you are doing your particular CBA is the starting point, and we do not recommend that you proceed unless you have that answer. The strategic, doctrine, and literature reviews can all start in parallel with the expertise search, but you should finish the strategic review prior to filling out your core team. In keeping with the edict to stay ahead of your working group, you should have the study plan (including organization and working relationships) drafted prior to the first meeting of the working group.

Note that you will have to get some help early on if you want to try to do the various review tasks and search tasks in parallel. Hence, the task is to *complete* selection of the core team prior building a study plan and forming a working group.

You may have a CBA that depends on a JIC, but you may not be able to influence the progress of the JIC. Yet, experience has shown that you don't need to wait until the JIC is complete to do a substantial amount of work. Figure 7 shows how much can be done prior to final JIC approval. The other shaded process (the quick look) is a task limited to your core team, and will be discussed further in Chapter 5. For scheduling purposes, you should try to complete the quick look prior to the completion of the FAA.

Because of the wide range of CBA types and topics, it is difficult for us to recommend typical times that it should take to complete the tasks shown above. Also, some tasks may have already been completed. For example, the JIC writing team may have already summarized all the relevant doctrinal literature (and this would be another reason to participate in JIC development).

JCIDS specifies three formal decision points: the FAA, the FNA, and the FSA. So, you will staff results through JCIDS channels *at least* three times. In addition, if the JROC directed your CBA, then your study plan must be approved as well.

The other major decision points are concerned with requests that you want to staff formally, such as data calls, threat assessments, and so on. You will normally conduct these within an FAA, FNA, or FSA, so we will cover those in Chapters 6 - 8.

When CBAs were first established, the prevailing opinion was that they should take 90 days (30 days for each of the major analyses). Unfortunately, none of the JROC-directed CBAs done to date has even come close to finishing in 270 days.

Here are some reasons for this.

- **JIC delays.** The JIC is usually commissioned at the same time as the CBA, so the CBA can't really start until the JIC has least been drafted. In reality, several CBAs have completed the FAA and gone into the FNA before the JIC was finally approved (NOTE: if this happens, it is possible to execute the CBA and JIC simultaneously, but such an arrangement would have to be negotiated through the JROC, and your CBA will have to absorb the overhead of frequent communication with the JIC writers).
- **False starts.** Several CBAs were well down the road when they discovered that they either had an unmanageable scope, the wrong team, or the wrong methodology. Backtracking and fixing these problems caused considerable delay.
- **Staffing results through JCIDS.** Suppose that your CBA was JROC-directed. Then the CBA study plan, FAA, FNA, and FSA must be approved by the JROC. This means that each must be presented to the lead FCB, then the Joint Capabilities Board (JCB), and then to the JROC. If each of these takes a week to schedule and execute (including the inevitable prebriefs and resulting modifications), then you will spend *at least* $4 \times 3 \times 7 = 84$ calendar days just getting results presented and approved – and this does not include staffing. And, since each step determines the next step, it's risky to start the next step without approval of the previous step.
- **Command redirection.** CBAs tend to outlast the four-stars that commissioned them, and their replacements may direct (and have directed) substantial changes to the scope and emphasis of the assessment.
- **Clearance problems.** As mentioned in Section 3.2, several CBAs have had significant delays because of difficulties getting clearances for study team members.

Regrettably, presenting results for approval will take far more time than you ever thought. As a result, you have to schedule so that your team is still producing while you are bringing forward results for approval. This is a challenge, because the JCIDS analysis process is entirely sequential. We recommend a quick look (Chapter 5) as a way to mitigate some of these delays.

Finally, just because history has shown that these assessments tend to go slowly does not allow you to execute at a glacial pace. You will have to push the effort along. Otherwise, you will be in serious danger of delivering answers long after the key decision windows have closed, and the four-stars that were interested in the topic have already made up their minds – without being informed by anything that you did.

4. The Study Plan

All the work you have done to this point is aimed at determining a way to execute your CBA. The first document that you will produce that goes to the outside world is the study plan, and it communicates what you want to do, and how.

JCIDS specifically addresses study plans (also known as terms of reference, or TORs) for JROC-directed CBAs:

When the JROC directs the initiation of a CBA, the CBA study plan will be included as a step prior to the functional area analysis. The study plan will include specific areas the CBA will examine. The study plan will scope the CBA, clearly identify the focus of the assessment, identify which of the four Capability Based Planning challenges (traditional, irregular, disruptive, catastrophic) it will address, and demonstrate that the assessment will address the tasking authority's request... This study plan also makes clear what the CBA will not address. The CBA needs to be thorough yet not subject to mission creep. [JROCM 062-06, 2006]

This direction was due to experiences with the first few CBAs, which, like most pioneering efforts under a new process, had considerable problems maintaining a clear focus.

Clearly, the JROC's overarching concern is limiting the scope of the assessment to something that both addresses their intent and can be delivered in a reasonable amount of time. But what, exactly, defines the scope of a CBA?

The scope of a CBA is specified by the following six elements.

- **Capabilities desired.** A capability, in JCIDS, is the ability to achieve an effect in a military operation. CBAs such as Joint Forcible Entry Operations and Global Strike Raid Scenario have differing scopes because the effects that those types of operations are intended to achieve are different.
- **Scenarios considered.** We cannot say that we actually have a capability unless we test it against various adversaries and operating conditions. The sample of adversaries and operating conditions – in other words, the scenarios used – are a component of the scope of an assessment.
- **Functions considered.** It is difficult to find a military operation that does not employ virtually all functions of the DOD, from exercising space control to providing physical fitness facilities. But, not all of the employed functions must (or should) be analyzed in a CBA.
- **Types of solutions considered.** In some cases, the type of solutions allowed by policy, existing treaties, and so on may narrow the scope (e.g., space-based weapons may be ruled out at the outset). Also, if you have a solution-oriented CBA such as Seabasing, your assessment is limited to assessing the alternatives within, and utility of, that concept.
- **Resource limits.** While resource limits have not been imposed on any CBA done to date, it is entirely possible to scope a CBA by stipulating limits on solutions, such as requiring that the FSA output must present options that do not require additional manpower or funding. Note that recent changes to JCIDS require that the FSA consider alternative CONOPS that use non-materiel solutions [JROCM 062-06, 2006].
- **Planning horizon.** This is the time period that the CBA is considering, for both adversaries and potential solutions.

Of these six areas, the JIC will directly address desired capabilities, functions, and the planning horizon. Additionally, the JIC will offer an illustrative scenario. You, however, will have to determine the rest.

A challenge in specifying these elements in a study plan is that they constitute most of the “what” of the CBA – which is a major output of the FAA. Yet, this direction says that study plan must contain the description of what will and will not be considered. So how can you reconcile this guidance?

The answer is that there is nothing (at present) that says you have to complete the study plan prior to *starting* the FAA. As a matter of fact, the current guidance only implies that the study plan must be approved prior to your presenting FAA results, so you can proceed as illustrated in Figure 7. Consequently, we will discuss ways to do the scoping in Section 6.

Also, you can define the FAA as the “public” part of your study, that is, the point at which you form your working group and solicit input. This allows you to do a lot of research that you need for both the FAA and the study plan, and permits you to put out a study plan prior to starting the public portions of the FAA.

The study plan should not be an enormous document. Shorter is better, and you should aim for a plan that is 15 pages or less. There is no set format, but the following outline is a composite of CBA study plans done to date.

- **References.** List DOD guidance that directly affects your CBA, plus applicable joint concept and scenario documents.
- **Purpose.** This contains a single paragraph that states the purpose and contents of the study plan.
- **Background and Guidance.** Summarize the answer to the “why this CBA?” question and quote DOD guidance relevant to your CBA.
- **Objectives.** Describe the type of CBA you have and the desired products.
- **Scope.** Discuss the six elements of scoping as they apply to your CBA, and refer back to the relevant DOD guidance to support your scope. This is the most important part of the study plan, so you will have to devote some space to proving that your scope is correct.
- **Methodology.** Leave yourself room to adjust in this section. Be specific about how you intend to do the FAA, but allow for options in the conduct of the FNA and FSA.
- **Organization and Governance.** It is not necessary for you to describe how your core team will function; this section should instead concentrate on how you will work with external organizations, to include your web site and coordination procedures. You should also document the governance structure of your CBA, including all oversight committees and general officer steering groups.
- **Projected Schedule.** Keep this short, and limit it to major staff actions and milestones (FAA, FNA, and FSA) that you already know about. Say that an updated schedule will be maintained on your web site.
- **Responsibilities.** List what you want from external government organizations. For now, you should be able to specify which organizations should provide representatives to your working groups. If you are planning on relying on external government organizations for major parts of your assessment, list them in the study plan and also refer to them in the methodology section.

Remember that the study plan contains your *initial proposals* for how you will proceed. It is not an ironclad contract, because bodies such as the JROC that commission CBAs retain the right to redirect

you. Since it is likely that you will modify the scope of your CBA during its execution, changes are allowed, and the study plan is really a live document. But, to get approval to start, you have to demonstrate that you're ready to start. The study plan is the basis for that decision.

Clearly, you can maximize your flexibility by minimizing the number of activities you commit to in the study plan. Unfortunately, your desire for managerial flexibility is at odds with the leadership's desire to see evidence that you have an approach that is workable. Consequently, you should present your initial thoughts on the following in the methodology section of the study plan.

- **Methodology approaches.** You probably have some idea of the analytical tools and techniques you will use for your assessment. While this is not a primary element of scoping, the choice of methodology is a direct consequence of the capabilities, scenarios, and functions you want to evaluate. This is important enough that you should cover at least what level of analysis you expect to conduct (see Section 7.2).
- **Measures of effectiveness (MOEs).**¹ While we show these as an FAA output, you should offer an initial list in the study plan. If you have a JIC, it will give you some advice on measures. Otherwise, you can derive some measures from attributes listed in the applicable JOCs and JFCs.
- **Technological and policy opportunities.** Two central reasons for commissioning a CBA are first, to examine areas where we need to improve, and second, to examine areas where improvements are possible due to technological or policy opportunities. If the latter is the case with your CBA, you should mention that in the study plan, and list the specific technological or policy opportunities.

The quote that begins this section makes it very clear what the JROC wants from a CBA study plan. To be accepted, the study plan must communicate that:

- you understand what you're supposed to be assessing;
- you have the correct scope;
- you have an approach that makes sense and is executable;
- you are working with the right organizations; and,
- you have a plan to finish in an acceptable amount of time.

Format and the order of the sections is not a concern; clarity, brevity, completeness, and believability are.

Finally, your study plan may not need to address an FAA, FNA, and FSA. If a COCOM commissions a CBA based on its assigned missions, it may have already accumulated enough information to constitute an FAA. Also, the JIC may contain sufficient information that no additional FAA work is necessary. In that case, the study plan can reference that work and concentrate on the FNA and FSA. Also, there may be no need to do an FSA, because the intent of the assessment may be to develop information to support a joint experiment, or you may know at the outset that the FSA will be done by a different organization. The point is that there are several possible ways in (and out) of a CBA, and the general format we offer supports all of them.

¹ In this paper, we define an MOE as a measure of the degree to which we can meet an operational objective, as distinguished from a Measure of Performance (MOP), which is a measure of how well a system or force element performs its functions (e.g., survivability or lethality).

5. The Quick Look

The notion of doing a quick look – a quick, abbreviated version of the entire assessment done at the start of the process – has been used in several CBAs. In all cases, the quick look proved enormously useful for scoping the assessment, helping the study team discover the landscape of the problem, and shaping subsequent work.

JCIDS doesn't require a quick look. The value of doing one is so great, however, that we highly recommend it.

5.1. The Need for a Pilot Effort

In his seminal book on software engineering, Fredrick Brooks comments on pilot efforts:

The management question, therefore, is not *whether* to build a pilot system and throw it away. You *will* do that. The only question is whether to plan in advance to build a throwaway, or to promise to deliver the throwaway to customers. Seen this way, the answer is much clearer...

Hence *plan to throw one away; you will, anyhow* [Brooks, 1996, p. 116]

All pilot efforts are designed to discover and repair shortcomings prior to committing to a major operation, and the quick look we recommend is the same thing. Although you know why you are doing the CBA, have collected relevant analyses and doctrine, and have built your core team, you haven't exercised your machine yet. The quick look provides you a way to have a training camp for your CBA.

More importantly, the quick look helps you determine what functions should be examined and what types of solutions are realizable. Both of these are important parts of scoping the assessment, but you really need to go *further* than the FAA to uncover them. For example, you may believe that your CBA doesn't need to examine deployment and employment of command and control. You should, however, have some justification for making that decision, and an end-to-end quick look can inform that decision.

The primary purpose of the quick look is to expose areas of uncertainty and highlight likely findings and recommendations. You may discover in the quick look that certain functions have always been assumed to be unimportant. A quick look can expose that possibility, and give you advice on where to spend scarce analysis time sharpening estimates while there is still time to resolve those uncertainties. In addition, the quick look should tell you enough about the dimensionality of the problem and the scenario space to advise you on possible analytic approaches.

Finally, doing a quick look puts you ahead of your external working group, and gives you a means to provide a rough estimate of your final results at *any* point during the CBA. Quick look results don't have a warranty, and you should present them as rough estimates based on expertise and aggregated analysis techniques. Regardless, it will be much easier for you and your management if you have some idea, however imprecise, of the road ahead.

5.2. Establishing Analytical Bounds

As mentioned above, the quick look can help you bound your assessment. In particular, it should concentrate on the following.

- **Bounding the effectiveness of current doctrinal CONOPS.** How good are we now? Suppose we currently attack enemy amphibious ships using certain types of platforms,

weapons, and tactics. How good could we become if we updated the platforms and weapons? And what updates are fiscally and technologically possible?

- **Bounding options open to the enemy.** What sorts of things can the enemy do to prevent us from achieving the desired effects? We note that current operations in Iraq show just how adaptive and innovative an enemy can be; no assessment done prior to Operation IRAQI FREEDOM predicted how much the use of improvised explosive devices would disrupt our stabilization operations.
- **Bounding investments in the capability areas.** The CBA will be assessing a set of capabilities introduced in the JIC. How much has DOD typically invested in these areas? How much more (or less) is it likely to invest? If the DOD decided that it wanted to maximize capability in this area, what would the maximal rational investment be?
- **Bounding alternative CONOPS and operating policies.** Are there things we don't do right now that we might do? For example, we obeyed the antiballistic missile treaty negotiated with the Soviets for many years after the Soviet Union dissolved, but then withdrew from it and began fielding national missile defense systems. Are there similar alternatives available that could substantially change how we achieve certain capabilities?

The notion of bounding is very important for your assessment. Many DOD studies spend *far* too much time refining baseline CONOPS, performance estimates, investment trends, and policy limits. Such studies ultimately produce answers with considerable depth but no breadth, and investigate very few alternatives. Since the quick look is entirely yours, you are free to search for plausible situations that may result in radically different views of the military problem being considered in your CBA. You do not have to have an external working group filtering what you examine, nor do you have to seek concurrence from anyone. It is just you and your core team.

5.3. Quick Look Products and Timing

A quick look, to be completely useful, should produce something that looks like an FAA (Section 6), an FNA (Section 7), and an FSA (Section 8), and should offer initial answers to the questions posed in Figure 3.

More importantly, the quick look should effectively communicate what you are proposing for analytical bounds. In particular, it should address the four questions discussed in Section 5.2 above, offer some alternative bounds, and record the consequences of those alternatives on your CBA's depth, breadth, and potential completion date.

The output of the quick look should be a briefing, because you will use it to reinforce some decisions. In your CBA, you will work with an external working group as well as your governance apparatus, but your day-to-day labors will be closely followed by your normal chain of command. You will be bringing any substantive decisions on the CBA to your chain first; if they approve, then you'll have to persuade the other groups to accept those decisions as well.

So the quick look is really aimed at your superiors, and gets them into the decision-making process on your CBA. They may believe that the joint concepts documents and the JCIDS documentation contain sufficient guidance to settle any issues, and they will likely be surprised when you bring in a quick look that shows a large variation in possible approaches and outcomes.

This briefing has another important function. You should use it as a shell for your final CBA briefing, and by keeping and documenting successive versions of it, you can maintain sort of a

diary of how the assessment proceeded from wide quick look bounds to progressively more focused recommendations. Again, this is a product for you and your management, and there is no reason to staff or distribute it outside of your core team.

Ideally, you would finish the quick look prior to starting the FAA, because then you would have a preliminary analysis in hand to help with scoping. But schedules may forbid that, so the *latest* completion date for the quick look should be just prior to the formal staffing of the FAA. If you delay the quick look longer, you will have to make decisions on CBA directions without a bounding analysis of the potential outcomes, which is risky.

So, to further explain the precedence relationships in Figure 7, we recommend that you begin a quick look with your internal team as soon as possible. The quick look can inform the study plan, but it is not a prerequisite; you can work on the quick look and the study plan simultaneously, but you should organize the quick look so that it first addresses the scoping issues that the study plan must address. Finally, you should have both the quick look done and the study plan approved prior to formal staffing of the FAA.

6. The Functional Area Analysis (FAA)

CJCSM 3170.01C tells us that

An FAA defines the military problem to be assessed, the concepts to be examined, and the scope of the assessment... a CBA is motivated both by the existence of military objectives to be achieved and the publication of a concept or a formal CONOPS for achieving them. The FAA describes the relevant objectives and CONOPS or concepts, and lists the relevant effects to be achieved. Since a capability is the ability to achieve an effect, the FAA connects capabilities to the defense strategy via objectives, concepts, and CONOPS. Furthermore, the capabilities identified in the FAA also scope the assessment and identify which capabilities will be examined. [2006, p. A-7]

This seems straightforward. But, you might also ask the following.

- 1) If I have a JIC that contains tasks, conditions, and standards, and I have to present all of the important scoping information in the study plan, what do I do in the FAA?
- 2) Is the FAA nothing more than writing down what I've already researched?

In a perfect world, the answers would be 1) nothing, and 2) yes. But the world is not yet perfect, so plan on doing work in your FAA. What we will present in this section is a set of activities that will lead you from the inputs to the outputs in a reasonable and defensible manner.

6.1. Defining the Military Problem and the Concept to Be Examined

Any analysis begins with a problem statement, and the FAA must start with the military problem to be examined. If your CBA has an associated JIC, then the JIC will contain a description of the military problem, as well as the central idea of the concept – that is, the idea that states how we would like to operate in the future. For example, the military problem described in the Seabasing JIC is one of projecting joint military power in situations where permanent land basing or temporary access are unavailable, and the central idea of the concept is that seabasing can provide the necessary access [Seabasing JIC, 2005, pp. 16-18].

Conversely, the Global Strike JIC is concerned with “responsive joint operations that strike enemy high value / payoff targets (HVTs/HPTs), as an integral part of joint force operations conducted to gain and maintain battlespace access, achieve other desired effects and set conditions for follow-on decisive operations to achieve strategic and operational objectives” [Global Strike JIC, 2005, p. 2-1]. The central idea of this JIC concept focuses on the initial phases of a major force-on-force campaign. In particular, it “envisions the joint force commander employing joint capabilities anywhere in the world through and in any domain at the place and time of his choosing” [Global Strike JIC, 2005, p. 3-5], thus defining a global scope. The Global Strike JIC does not offer solution concepts as the Seabasing JIC does; it is focused on a mission area.

In both of these JICs, the military problem is stated in a straightforward way and can be quoted directly. If you do not have a JIC, then you will have to describe the military problem in your FAA. Furthermore, you will have to quote appropriate strategic guidance to prove that your problem is worthy of a CBA, and you will have to provide your own central idea. It is not enough to say, “My Service has always done this,” as JCIDS was constructed expressly to avoid such “inexorable” requirements.

You cannot assume that there are no conflicts between the JIC and other strategic guidance such as the CPG, UCP, and SPG. Due to publication timing and a host of other issues, there may be disagreements among those documents, so you will have to navigate among their

potentially different views. Also, remember that joint concepts are intended to drive progress, so they may present views at odds with current doctrine. Reconciling these positions is formally a JIC issue, but be aware that conflicts may not be settled when you begin your CBA. In some CBAs, the question of what military problem was being studied persisted until the end of the *FNA*.

6.2. Scoping I: Scenario Selection

The use of scenarios has been a topic of much debate over the last several years. When the DOD shifted to a capabilities-based approach to analyzing needs in 2001, many interpreted this to mean that major analyses had to be agnostic with respect to scenarios. Consequently, many analysts argued that it was *illegal* to specify enemies, and all assessments had to deal in generic capabilities. In fact, one of the first CBAs commissioned under JCIDS (Joint Forcible Entry Operations) spent a great deal of time trying to produce a scenario-agnostic assessment.

But this attempt did not succeed, and the philosophy of scenario agnosticism has been discarded. You are now free to specify actual threat scenarios, and the DOD Analytical Agenda process provides a comprehensive set of scenarios that have already been approved, coordinated, and populated (to varying degrees) with data on both friendly and enemy intentions and capabilities.

Scenario selection is the most important scoping step in your CBA, for four reasons.

- **Scenarios provide the means to assess the capabilities associated with the mission area.** We cannot declare whether or not the DOD has a capability without testing it against real enemies with real objectives, forces, and geography. Otherwise, anyone could simply assert the presence or absence of a capability without providing any proof.
- **Scenarios provide a way to connect the assessment topic to the existing strategic guidance.** A few years ago, many analysts were claiming their products were capabilities-based because they posited imaginary enemies operating in synthesized environments (e.g., assisting in the defense of Puceland from an invasion by the evil Mauvians). While such artificiality provided some degree of scenario agnosticism, imaginary forces, objectives, and geography had to be specified. Worse, since these warring factions didn't actually exist, there was no way to connect them to very specific strategic guidance on achieving aims in the real world.
- **Scenarios provide a way to test the concept against the breadth of the defense strategy.** The original aim of the capabilities-based approach was to *broaden* our strategic perspective by considering a wider range of military situations. By choosing a good scenario sample, you can assess the concept against a wide range of relevant situations and comment on its overall applicability. Also, your assessment will be insured against sudden swings in priorities (e.g., the shift to the Global War on Terror after September 11, 2001).
- **Scenarios provide the spectrum of conditions for the FAA.** Scenarios yield a range of enemies, environments, and access challenges, all of which constitute conditions.

While it is crucial to choose the range of scenarios wisely, scenario selection is less difficult than you might think. For example, the current defense strategy divides all future security challenges into four categories:

- **traditional** challenges are posed by states employing recognized military capabilities and forces in well-understood forms of military competition and conflict;

- **irregular** challenges come from those employing unconventional methods to counter the traditional advantages of stronger opponents;
- **catastrophic** challenges involve the acquisition, possession, and use of (weapons of mass destruction (WMD) or methods producing WMD like effects; and
- **disruptive** challenges that may come from adversaries who develop and use breakthrough technologies to negate current U.S. advantages in key operational domains [National Defense Strategy, 2005, p. 2].

Furthermore, all the scenarios in the DOD Analytical Agenda have been mapped to one or more of these categories. So, if you choose this framework, you should pick at least four scenarios, one for each future security environment.

This framework is not the only one available, however. The strategy also offers four strategic objectives:

- **secure the United States from direct attack;**
- **secure strategic access and retain global freedom of action;**
- **strengthen alliances and partnerships;** and
- **establish favorable security conditions** [National Defense Strategy, 2005, pp. 6-7].

One framework may suit your CBA better than another. *Regardless, you must resist the urge to pick one scenario and devote all your time to it, under the assertion that “if we can do this, we can do anything.”* This sort of Maginot Line reasoning has been proven untrue so often that the idea should never come up. But this notion – however flawed – appears to be ineradicable. Instead, force your CBA to inspect a wide range of situations (including enemy options within those situations), and reduce them to a set that provides a good sample, one that covers the breadth of the defense strategy.

The idea of sampling is very important in scenario selection. An operation such as forcible entry could be conducted in a very wide range of environments, and you will not have time to analyze all the interesting situations. Instead, you’ll have to pick a set of criteria and use those criteria to select a manageable but comprehensive set. There are quantitative methods available to help choose a sample, so you should have a member of your team that has these skills.

One useful task for the quick look is to have your core team examine all of the Analytical Agenda scenarios (there are now over 100 of them, most with multiple variations) and suggest combinations that are comprehensive and analyzable within the time and resources available. This exercise will provide many insights in and of itself, and can be done in a day or two.

Scenario selection will likely be the first area of contention in your CBA. One shortcoming of a capabilities-based approach is that it is very easy to define a situation that requires a particular capability that is best addressed by a particular solution. Consequently, people promoting these solutions will try to you drive towards those situations to the exclusion of all others. Your job is to resist these sorts of hijacking attempts, and instead ensure that the CBA addresses the range of military operations described in the strategy.

You need a formal position on the choice of scenarios. If you are doing a JROC-directed CBA, scenario concurrence will come when you staff the study plan in JCIDS.

6.3. From Scenarios to Capabilities

Now that you have a scenario sample, you have to determine the military objectives of each scenario and extract the objectives that your CBA topic supports. We attain these objectives by

creating effects, *and the abilities to achieve those effects are the capabilities that are the basis of your assessment.*

This leads to a straightforward examination of each scenario. For example, you may be assessing integrated air and missile defense, and you are contemplating a typical regional conflict. The overarching objective is to win the war, and a subordinate objective would be to win the ground battle. To win the ground battle, we may choose to deploy ground forces, and those forces have to be protected from enemy air and missile attack at their ports of debarkation. Providing that protection is the capability that you are assessing; the scenario provides the context.

What we have outlined above has long been practiced in the DOD under various names. The best-known label is “strategy to task” [for example, see Pirnie and Gardiner, 1996]. We have already advised you to investigate the higher levels of strategic documents for advice related to your CBA topic; now we are advising you to connect the capabilities you are assessing to your scenario sample.

This may seem like a deceptively simple step, but it may prove challenging. For example, an alternative CONOPS for our example above might involve using allied ground forces to win the ground fight, and not deploying any of our ground forces at all. Then, protecting deploying ground elements becomes irrelevant, and providing the capability is no longer necessary. So, it is important to recognize that capabilities are a function of both scenario and CONOPS.

Of course, we may choose to protect allied ground forces from air and missile attack, or we may have to protect our deploying air and maritime forces. The point is, by tying the capabilities to scenario objectives and a set of CONOPS, you eliminate the problem of trying to assess in terms of capabilities *de nusquam*².

Early writing on JCIDS often referred to “critical capabilities,” implying that there are other capabilities that are not critical. To save yourself a semantic debate, merely state that in your CBA, the critical capabilities are those effects that you have opted to assess in your scenarios.

6.4. Collecting and Documenting Doctrinal Approaches

Now that you have chosen your scenarios and associated capabilities, it’s time to employ collaboration. You have to determine how we provide these capabilities *now* and how we *currently plan* to provide them in the future. And, the best way to do this is to solicit approaches from your working group.

You should give your group the set of scenarios and the capabilities you’ve derived from those scenarios, and have them tell you how they would achieve those effects. This requires you to define:

- the scenarios, the objectives, and the associated capabilities; and
- a standard format for reporting the proposals.

Essentially, you are giving your working group a mission order. You want them to tell you how they would do the mission, particularly:

- what force elements they would use;
- how long it would take;
- what the sequencing of tasks and dependencies among tasks would be; and

² Latin, meaning “from nowhere.”

- what sort of basing, transport, and allied cooperation would be required.

If you have a concept-oriented CBA such as seabasing, you also want your group to give you proposals on how the solution concept would be employed to provide the capabilities.

If you use the Analytical Agenda scenarios (and we highly recommend you do that), then you can just refer your group to those documents. If you don't use these scenarios, you'll have to provide a great deal of information and justification, and it will probably prove to be far more trouble than it is worth.

Even though you are analyzing needs 10-20 years in the future, you should ask for current approaches to providing these capabilities. The reason for this is that you can get the Combatant Commands involved. They likely have an OPLAN or CONPLAN available for scenarios similar to yours, and they have thought through how to achieve the effects with forces that actually exist.

Combatant Command staffs, however, do not like to comment on future capabilities. Consequently, you will have to ask the Services for how they would operate in a future time period if they execute their program. This will result in several different proposals; if you have the time, you should conduct a joint war game to try to come up with a set of *joint* proposals.

You will have to ask for this information in a standard form that allows your working group to document their proposals in an efficient way. You can use the JCAs and UJTLs (Universal Joint Task Lists) to describe tasks and component responsibilities, and use a format similar to a Gantt chart to show timing and task precedent relationships.

Now, you may have sufficient doctrinal expertise on your core team that you feel that you can describe how we do it (or will do it) with your own resources. This is fine, but you still need formal concurrence that what you have represents our current doctrinal thinking. *The formal concurrence is crucial.* Otherwise, your CBA won't even have an agreed-upon starting point.

Note that you may receive a CONOPS that specifies a substantially different set of capabilities than what you had in mind. In the air and missile defense example above, for example, one proposal may call for using nothing but undersea assets, which again would make defending the land and air domains irrelevant. So what would you do with such a proposal? Well, you would keep it if there is evidence that it could be done, and assess it in the FNA and FSA. After all, *eliminating the need to provide a capability is just as much a solution as providing the capability.*

The art of collecting current approaches is that you must ask for enough detail to specify the forces and timing associated with providing the capabilities, *but not so much that the workload and the output obscures the really important issues.* Several CBAs have gotten bogged down in task hierarchies and activity models to the point that they lost sight of the objectives of the exercise. Generating reams of task tables does not help answer the larger questions.

6.5. Scoping II: Task Structure and Functions

The next step is to take the doctrinal CONOPS you have collected and synthesize them into an overarching task structure for your CBA. This list should not be overly detailed; the Global Strike Raid Scenario CBA used a task structure with 10 major tasks (see, for example, Figure 10 in Section 7.1), and the Seabasing CBA had a task structure with 20 tasks.

You want to keep the task discussion at a fairly high level, because you will use these inputs to help decide what functions and tasks you will assess in your CBA. For example, you may be assessing undersea superiority and have collected doctrinal approaches that employ

psychological operations. You would probably opt to assume that those operations would execute as planned, and not treat that particular function in your assessment.

Determining what functions and tasks you will analyze is an important part of scoping your CBA. In general, you will not address a function or task when:

- the function or task does not apply to your concept and your scenarios;
- the function or task is being actively studied in another, concurrent CBA; or
- there is ample evidence that the function or task will succeed in your scenarios.

Several CBAs have relied on group approaches to determine the sets of critical tasks and functions, ranging from simple voting to use of multiattribute decision theory. These approaches have merit; among other things, they allow wide participation and can be executed very quickly. But be warned that such techniques may *prevent* you from examining functions and tasks that should be addressed. Prior to Operation Iraqi Freedom, *no* group predicted that providing road security after cessation of major combat operations would be a critical task. Unfortunately, it has proven to be just that.

The issues associated with group methods and the tendency for such groups to merely assert existing approaches is exactly the reason you need a bounding analysis in the quick look. In particular, you have to examine the range of potential enemy responses, and use that to help decide which functions and tasks to assess. JCIDS also provides a formal means to get such advice, as CJCSM 3170.01C requires the DIA to produce an “Initial Threat Warning Assessment” if you ask for one [2006, p. A-10].

Finally, remember that existing structures such as the JCAs and the UJTLs were built to reflect the DOD organization as it currently exists. Some CBAs have taken an approach similar to the mythological Greek innkeeper Procrustes, who ensured his guests fit his beds either by stretching them on the rack or chopping off their feet. If you have a new concept or a new CONOPS, the existing task frameworks simply may not fit it very well, and you should use some other depiction. Do not torture your analyses to fit the framework; otherwise you may be killed, as Procrustes eventually was by Theseus.

6.6. Using Strategic Guidance to Shape Standards

At this point, you have chosen scenarios, which give you the spectrum of conditions for the FAA-derived capabilities that are both fundamental to achieving the military objectives and are relevant to your topic. You have collected doctrinal approaches to providing those capabilities, and derived an overarching task structure. You have also decided which functions to assess, so you have completed the majority of the scoping tasks. This leaves the question of standards.

The joint concepts development process defines a standard as “quantitative or qualitative measures for specifying the levels of performance of a task” [CJCSI 3010.02B, p. GL-4]. While this is an accurate definition, it does not communicate what you should be producing in an FAA.

In the simplest terms, the FAA standards describe how you will grade the DOD’s abilities in your assessment. Recall that the FAA is the “what” part of the assessment, and that includes defining a framework for measuring how good or bad we are. If you come from an operational environment, you have used training standards; if you are an analyst, you have used measures of effectiveness; and if you are in acquisition, you have used key performance parameters, objectives, and thresholds. All of these are used to define what we consider acceptable.

You will *not* find (much less derive) a simple set of pass-fail criteria for all the scenarios, objectives, functions, and tasks that you are assessing that you can defend. Perhaps the current doctrinal standard for establishing a certain level of communications connectivity in a deployed location is 72 hours. Why 72? Do we lose the battle if we are an hour late? Also, attempting to write down standards for all possible tasks and functions in a microscopic fashion is complicated, time-consuming, and may very well not add up to anything that will help the FNA and FSA.

So what should you do?

Recall that JCIDS discusses things called attributes, which are “a quantitative or qualitative characteristic of an element or its actions” [CJCSM 3170.01C, p. GL-5]. If you have a JIC, the JIC will list a set of attributes; if you don’t, you can refer to attributes listed in the relevant JOCs and JFCs).

For example, the Seabasing JIC lists the following attributes:

- infrastructure size required for the seabase;
- operating capacity of the seabase;
- deployment and employment rates;
- degree of interoperability;
- survivability; and
- accessibility in varying environments [Seabasing JIC, pp. 49-51].

These attributes capture the concept’s intent for judging the utility of alternative seabasing concepts, and provide a starting point for you to derive your evaluation criteria.

But, notice that the seabasing list is not comprehensive. For example, there is no attribute that says “contribution to the warfight.” Now, the implication is that a small, large capacity, interoperable, survivable, accessible seabase that deploys quickly and employs and sustains forces at high rates cannot help but improve the warfight. Nonetheless, there may be situations where having a seabase does not significantly affect the outcome.

This is why you have to augment what comes in the typical JIC. You need to connect the attributes to the scenarios you’ve chosen, and come up with appropriate metrics for the attributes. Some metrics, such as those associated with survivability, are straightforward. Others, like measuring interoperability, are much more difficult.

Also, the other strategic documents mentioned in Section 2.3 are likely to contain guidance that will affect your choice of criteria. The SPG in particular tends to contain very specific guidance on mission areas where we should either decrease or accept risk, and you must try to respect this guidance when you develop your standards.

Note also that none of these attributes have obvious pass-fail criteria associated with them, and instead are probably better represented by a continuum of values. Figure 8 shows a notional value function associated with a survivability attribute; in this case, the metric is expected personnel lost in a particular scenario, and the payoff values range from 0 – 100.

The representation of payoffs versus metrics is much more useful, because it allows you to represent how we might value a continuum of outcomes, rather than simply stating “the standard is 72 hours.” Note that the function in Figure 8 does not prevent you from asserting a threshold value; for example, you might establish that alternatives that expect to lose more than 1000 personnel are simply unacceptable and will not be considered.

Also, expressing your evaluation criteria in a common scale (here, we are using an abstract value scale) will allow you to investigate tradeoffs later on in the CBA. In the seabasing example, the desire for high capacity would generally lead to a larger seabase, which is at odds with the desire to minimize infrastructure.

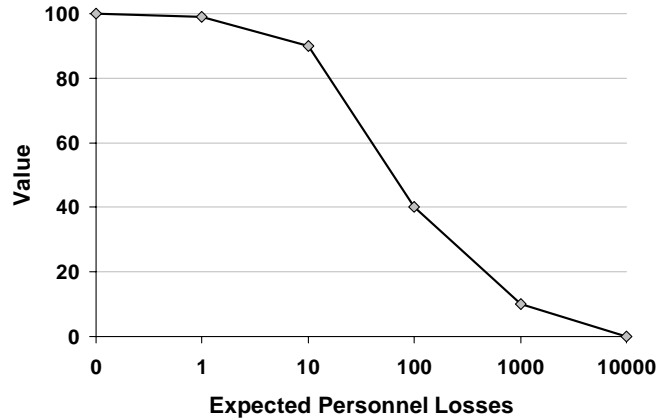


Figure 8. Notional value function for expected personnel losses.

The methodology associated with the development and use of functions such as the one in Figure 8 is generally known as multiobjective decision analysis, and there are many good books available on the subject (see, for example, Kirkwood [1997]). Even if your CBA will eventually use large-scale combat modeling and simulation to estimate warfighting outcomes, it is worth spending the time to link attributes, metrics, and value functions. The process will help you identify the most important measures, and will also demonstrate how some of the standards may conflict (e.g., minimizing infrastructure while maximizing throughput).

If you cannot avoid the pressure to present single-number criteria, consider using the following set of thresholds:

- the minimum level of the measure required for mission success (go-no go threshold);
- the minimum level at which measure is no longer a critical or pacing part of the CONOPS (nominal performance threshold);
- the level of the measure above which there is no real increase in mission effectiveness (gold-plating threshold).

If you develop these three numbers, you will probably find that connecting the dots yields a curve similar to the one in Figure 8. There is a range below which you cannot function at all, a range that gives benefits as the measures improve, and a range above which increased investment simply isn't worth it.

6.7. The Overall FAA Process

Figure 9 shows the major parts of an FAA and our advice on how to order them. All of the steps are informed by the JIC, other applicable joint concepts, the strategic guidance, the literature search, and the quick look (if you have done one).

Defining the military problem begins the FAA. Scenario selection provides the linkage to the defense strategy, and the military objectives of those scenarios provide advice on desirable

effects. The scenarios and effects result in capabilities, which represent the condition output of the FAA.

Once the conditions are established, collecting doctrinal approaches allows you to derive an overarching task structure. This structure, along with your literature search, will help you decide which functions to analyze explicitly in the FAA, and represents the task output of the FAA.

Finally, comparing the scenarios, objectives, and task structure to attributes available in the joint concepts allows you to choose measures. Once you have developed a set of measures, you can again go back to the strategic guidance and existing doctrine to develop value functions (and also minimum performance criteria) for the measures.

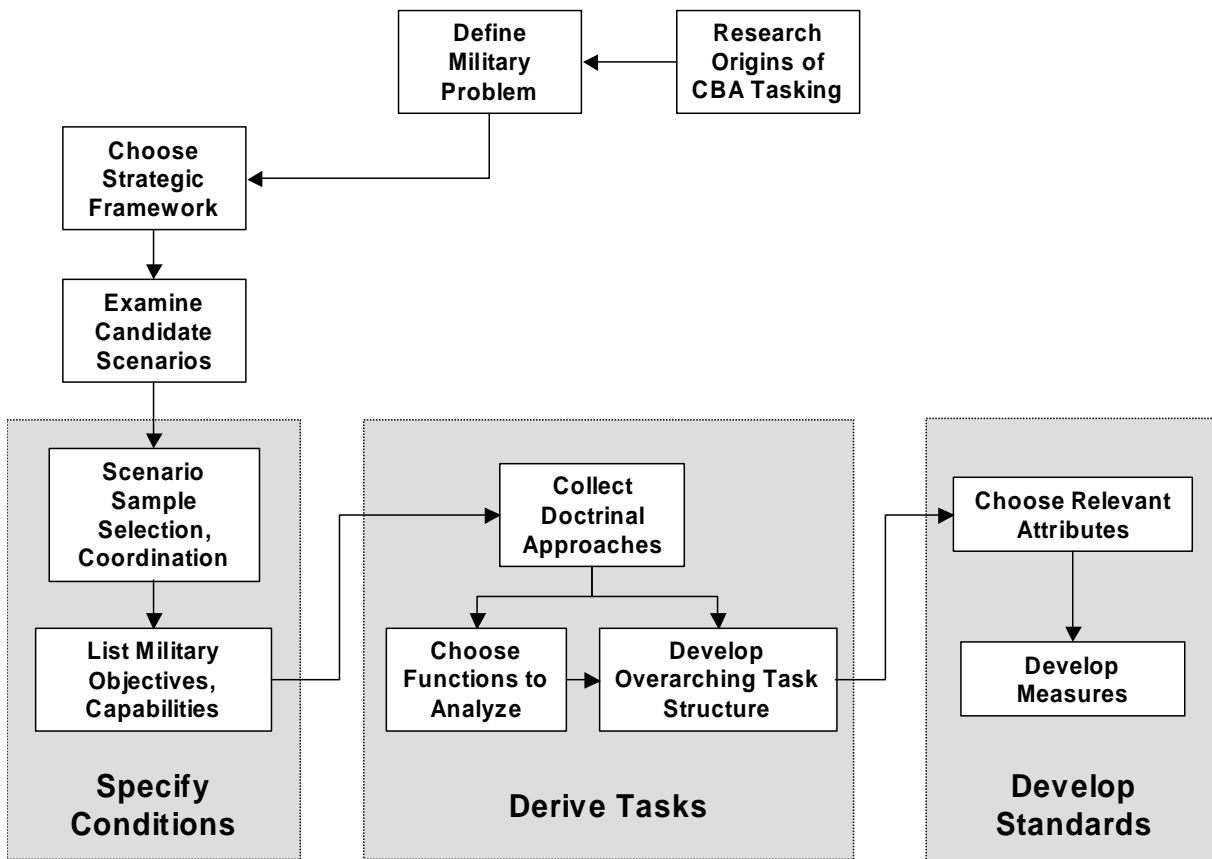


Figure 9. Major FAA tasks and flow.

7. The Functional Needs Analysis (FNA)

Returning to the formal guidance, CJCSM 3170.01C says that

The FNA assesses the ability of the current and programmed force to meet the relevant military objectives of the scenarios chosen in the FAA using doctrinal approaches. Using the standards and evaluation criteria described in the FAA, the FNA assesses whether or not an inability to achieve a desired effect (a capability gap) exists [2006, p. A-3].

The manual also adds several more suggestions for an FNA, saying that it must:

... describe the gaps in terms of the scenarios assessed and the effects on achieving the relevant military objectives ... it is essential to link the gaps to their operational context.

...assess the impact of the capability gap in terms of the risk to mission (the ability to achieve the objectives of the scenario), the risk to force (the potential losses due to the capability gap), and other important considerations, such as effects on allies and noncombatants.

...characterize whether the gaps are due to proficiency (inability to achieve the relevant effect in particular conditions), sufficiency (ability to achieve the effect, but inability to bring the needed force to bear due to force shortages or other commitments), or policy limitations (inability to use the force as needed due to operational constraints).

...list a set of needs that the DOD should address, or conclude that no pressing needs exist

...offer a prioritization of the gaps that is directly linked to priorities in the strategic guidance...it must also completely document the significant driving factors behind the recommended priorities to give senior leaders the information they need if they choose to make adjustments [CJCSM 3170.01C, 2006, pp. A-9 –10]

The manual does not describe these areas further, and does not present any sort of process that describes how to proceed from FAA inputs to FNA outputs. Our advice on such a process occupies the rest of this section.

7.1. Operational Depiction

The FAA will result in a set of scenarios, a set of doctrinal CONOPS, and a set of functions and tasks that you have decided are potentially relevant to the assessment. The FNA uses these FAA outputs to uncover needs. Since needs generate bills that the DOD must pay, the standard of proof is high, and you have to demonstrate that we cannot meet some set of military objectives in some scenario of interest. Consequently, you have to convert your scenarios, CONOPS, tasks, and functions (which, at this point, are likely just a collection of lists) into a form that allows you to depict relationships among scenarios, objectives, tasks, and force elements.

Figure 10 shows an example based on the Global Strike Raid Scenario CBA. This figure is the generic task structure for a rendition (capture and return) operation against an enemy camp. The graphic is useful because it captures the high-level tasks, their relationships, and timing. For example, we see that we can accomplish a fair amount of force movement prior to understanding the targets, but the actual operation cannot take place until the targets are characterized and all the battle management and command and control elements are in place. Furthermore, it is easy to use this structure to write down the possible combinations of force elements that might perform these tasks, and in what regions and types of terrain.

You should be careful when formulating these depictions. One of the problems with using the DODAF is that it was intended for systems engineering applications, where it is critical that *all* connections be documented and made to function (or else the machine won't work). You cannot assess at that level of detail in a CBA, which examines an entire mission area or a broad concept. You must settle for a more aggregate, higher-level view of the topic.

It may be difficult for you to compose a small set of graphics that depict the operations you are analyzing. For example, if you were doing a CBA on undersea superiority, you may decide to analyze an entire regional warfight to determine to what extent our undersea capabilities determine the outcome of a particular scenario. But, you could still depict the conflict at the theater level, and show how undersea superiority affected other aspects of the fight.

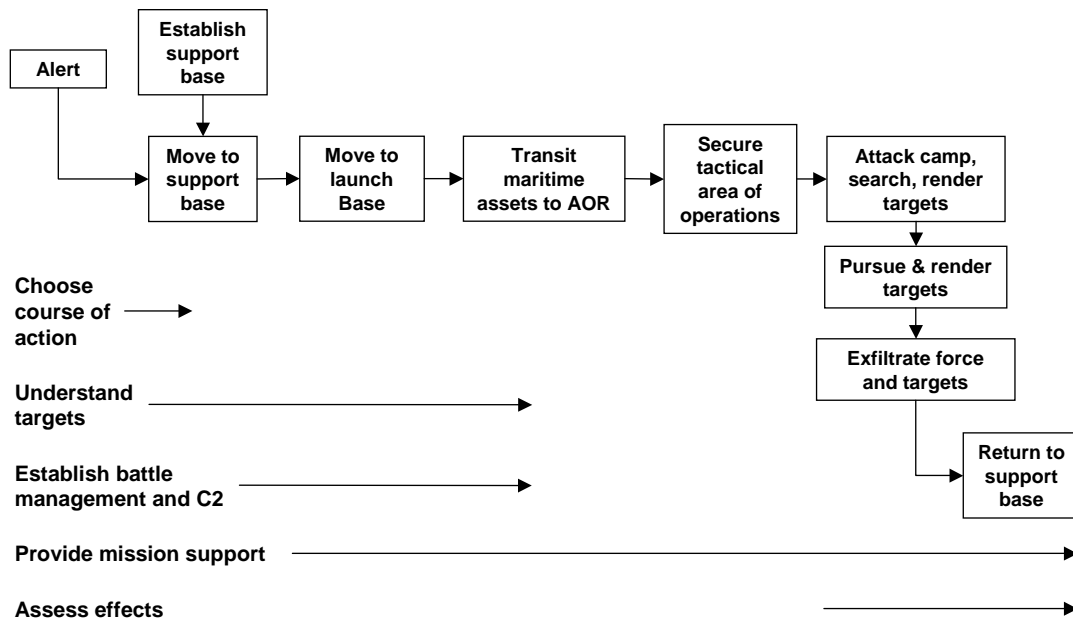


Figure 10. Task flow for a rendition operation from the Global Strike Raid Scenario CBA.

In addition to setting you up for your analysis, generating an operational depiction can also help settle misunderstandings over terminology. Figure 11 shows the overarching engagement sequence derived for the Integrated Air and Missile Defense (IAMMD) CBA. This CBA took a variety of kill chain depictions and derived a sequence to use as a common reference for analysis. This allowed that CBA to depict existing doctrine using a single structure, which allowed for comparisons of proposals *and* solved a considerable communications problem.

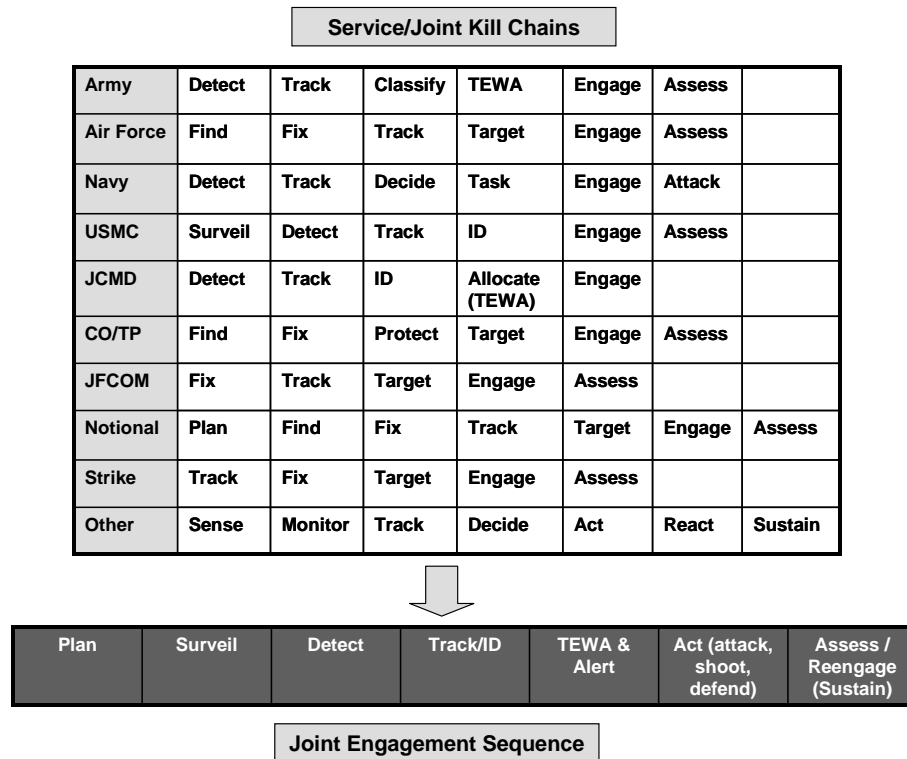


Figure 11. Derivation of the common Joint Engagement Sequence for the IAMD CBA³.

Notice that the operational outcomes of concern are obvious in both Figures 10 and 11. In the case of Figure 10, the question is whether we captured the targets of interest, and what consequences (losses, collateral damage, and so on) resulted from the raid. In Figure 11, the outcome of interest is whether or not we successfully defended against the missile attack. In both cases, the operational depiction allows you to communicate with clarity and economy how you are portraying the mission.

You should also derive a set of operational depictions for enemy forces. After all, enemies have objectives and alternatives open to them, and your assessment has to account for those as well. Consider the diagram in Figure 12, which is based on the Global Strike Raid Scenario CBA. This figure shows how enemy leadership targets relocate in a conflict on receiving warning. While they spend most of their time in unhardened government facilities, on warning they transit to a vehicle, then to either an informal hide site or a formal hardened site. If they get warning while at one of these sites, they move again. Clearly, if your objective is to interdict one of these leaders, then you must characterize how they move.

Note also that this is the *last* chance you will have to ensure that you are assessing the right things. With a good set of operational depictions, you can go back to your chain of command and your working group (or even the JROC) and ask “is this what you wanted us to look at?”

³ TEWA means “target evaluation and weapons assignment.”

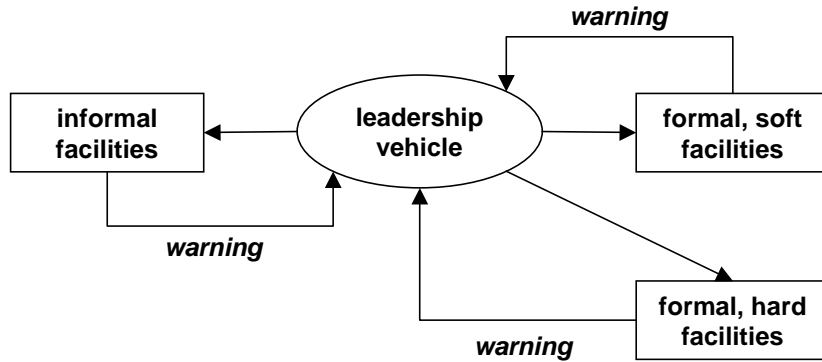


Figure 12. Transition diagram for leadership targets from the Global Strike Raid Scenario CBA.

7.2. Choosing an Analytical Approach

You will be pressured to write your preferred analytical approach into the study plan. Your chain of command knows that analysis, modeling, and simulation can be very time consuming and expensive, and that many huge DOD analyses have produced little or no return. Consequently, this is an area that they (and you) will worry about throughout the assessment.

It's not possible for us to give a comprehensive treatment of your analytical options in this paper, but you need to know something beyond "hire someone good and let him take care of it." You will have to gain a sufficient understanding of the methodology being used to explain it to senior audiences, because you will have to convince them that your CBA provides reasonable estimates of warfighting causes and effects.

The analytical approach is not merely choosing a model or a set of models. Models are abstractions of reality, and are *tools*. The analytical approach, however, is a plan executed by an analytical team, and they will employ a *collection* of tools to transform input data, estimate warfighting outcomes and MOEs, and present results. A competent analytical team will examine your problem and recommend options for approaches, and will not just talk about models.

Nonetheless, the choice of modeling techniques is a central element of an analysis approach, and also provides a useful way to introduce the types of approaches possible. So, we will use model classification schemes to illustrate the varying options you'll have.

Probably the first question to consider is the operational level of your assessment. Figure 13 depicts a common DOD model taxonomy, which classifies models in terms of warfighting scope.

In this taxonomy, the size of the forces in opposition and the time span considered define the type of model. For example, an engineering level model might only consider a single radar trying to detect a single ballistic missile, and would probably devote a large amount of detail to the physics of the systems being considered. An engagement level model would feature the force elements or platforms employing the radar and the missile, and would contain less detail about the physics of those systems and more information on the tactics of the engagement. The raid level model would represent a collection of force elements opposing each other in a single engagement (or over a limited time period), while the campaign model would provide an abstract representation of an entire war.

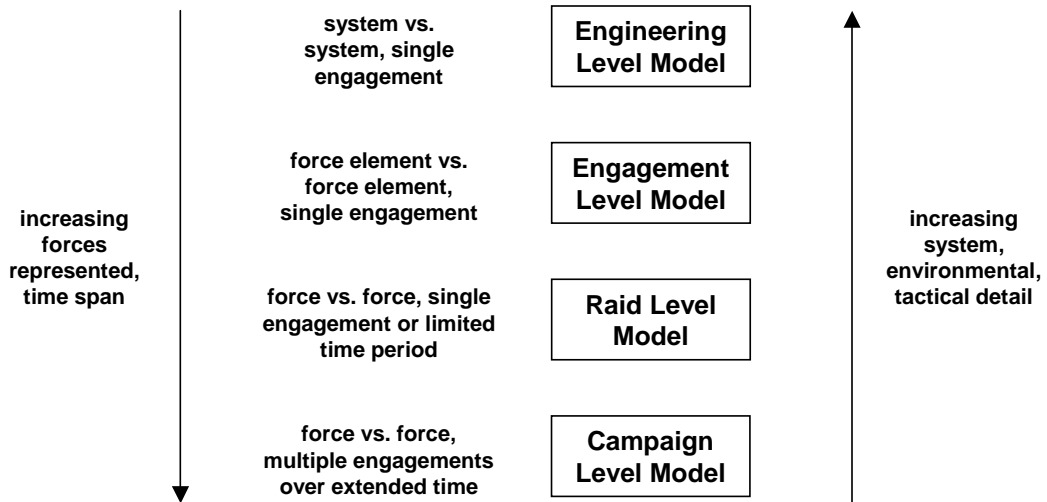


Figure 13. Classification of models by warfighting scope.

Figure 14 [Washburn, 1998, p. 3] is a less common depiction, and depicts analysis approaches by technique as opposed to scope. To explain this figure, we will go from right to left. We are all familiar with exercises, as they employ actual forces in real environments. There is *no ground truth* in an exercise, as the actual exercise outcomes are subject to human perception and judgments.

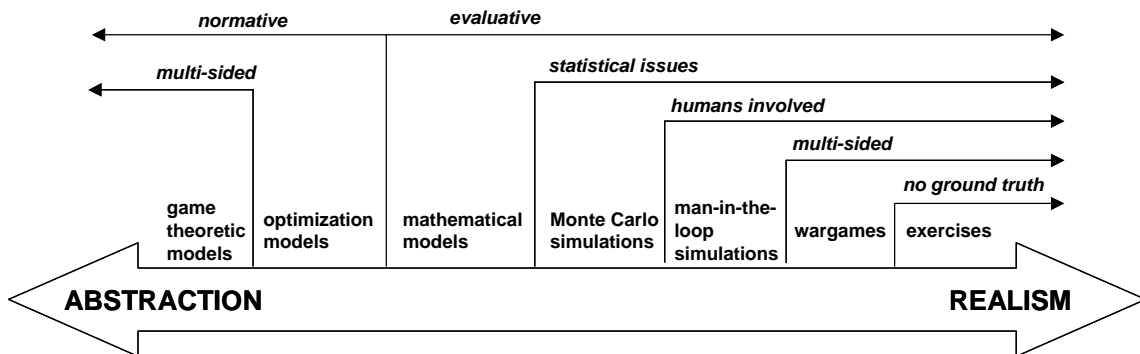


Figure 14. A classification scheme for analysis approaches.

Furthermore, exercises have opposing forces, so they are *multi-sided* and have *humans involved*. Exercises also have *statistical issues*, in that the outcomes might be more a function of the ability of the particular players involved than the capabilities possessed by the sides. Finally, exercises are *evaluative*, in that they are not designed to produce solutions; instead, they provide a way to demonstrate and measure proposed solutions.

Going to the left, wargames remove the ground truth issue, and specify the physical environment and the mechanisms that produce combat outcomes. Man-in-the-loop simulations are man versus machine methodologies, and do not have multiple sides involving humans making decisions (if they did, this taxonomy would call them wargames). “Monte Carlo” simulations use analytical schemes to do repeated trials of random effects such as weather and bomb hits, and do not use humans in the loop. Finally, there are mathematical models that do not simulate random effects, but instead evaluate operations, systems, and human behavior analytically.

There is another class of models, which are shown on the left-hand side. These *normative* models are not based on evaluating inputs such as CONOPS, but instead use sets of rules to suggest solutions. Optimization models search a large set of alternatives and recommend solutions based on maximizing or minimizing a set of quantitative objectives. Game-theoretic models operate similarly, but add back in the multi-sided nature of military conflict.

Fine, you say. I'll take the game-theoretic model that represents the entire war at the engineering level, so I'll get good estimates of all the outcomes and use techniques that compute the best CONOPS.

Well, there's no such model, and there's no free lunch. The techniques on the left side of Figure 14 have significant limits in what they can represent directly, and you will likely have to give up the ability to represent certain tasks or functions to get your operational depiction into a form appropriate for those techniques.

Consequently, the question of choosing an analytical approach involves both warfighting scope and technique, and there are substantial tradeoffs involved. It is unlikely that your CBA will be so narrow that you will be analyzing purely in the engineering or engagement realm, so you will probably be assessing at the raid or campaign level. If you tend towards realism, you must involve humans, and that means your evaluations must be conducted in *real time*. If you need to examine a large number of alternatives, then you will need abstraction (and analytical expertise).

Suppose you have been given the Joint Forcible Entry Operations CBA. What range of techniques would you employ to assess our current capabilities? An actual exercise is probably out of the question, but wargames look attractive. But, can you set up wargames for all the relevant forcible entry scenarios you identified in the FAA? Also, will one set of players for each wargame be enough, or will you need to repeat the wargames with multiple teams?

Also, is it sufficient to concentrate on the forcible entry itself (which would be a raid-level analysis)? Don't you need to consider the impacts of the forcible entry operation on the larger campaign? If the forcible entry operation cannot be conducted as planned, is there a different CONOPS that would allow the campaign to achieve its objectives, and is there some normative model out there that could help produce that CONOPS?

Or, is the whole CBA really aimed at judging the contributions of a few proposed systems? If that's the case, can you reduce the problem to a set of engagement level analyses, and avoid dealing with all the forces and systems?

These are all difficult questions, which the actual Joint Forcible Entry Operations CBA team confronted with varying degrees of success. The sheer difficulty of answering these questions is all the more reason to do a quick look (Section 5), so you have some idea, *prior to the FNA*, of where you should spend your scarce analytical resources. Invariably, you will have to strike a balance between scope, techniques, and level of detail.

The following is a set of questions you should ask when evaluating analytical approaches.

- Can the approach evaluate the doctrinal approaches collected in the FAA?
- Can the approach estimate the measures of effectiveness tied to the FAA attributes?
- Can the approach represent the scenarios, tasks, and functions identified in the FAA?
- Does the approach represent the correct warfighting scope?
- How large a team does the analytical approach require to execute?

- How much analytical overhead (i.e., estimation of outcomes not relevant to the CBA) must be absorbed in the approach?
- How long will the approach take to execute?
- Does the approach require construction of a set of special-purpose models? If so, how difficult will it be to win community acceptance of these models?
- Is the approach agile enough? Can it quickly assess a large number of alternatives (US and enemy CONOPS, scenarios, and capabilities)?
- What is the backup plan if the approach doesn't work?

Do not let the availability of a particular tool or methodology (or the statement that a model is “validated”) drive the analytic approach. The approach must fit the problem, not vice versa.

An aside: group methods. Several CBAs have employed expert judgment techniques, typified by a variety of group voting and weighting methods. In the taxonomy of Figure 13, these fall into the category of mathematical methods, because they are evaluative.

Despite their widespread use, *we advise against relying on such techniques as your primary method of estimating outcomes, causes, and needs.* In the early days of JCIDS, many analysts attempted to construct matrices to map systems to capabilities (or functions), and used groups to grade the contribution of each system to the capability or the function. These grades, which were normally presented using the typical “red-amber-green” scale, were supposed to yield some sense of our adequacy in a mission area.

But, these methods are not very satisfying for estimating the outcomes of interest. Consider the rendition task flow shown in Figure 10. How does such a method produce estimates of friendly casualties or collateral damage? How does it assess the likelihood that the camp receives strategic warning from force movements and scatters before the attack even occurs? And how can it estimate the likelihood of capturing the targets?

To do this, you need to employ methods that represent the important physics of the situation – how fast both sides can move, how big their signatures are, what their detection capabilities are, and how well they can fight in a direct-fire engagement in the terrains of interest.

Note that such an approach does not preclude the use of expert judgment. You can gather a set of experts and have them estimate the probabilities of interest for the tasks shown in Figure 10, which would not only be fairly quick but would give you the range of expert opinion on the feasibility of executing that CONOPS. Furthermore, such an approach provides advice on where you need to spend your analytical resources, because it helps identify tasks that either appear critical or have widely differing views on their likelihoods of success.

The popularity of group methods is closely tied to the ideas of scenario agnosticism and capabilities *de nusquam*. Since the early theories of capabilities-based analysis argued that we could not represent actual environments and enemies, there was no way to represent the physics of a situation. Consequently, well-intentioned individuals trying to do JCIDS assessments found themselves in large conferences answering questions like, “on a scale of 1 to 100, what is the capability of this torpedo in achieving undersea superiority?” Such scores were dutifully compiled, averaged, and presented to three decimal places. While these numbers captured prevailing opinion, they certainly did not amount to a serious assessment, and more often than not just resulted in junk science.

We freely admit that there are many important considerations that do *not* have physics associated with them. For example, you may be comparing two doctrinal approaches to an operation, one of which requires getting basing rights from a single mildly uncooperative

country, while the other requires getting basing rights from four friendly countries. Which requires us to spend more diplomatic capital? Does the expenditure of this capital even matter? In these cases, you must resort to techniques based in expert judgment to make an estimate.

Nonetheless, we note that key performance parameters for major weapons systems are measurable quantities. Consequently, you should assess in those terms if possible. If you are interested in learning more about quantitative military modeling, several texts are available [e.g., Loerch and Rainey, 2007].

7.3. Collecting and Inspecting Performance Data

People who try to build a quantitative case against your assessment will either attack your scenarios, your analysis techniques, or your input data. Hopefully, you settled all the scenario issues in the FAA, and the quick look helped you determine a solid analytical approach. Now what's left is to collect performance data on the forces and systems you intend to analyze.

People new to the DOD analysis world are usually astounded at how difficult it is to obtain performance data in U.S. weapons systems, particularly those in development. Some of this is understandable, since we cannot expect to have perfect information on something that hasn't been employed (or even built) yet. But, getting information on even fielded systems can be contentious.

A central aim of the DOD Analytical Agenda is to solve this problem by making such data readily available for major studies. Since DODI 8620.2, *Implementation of Data Collection, Development, and Management for Strategic Analyses*, was published in 2003, it has become much easier to get information on both US and enemy capabilities for modeling purposes. As mentioned in Section 2.4, the Joint Data Support organization maintains a large repository of such data.

Your general approach to data collection should be that you should get as much as possible from current joint studies. This allows you to leverage efforts that have already been through joint scrutiny, and does not irritate your working group with requests for information that you could have gotten yourself. Some early CBAs did not take this approach. Instead, they opted to issue massive data calls that antagonized most of the participants (and provoked outright rebellion in some cases).

When you do ask external organizations for information, you have to be on your guard for submissions that have been "adjusted" to suit the providing organization's interests. You will have to examine all the submissions you get in some detail, and your core team will have to be satisfied that the information you are getting are reasonable estimates of the performance of the forces and systems you are assessing. You *will* get some inaccurate data, either by design or misunderstanding, and it's your job to catch and correct it.

Too many DOD analyses get hung up over establishing precise, coordinated, acceptable-to-all numbers for such things as the probability of kill for a weapon or the survivability of a platform. You can either 1) endure endless arguments over what the correct estimate should be, or 2) document the range of legitimate opinions on the numbers and assess the extremes to see if the estimate really matters to your overarching measures. Clearly, the latter is the better approach, as it reveals useful information. You can only do this, though, if you have adopted an agile analysis approach. If you have opted for a time-consuming, inordinately detailed model that only allows you to consider a minimal number of baseline cases, you'll succumb to the endless arguments.

7.4. Executing the Analytical Approach

Once you have gotten your analytical approach in place, you will go into production. You will have a set of scenarios and doctrinal approaches you will be evaluating, possibly for several different time frames (e.g., current year, 2015, and 2024). But, you have both a chain of command and a working group that are clamoring for your output. So how can you simultaneously produce and present?

First, start out with the least contentious (or most well-understood) case, put your core team to work on it as soon as possible, and get results from them as soon as possible. When they are done, inspect the results internally to ensure they make sense, and think through who might object to the outcomes and why. When you are satisfied that you can bring these results forward, get your core team started on the *next* case, and present your results to the working group.

Bringing results out in the open will always generate questions, if not outright protests. Some you should be able to handle right away, but others may require you to get additional analysis from your team. You should build some time into the schedule to rerun some of your analyses, because your working group will invariably bring forward information that you didn't have at the start.

Organizations that submitted doctrinal approaches to your scenarios may, upon seeing your results, want to change their submissions. This is good for you, because JCIDS insists that alternative CONOPS be considered in CBAs, and getting a revised CONOPS helps you fulfill that requirement. Now, you will have to be tough with these organizations, and not allow them to endlessly change their submissions until your machine yields results that they like. Nonetheless, having alternatives to analyze is preferable, particularly if the approaches were generated by the Services or combatant commands.

As an aside, we note that there are two cases of alternative CONOPS. The first type consists of alternative doctrinal approaches that use existing or programmed forces and *do not* require any additional resources, including training. The second type consists of approaches that *do* require additional resources. Your FNA should only consider the first type; you will consider both types in the FSA.

Bringing forward results case-by-case allows you to stay ahead of your working group and gives you some time to collect alternative approaches if offered. More importantly, this approach builds a story for your FNA in a systematic fashion. As your working group examines the results of each scenario and each CONOPS considered, they will likely see a set of pervasive issues appearing. If you have done a quick look, you probably already know what most of these issues are, so you know what's coming. They don't, however, so it's better for you to take an incremental approach.

Try to handle major conflicts outside of working group meetings. While jousting between CBA study leads and spun-up action officers has provided much entertainment for working groups in previous CBAs, such open conflict is counterproductive. Work with the protesting organization one-on-one *outside* of your regular meetings and see if you can settle things.

7.5. Extracting and Reporting Needs

At the beginning of this section, we quoted a number of suggestions from the JCIDS manual on FNA products, which discuss capabilities, gaps, overlaps, risk areas, tasks, conditions, and even UJTL linkage. It is very easy to get tangled up in all this language, but there is really no need for confusion. The FNA output is straightforward. It consists of:

- the scenarios considered;
- the alternative CONOPS considered;
- the estimated results of executing those CONOPS, in terms of the measures developed in the FAA;
- the results which appear to be unacceptable according to current strategic guidance;
- the reasons for the unacceptable results; and
- the functional needs that result from those reasons.

Here is a very straightforward example. Consider what an FNA would look like if the scenario were Operation EAGLE CLAW, the Iranian hostage rescue attempt conducted in 1980. The mission would be to rescue a set of hostages held in Tehran, with the following measures and constraints as dictated by the White House:

- maximize probability of mission success;
- protect the lives of the hostages;
- maximize security in the planning process;
- minimize collateral damage;
- minimize the size of the planning group and the assault force; and
- use only US forces. [Ryan, 1985, pp. 10-16].

The CONOPS would be to use RH-53D minesweeping helicopters operating from a carrier and MC-130 aircraft to move the SOF assault force, which would be supported by AC-130 gunships during the actual assault. An analytic approach would likely try to estimate the following:

- the likelihood of the enemy receiving strategic warning, either by exposure of the planning process, detection of rehearsals or force movement, or by signals intelligence;
- the likelihood of the assault force reaching the initial staging location at Desert One (the probability of at least 6 of the 8 helicopters reaching Desert One, given the reliability of the RH-53D at that time, was later estimated to be about 0.65);
- the likelihood of the assault force reaching the U.S. embassy in Teheran;
- the estimated outcome of the assault, in terms of losses and collateral damage; and
- the likelihood of the assault force returning with the hostages.

If your FNA analysis matched that of the Holloway Commission (which investigated Operation EAGLE CLAW), you would conclude that the mission was high risk [Holloway, 1980, p. v]. Furthermore, your FNA would conclude that, for this scenario and CONOPS, the lack of reliable, long-range lift from maritime platforms would be one of the overarching functional needs. You might also argue that the CONOPS was likely to have difficulties because it involved force elements from all Services and did not include joint training or a full-scale rehearsal. Finally, you might point out that an alternative need would be to secure a land base to avoid the complexities of employing helicopters from a carrier.

The point of the foregoing discussion is that the output of an FNA need not be couched in strange, abstract language (or even linked to UJTLs, for that matter). The FNA results are simply an assessment of how well we can do something, and an accounting of the reasons why

we cannot achieve mission success at an acceptable level of risk. If at all possible, you should state the needs in quantitative terms.

This leaves the question of prioritizing needs (which are also called gaps in many JCIDS documents). Within a particular scenario, such as the EAGLE CLAW example above, prioritizing needs is probably straightforward. If the assault force cannot get to Teheran with high probability, then the assault can't even occur. So securing highly reliable lift is a necessary (but not sufficient) requirement for mission success.

Prioritization becomes difficult when you are assessing multiple scenarios across the breadth of the defense strategy, and you end up with a disparate list of needs. This list will usually contain a few things that are common to all scenarios, so their pervasiveness probably makes them a high priority. On the other hand, some needs that are backbreakers in one situation (such as the need to defeat enemy air defenses) may be irrelevant in others (irregular situations where the enemy has *no* air defenses). So how do you provide this prioritization?

One reason we have stressed examining the strategic guidance in this document is that the SPG and CPG in particular contain a great deal of advice on priorities. The best prioritization scheme is one where you can directly lift the priority information out of these documents and apply it to your needs, so that you have a clear source for how you have ordered your needs.

At this stage of the assessment, however, prioritization is not that critical. Since you have not yet investigated solutions and their costs, having a priority of need is less important than identifying the *set of crucial needs* that are dragging down the likelihoods of operational success. Suppose, for example, that one of your needs ends up as the bottom priority. But, you subsequently discover in the FSA that the need can be filled by a policy change, using existing capabilities, at little or no cost. Clearly you would recommend that action, because the costs are inconsequential.

It *is* critical, however, to provide the linkage from your needs to your estimated operational outcomes for each scenario, in terms of your MOEs. This allows senior decision makers to consider both the likelihood of the scenario occurring and the consequences of failure, which are the major components of risk. It also allows them to perform their own calculus in terms of tradeoffs among MOEs (e.g., the inevitable tradeoff between confidence of killing a target and expected collateral damage).

What if there are no problems? There is one other outcome that may occur in an FNA: you may discover that there are *no* needs. This could happen due to changes in strategic priorities (such as the collapse of a particular enemy), a new application of existing CONOPS, or the simple exposure of operational combinations that had not been considered in a unified assessment. To give a recent historical example, the reason the DOD cancelled the Crusader program was that the leadership felt that the need the Crusader was aimed at was addressed adequately by other combinations of existing systems.

Concluding that there are no needs will be very controversial. Some important group pushed to have a CBA done, and they did so with the firm belief that there was some operational problem that needed to be fixed. They will not react well if you tell them they were wrong, so you will have to do considerable consultation with your chain of command on how to bring your assessment forward. Note that if you execute your analysis on the case-by-case basis we recommend in Section 7.4, the story will grow over time, and your opponents will not be able to accuse you of sucker-punching them with a completely unexpected outcome. They will still be upset, but you can honestly respond that they should have seen it coming.

7.6. Vision and Reality in Stating Needs

In 1939, there was nothing stopping the Army Air Forces from stating the need for a 2000-lb bomb that had 10-meter delivery accuracy in all weather conditions when delivered from a B-17. But writing down such a need would have been pointless, because no technology existed at that time that made such a weapon realizable.

Consequently, you need to understand that your statement of needs cannot be a plea for a miracle, nor can it induce the DOD to produce something made of unobtainium (or unaffordium). Your statement of needs has to be tempered by rough feasibility, cost, and schedule estimates, and you have to have some idea of what the DOD is willing to tolerate for additional investments in your areas.

Do not take this advice to mean that you should artificially limit your imagination. The DOD has a substantial research program and a substantial experimentation program, and both are designed to discover what is really possible. But, you are trying to define a strategy for your mission area with your CBA, and that brings with it the responsibility to not publish yet another plea for something like “omniscient predictive battlespace awareness.”

7.7. The Overall FNA Process

We illustrate our advice on the overall FNA process in Figure 15. Finalizing your analytical approach and collecting performance data is the preparation phase. Choosing a straightforward scenario to begin with starts the scenario analysis-analysis reconciliation phase, and the entire exercise concludes with the derivation and documentation of needs.

To conclude this section, we add some additional points. To give advice on *when* a shortcoming will become a need, you will have to examine scenarios in at least two time periods. We previously recommended considering current-day scenarios and capabilities, and you will also want to examine some time period either at or past the end of the Future Years Defense Plan (7-10 years in the future).

You also have some choices in what framework to use to portray our needs. The JCIDS manual emphasizes UJTLs, but you could also couch your needs in terms of the emerging Joint Capability Areas (JCAs). The point is to try and present the needs in solution-agnostic terms to the maximum extent possible; rather than saying “we need the Crusader,” the more general statement would be that “we need survivable, responsive, precise, high-volume fires for suppressing enemy activities as well as imposing attrition.” Furthermore, you should be able to justify this by saying something like “this conclusion was derived from our analysis of Scenario X in year Y, where we do not have a high enough likelihood of succeeding during the early counterbattery fight using doctrinal CONOPS X, Y, or Z.”

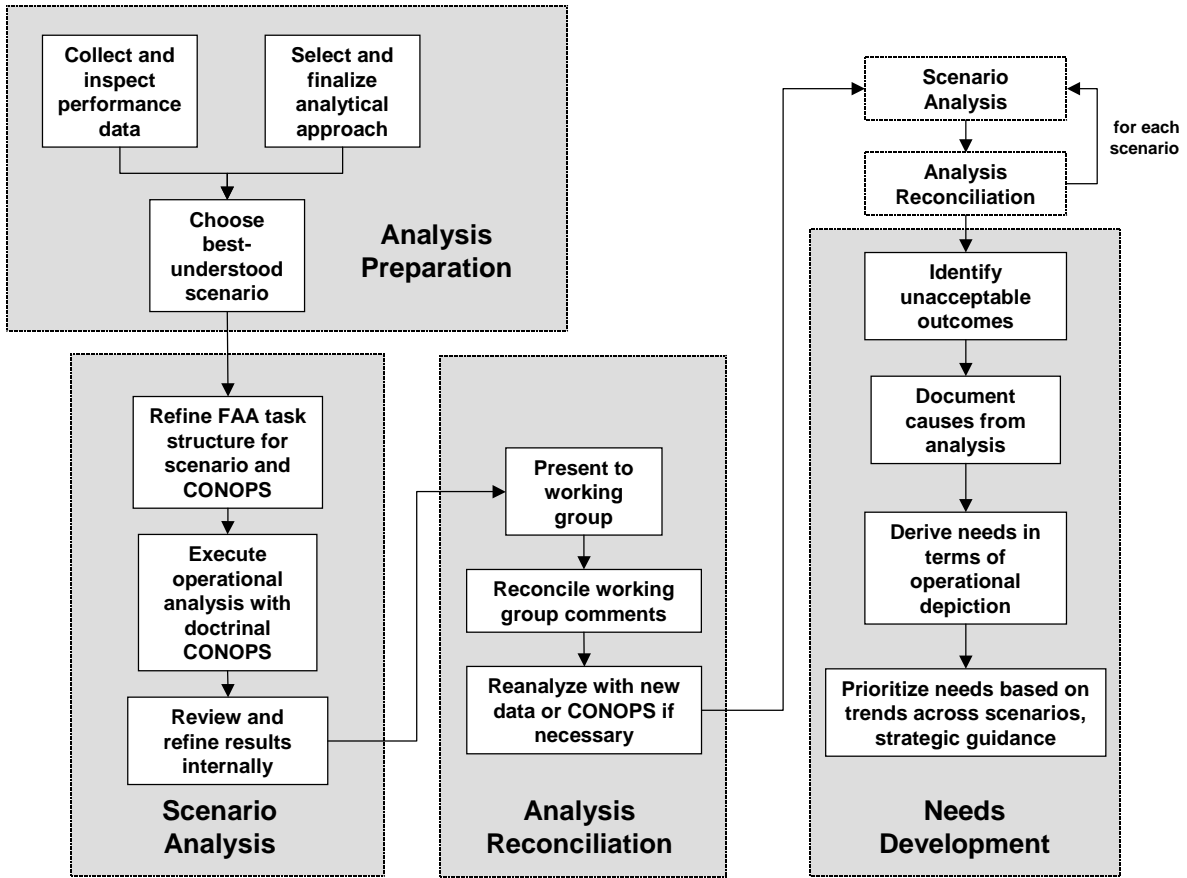


Figure 15. Overall FNA task flow.

8. The Functional Solutions Analysis (FSA)

Here is some of the formal guidance on the FSA:

“... it is a joint assessment of potential approaches to solving, or at least mitigating, the capability gaps identified in the FNA. The approaches identified should include the broadest possible range of joint possibilities for addressing the capability gaps...

Solutions proposed by an FSA must meet three criteria:

- (1) they are strategically responsive and deliver solutions when and where they are needed;
- (2) they are feasible with respect to policy, personnel limitations, and technological risk; and
- (3) they are realizable; the DOD could actually resource and implement the solutions.” [CJCSM 3170.01C, 2006, p. A-12].

As with the FAA and FNA, we will suggest a process that will help you execute what would seem to be an overwhelming task. But some other remarks are in order.

A few CBAs done to date have produced FNAs that recommended multiple FSAs. The problem with this approach is that a CBA is supposed to take a comprehensive look at a mission or functional area, and ultimately make recommendations on an integrated package. Having a set of disparate organizations conduct multiple FSAs without any sort of unifying oversight can provide a balanced set of recommendations only by accident. Also, we noted in the last chapter that prioritization is not very useful without knowledge of resource considerations. If you split out your FSA, what mechanism exists to consolidate the answers into something that makes sense as a whole? The JROC won't do this; if they could, they wouldn't have bothered to ask you to do an assessment in the first place.

Of course, reality may intrude, and you may not be given the time, resources, or clearances necessary to do a completely integrated FSA. In that case, you will have to come up with some recommendations about how much to pursue, and proceed accordingly. As an extreme, you could simply stop with the FNA, throw the needs out to the community, and hope someone runs with them. In fact, a JCD, which does not contain an FSA, is an example of this “market-based” approach to obtaining solutions. But you should let everyone know that this is not as efficient as conducting a deliberate solutions analysis.

As with the FAA and FNA, you do not need integrated architectures to perform your FSA. You are free to use them if they help, but they are not a requirement.

Finally, you might ask what the difference is between an FSA and an AoA, which is commissioned by the acquisition community. While we note that the interface between JCIDS and the DOD acquisition process is still evolving, we will say that, at present, the FSA (and CBA in general) have a much broader scope than an AoA, which tends to evaluate specific materiel alternatives. In particular, the CBA should yield the most attractive and realizable CONOPS, essentially recommending how to fight. The AoA should adopt these recommendations as an assumption, and concentrate on the particulars of what should be provided to fight in that manner.

Also, the CBA will provide useful products to the AoA, particularly the linkage to the strategic guidance, the scenarios, the measures of effectiveness, and advice on which problems to solve using materiel versus non-materiel approaches. The CBA will typically examine many more functions than an AoA, and will recommend which ones require further attention. The USAF Office of Aerospace Studies (OAS) has published an AoA handbook [OAS, 2004] that also summarizes JCIDS guidance on CBAs, so it provides a view of what an AoA should receive from an FSA.

8.1. Gaps Versus Game-Changing Capabilities

We offer a distinction that is not in any of the formal guidance, but will help you classify possible solutions. Recall that our advice on the FNA is to evaluate doctrinal approaches. You will probably find that the doctrinal approach, using programmed forces and capabilities, is not adequate for some relevant threat. The natural tendency is to inspect these cases, zero in on the functions that seem to be the problem, call them “gaps,” and call for improved versions of things that currently perform those functions.

It is possible, of course, that getting upgraded versions of the same things would fill the needs. But, consider as an example the British air defense problem of the late 1930’s. Using methods available at that time, they could only spot attacking air forces from about 10 miles out, which provided them insufficient warning to interdict the attackers. A British FNA at that time would probably conclude that to address the gaps, they would need higher-wattage klieg lights, better barrage balloons, many more spotters, and maybe a companion to their gigantic concrete acoustic mirror in the Romney marsh – in other words, better versions of the same things.

Contrast this with what the British actually did, which was to employ radar. Radar did not fill a gap, in the sense of this paper; instead, it was a completely different way of doing things, and represented what we call a *game-changing capability*. With radar, attackers could be detected at far greater distances in all weather, and the introduction of this technology completely changed the dynamics of air defense.

Furthermore, finding a game-changing capability also introduces the need to provide an employment concept that makes sense. Again, bureaucratic issues will arise, because there will be no textbook answer on the best use of something totally new, and merely plugging the innovation into an existing CONOPS probably won’t work. As an example, many authors have contended that the true innovation of the British WWII Chain Home radar system was not the radars (which were primitive HF systems), but the “Filter Room” established at Bentley Prior. The British concept was to have all contacts reported to this single facility, which then built a common air picture, and planned and executed responses.

A potential game-changing capability is a good candidate for experimentation, because it will take actual fieldwork to confirm the utility of the idea and discover good ways to employ it. But, your team must have the expertise to even spot the opportunity, as it will *not* look like a better version of what we already have.

You may not, in your CBA, uncover any game-changing capabilities. *But, the most important part of your FSA will be for you to look hard for them.* These capabilities may, like radar, come in the form of a revolutionary technology advance. Others, such as the development of amphibious operations capability on the eve of World War II, may come from a revolutionary set of operating concepts supported by existing technology.

In any case, introducing a game-changing capability will meet with considerable resistance, as they are by their nature at odds with the status quo. For example, the introduction of mechanized ground forces made horse cavalry irrelevant, but the members of that community did not give up their existence without a fight. If you uncover a fundamental weakness that a game-changing capability could solve, you will face reflexive and ferocious opposition from whatever horse cavalry is threatened by your proposals, as well as (justifiable) skepticism from everyone else.

So, if you are going to propose a game-changing capability, plan on a fight. Think through who will be opposed and why, and formulate a good defense. Do not underestimate the ability of the bureaucracy to make a good idea so painful that even its originator is relieved to see it die.

8.2. Examining Policy Alternatives

CBAs done to date have not done a good job of investigating policy alternatives. Much of this is due to an entrenched tendency to separate policy from operational challenges, and operational analysts tend to assume that the policy is immutable.

But to not investigate policy alternatives is to ignore a large set of possibilities for non-materiel solutions. These options could range from simply avoiding the problem to completely changing the strategic response. Now, we do not recommend that you offer “do nothing” as an alternative; in addition to antagonizing your audiences, it would have been pointless to choose the scenario as part of your sample if the expectation was that the DOD would not respond.

But consider the Iranian hostage rescue situation. Suppose we were analyzing that case in a CBA, and concluded that we could not build a force that could deliver a high enough probability of success in the next 10 years. A CBA could suggest altering the strategic response by, say, inducing the enemy to free the hostages via a maritime blockade, strategic bombing of economic targets, or holding the leadership at risk with long-range strategic weapons. Such options would have other policy implications, such as affecting U.S. relations in the region.

You may argue that you can’t deal with such open-ended possibilities, and that you would have to stick with the main objective of conducting a hostage rescue via direct action. But, JCIDS does not stipulate this, and in fact demands quite the opposite – the imperative is to contemplate broad alternatives. Recall the hostage rescue goals from Section 7.5, which were to:

- maximize probability of mission success;
- protect the lives of the hostages;
- maximize security in the planning process;
- minimize collateral damage;
- minimize the size of the planning group and the assault force; and
- use only US forces. [Ryan, 1985, pp. 10-16].

The third and fifth of these conditions resulted from the direct action CONOPS, but you can envision other approaches that obey the other four edicts.

The response to *any* scenario has alternatives rooted in policy changes. We have already advised you to include policy expertise on your core team, and you should employ that expertise in the FSA.

A policy change will almost always imply a CONOPS that is different than the baseline CONOPS written into an Analytical Agenda scenario. This will create a substantial bureaucratic challenge for you, because the baseline CONOPS was developed by a large number of people and went through lengthy coordination. As a result, deviating from this baseline will certainly spark protests. JCIDS, however, demands that you analyze alternative CONOPS, so you can use that edict in the instruction to solicit proposals from your working group.

Also, you do not need to produce a consensus CONOPS as you would if you were constructing an Analytical Agenda scenario baseline. Since you are looking for solutions, you can collect multiple CONOPS and evaluate them, with an eye towards identifying under what conditions one CONOPS would work better than another.

8.3. Analysis of Mission Effectiveness

In the course of doing the FSA, you will have to revisit the scenario analyses you did in the FNA to analyze new solutions that you are considering. If you have adopted an agile modeling process as we recommend in Section 7.2, you should be able to accommodate new systems, forces, or CONOPS and evaluate them using the measures you developed for the FAA.

One issue is that you will probably be looking at options whose performance is not well understood, since they probably do not exist yet. In these cases, you should develop bounds on what these (typically nonexistent) systems could do and analyze the extremes to discover where they would compete favorably. Also, these options may require CONOPS that are radically different than those you assessed in the FNA, and tasks that are radically different than those you developed in the FAA. These are probably the most interesting alternatives, and there is no reason to reject them because they do not fit within existing task structures.

Evaluating alternative CONOPS will require you to go back to what you did in the FNA, when you evaluated doctrinal CONOPS. You will have to develop a relevant operational depiction as discussed in Section 7.1, and evaluate it using the analytical approach you set up for the FNA. If the proposed CONOPS is so different that your existing analytical approach can't represent it, you will have to either augment your analytical approach or recommend the CONOPS for experimentation. Otherwise, you are just revisiting the FNA with a modified CONOPS.

8.4. Finding Affordable, Feasible, and Responsive Solutions

Recall that JCIDS presents three criteria for FSA solutions:

- they are affordable;
- they are feasible, both from the standpoint of policy and technology; and
- they are strategically responsive; that is, they deliver solutions when they are needed.

JCIDS is not a mature process, and one of the most immature parts of JCIDS is how it should treat affordability. Historically, the requirements processes operated by the JROC have restricted their advice to operational needs and solutions, and have left the question of whether a particular solution is worth the investment to the larger programming and acquisition processes. But, you can no longer avoid the issue in a CBA.

For existing programs, gathering cost estimates is a matter of contacting the program office or OSD/PA&E's Cost Analysis Improvement Group (CAIG). The program office estimate and the CAIG's estimate will generally differ, so you should inspect both.

Also get manpower estimates. Many current programs have justified increased materiel expense via reductions in manning requirements. You will have to determine whether or not these manpower reductions are captured in your cost data (as they would be in life-cycle costs), or whether they are not accounted for in developmental and per-unit acquisition costs.

Demonstration programs or proposed programs are much more difficult. In these cases, you may have to commission a separate cost analysis to estimate what it would take to get the capability. If that gets to be too difficult or contentious, an alternative approach would be to get the high and low estimates and evaluate the worth of the capability for both cases.

JCIDS does not insist that you produce a very detailed independent cost estimate such as those required by the acquisition community. What you should be able to do, though, is characterize the 20-year life-cycle costs (or savings) of the things you are proposing, in terms of:

- developmental costs;

- facility or infrastructure costs;
- per-unit and rough force-level acquisition costs; and
- recurring operating costs.

These are the four critical cost components in any solution. We have to pay to develop a capability, provide a place to house it in peacetime, procure it, and operate, maintain, and staff it. If you can portray your CBA solutions in those terms (with rough, but reasonable estimates) and contrast them with the program of record, you will have provided a *complete* economic picture to the leadership. It is one thing to prioritize needs and potential solutions, but quite another to choose what solutions you really procure. Everyone has a vision of the car they always wanted; few can actually afford it.

Next, you must develop rough estimates of the technical feasibility of your proposed solutions. You cannot work at the engineering level, because you will be considering a broad range of possibilities. You can, however, use a framework like the following to classify the technical risk of your alternatives.

- **No risk.** This is a new use of existing systems, such as employing strategic bombers for close air support.
- **Very low risk.** This is a new use of systems that are due to be fielded in the near term.
- **Low risk.** This is a new combination of existed or programmed subsystems that will require new integration, such as equipping the existing Predator UAV with the existing Hellfire missile.
- **Medium risk.** These options require development of new equipment and systems, but they do not require technological or industrial advances.
- **High risk.** These options require significant scientific, technological, or industrial advances.

We note that JCIDS has begun using the more formal framework described in Defense Acquisition Guidebook [Section 10.5.2, 2006], which describes nine Technology Readiness Levels (TRLs). This is a framework similar to the one above, but contains more precise definitions of maturity of the technology. Clearly, you will need legitimate technology experts to make these kinds of assessments.

This leaves the question of strategic responsiveness. If you have done your job correctly in the FAA, you have characterized a range of security challenges that are supported by the area you are assessing. Are these problems that need solutions now? If not, when do we think that they will really become a problem, and what's the likelihood that they never become a problem? JCIDS is oriented at looking 7-14 years into the future, but many of the issues being considered in CBAs exist in the current day, and embarking on a leisurely 15-year development program may not be the best option.

Since you are dealing with uncertain futures, the question of strategic responsiveness contains considerable uncertainty. As a result, you may choose to frame options in terms of when they can be realized. As an example, the DOD realized in the early 1980s that it had a significant airlift shortfall. Rather than wait for the full execution of the C-17 program, the DOD opted to restart the C-5 production line and also procure a number of KC-10 tankers that had significant cargo-carrying capability. This solution had three components: a short-term fix with the KC-10; a mid-term fix with the C-5B; and a long-term fix with the C-17.

If a future threat has considerable uncertainty, then a longer-term hedge approach may be the better choice. People often decry the two-decade gestation period of the F-22 fighter, which was originally developed to prosecute the air war against much larger Soviet forces. When the Soviet Union dissolved, the F-22 program was delayed but was still retained as a hedge in case a similar threat was resurrected. The Soviets did not reappear, and the F-22 is now being procured in much smaller numbers than originally planned. Now, we will not debate whether this is by design or by accident, but the point is that recommending that the entire force be remade at great expense to address a challenge that *may* appear in 20 years is not particularly prudent when a hedged approach is available.

If you are proposing materiel solutions, you probably need to consult with the acquisition community on when those solutions could be fielded, assuming prompt budgetary action. Many things have to happen in any acquisition, and all of them take time that you need to estimate.

Too many DOD analyses present recommendations that are simply Christmas lists. They throw every solution imaginable at a problem, propose gold-plated systems, ask for ill-defined, magic technologies, recommend concepts that only apply in a narrow (or even fanciful) set of operational conditions, or outline solutions that are only realizable after three decades of development. We assume that, if for no other reason than professional pride, you do not want your CBA to become one of these analyses. The *only* way to ensure that is to seriously assess affordability, feasibility, and strategic responsiveness.

8.5. Describing Collections of Options Via Portfolios

You may feel that, if you follow our advice, that your CBA will accumulate what appears to be an unmanageable set of disparate options. The various alternatives will include a dog's breakfast of materiel approaches, policy alternatives, and perhaps even one or two game-changing capabilities, all with differing resource demands, future availabilities, technical risks, and contributions to your MOEs. So how do you integrate all the information you have accumulated and produce a coherent set of options?

The answer is that you need to come up with yet another organizing framework for your CBA that allows you to group sets of options coherently. We call these sets of options *portfolios*, and they are mutually supporting sets of recommendations that are related by a common theme.

One obvious portfolio framework that you should examine in all cases is one based on total solution cost. This framework would contain portfolios that consider three cases:

- best obtainable solution if costs are unconstrained;
- best solution that neither increases or decreases total costs; and
- best solution that achieves some specified decrease in costs.

Now, the situation may be such that your CBA does not have to consider solutions that decrease costs. After all, the leadership wanted your mission area examined, and they likely wanted it examined because they jointly committed to the need to improve it. But the first two portfolio options should be an output of your FSA *regardless*. You have to give good advice on the upper bound of realizable solutions, which is the cost-unconstrained case. You should also give good advice on the best cost-neutral solution, as this, coupled with the cost-unconstrained case, gives the leadership an estimate of the range of payoffs possible with additional investments. This is *not* the oft-criticized “budget-driven” approach to analysis, where the objective is to pay some bill by cutting capability in a mission area. Instead the idea is to characterize the spectrum of investment options and operational payoffs.

In addition, creating and analyzing the cost-decreasing case has the benefit of characterizing where the bulk of the costs lie in the legacy force, and whether those costs are commensurate with their contributions to your mission area. As an example, the DOD established continual fighter orbits over most major US cities after the attacks of September 11, 2001 to allow for rapid intercepts of any additional hijacked airliners. Clearly, a modern fighter such as an F-15C is grossly over designed for shooting down an airliner, and a CBA on this operational need would likely recommend a completely different portfolio of approaches if time were available to change procedures (such as passenger screening), modify existing systems (such as putting armored doors on crew compartments of airliners), or even procure inexpensive air-to-air or surface-to-air intercept capabilities. The point is that trying to employ legacy forces on the cheap to accomplish certain operations may reveal a substantial force capability-operating cost-need mismatch that you wouldn't have detected otherwise.

Another useful organizing framework addresses the uncertainty of having critical capabilities that are outside the scope of your CBA. For example, the DOD has committed to fielding the Global Information Grid (GIG) as a way to share information. Unfortunately, we don't know when (and perhaps if) the GIG will be realized, and your options are likely very different depending on the GIG's availability. This could lead to three portfolios:

- GIG assumed available;
- GIG assumed available, but solutions hedged against GIG not being available; and
- GIG assumed unavailable.

Other frameworks could revolve around strategic risk guidance across future security challenges (accept risk in one area to improve performance in another), choice of employment domain (ground, sea, air, space, or cyberspace), or even force basing posture (use CONUS-based or overseas-based forces). Our point is that choosing a few of these frameworks makes it much easier to assemble sets of options that are linked to overarching themes.

This leaves the question of how to assemble a portfolio option given a particular framework. This has to be a part of your FSA analysis plan, because you will quickly discover why Wall Street investment managers are paid so much money to assemble mutual fund portfolios. It is not an easy job, particularly if you are trying to find the best mix of options across multiple MOEs and affordability, risk, and responsiveness criteria.

As a result, you should seek a methodology that looks at lots of options. Too often, large DOD studies devolve to a slide that recommends three possible courses of action, one of which is obviously preferred, one of which is an obvious throwaway, and the last is included to satisfy the preferences of some particular senior leader or influential group. While senior leaders and influential groups can only be ignored at your own peril, their views should not artificially limit your ability to consider a large number of combinations. Analysts in the optimization community routinely solve problems with tens of thousands of variables and thousands of constraints, so computational capability is not the issue.

Using such approaches, however, puts you firmly into the realm of abstract tools as shown in Figure 14. So, you will have to invest some of your time into understanding how the contents of your various portfolios were generated if you choose one of these approaches.

Here's some advice on inspecting the contents of solution portfolios.

- **How is the portfolio divided among special-purpose and general-purpose solutions?** An infantry battalion can accomplish a large variety of missions. It is not, however, the best choice for disarming a captured nuclear weapon, as that is the specialty of a very small number of highly trained teams. If your portfolio contains all special-purpose

investments, you may be in danger of producing a set of solutions that are optimized only for particular situations, and are not useful otherwise. Conversely, if your portfolio contains nothing but general-purpose solutions, you may be in danger of producing a team full of decathletes – competent, but likely to be beaten by a team that contains some number of specialists.

- **How much is the portfolio at odds with current investment trends?** If your portfolio calls for, say, a doubling or tripling of funding in a mission area that has not yet resulted in an actual operational disaster, you will have a difficult time making your case. Even when risks are understood (such as what would happen if the levees protecting the city of New Orleans failed in a hurricane, as they did in 2005), it is very difficult to overcome a long history of no disaster.
- **Do you have a portfolio that largely recommends realizable non-materiel solutions?** You should produce at least one portfolio that does not recommend a new acquisition program. This will bound the amount of improvement we can realize without new materiel, and also satisfies the JCIDS requirements to analyze alternative CONOPS in the FSA.

One type of CBA that may present a challenge for the portfolio approach is one that proposes an operational concept, such as seabasing. But, even these types of CBAs contain different options. For example, a possible theme for alternative seabasing portfolios could be organized around the question of what type of force to seabase (SOF, ISR, fixed wing aviation, or a full Marine Expeditionary Force). This framework would result in multiple options, and would work well in bounding the available seabasing alternatives.

The final challenge with assembling a portfolio is that you are selecting a set of options that presumably optimize something. That's easy, you say; I'm trying to optimize the likelihood of mission success. But, recall that way back in the FAA you developed a set of measures to judge the value of a particular CONOPS. Those measures are what you should be using to evaluate the mission effectiveness of your portfolios.

Some of your measures will be at odds with each other. For example, the option that minimizes expected collateral damage may have a low lethality. The existence of such conflicting aims is why analysts do so-called trade studies; they use these studies to find out how various operational goals trade off against each other.

Your natural response to this may be to interrogate the relevant decision makers on their priorities. This almost never works, because:

- you can't get enough time with the right decision makers to unambiguously determine their (multidimensional) priorities;
- the decision makers will disagree on what the priorities should be;
- the decision makers don't have well-formed priorities (because if they did, they wouldn't have asked you to do the CBA!); and
- there is no guarantee that they won't reject your recommendations, even if you used their priorities.

A better approach is to examine your measures and try to discover which sets of priorities cause the recommended portfolio to change. Returning the Iranian hostage rescue, prior to Desert One the impetus was on planning secrecy and minimal force size. In the subsequent planning for another attempt *after* Desert One, these imperatives were much less important, and a CBA aimed at such a scenario would likely recommend a much different approach.

Note that your measures in and of themselves can provide a framework for portfolio options. You could have, say, a minimal collateral damage portfolio, a maximum lethality portfolio, and a minimum force size portfolio. This approach also directly addresses the issue of conflicting operational goals, because you (and your target audiences) can see how the solution choices change in the portfolios as the measures change.

The construction of a portfolio requires weighing the major components of the possible solutions: their mission effectiveness, their affordability, their technical risk, and their strategic responsiveness. The frameworks you choose will dictate how you use these components in constructing portfolios, and you should be able to formulate several interesting portfolios that contain a mix of approaches, such as the airlift example we discussed above.

8.6. Excesses

At various places in the formal JCIDS documentation, you will find references that require you to identify things called “redundancies” and “overlaps”. We advise that the appropriate place to propose capabilities that are excess to needs is in the FSA. It is not until you know the needs, the spectrum of realizable options, and the resource implications of those options that you can judge something as being unnecessary.

Admittedly, this is very dangerous territory. Previous Joint Staff requirements processes only commented on needs, and did not offer up offsets (a polite term for budget sacrifices). JCIDS, however, mandates that the issue of excesses be examined, so you will have to consider them.

The advice above on portfolio frameworks also gives you a tenable way to bring forward candidates for excess. If you build a cost-neutral or a cost-saving portfolio, something in the programmed force will likely become an offset make room for a more efficient capability. So, that framework will automatically identify excess candidates.

Using risk guidance from the strategic documents is another way to present a framework for excesses. For example, DOD funding for irregular warfare capabilities has increased dramatically since 2001, while several traditional warfighting systems have been cancelled or curtailed. The implication is that strategic priorities have changed what we view as excesses in general-purpose forces.

Your challenge is that you have to stay within the scope of your CBA. The current state of JCIDS is such that you are not allowed to declare excesses in other mission areas beyond the scope you defined in the FAA; you are not allowed to propose gutting the Defense Commissary Agency to pay for new capabilities that your CBA needs. Nonetheless, you will be looking at a broad range of force elements and systems, and if you defined your scope correctly, you will have a large trade space. Some of these forces and systems are *only* applicable to your mission area, so you can comment authoritatively on whether they are redundant.

The more difficult problem is judging general-purpose capabilities. Some time ago, the DOD opted to remove nuclear weapons capability from the B-1B bomber, as it was deemed to be excess to that particular mission. This decision did not, however, make the B-1B excess in general, as it has considerable conventional capability. To declare it as excess in general would require examining its conventional capabilities.

This unfortunately leaves the defender of any capability a trump card. As long as a program defender can demonstrate his program has utility outside of your CBA’s mission area, then they can claim you can’t brand it as excess without further study. Your best option in this case is to identify it as excess to your mission area, and let the JROC decide whether to commission the additional study.

Since it is easy to construct a situation where the thing you believe is excess is the *exactly* the thing we had to have, we have stressed assessing a broad range of operational situations. If you have an adequate scenario sample, and the resource in question doesn't compete favorably in *any* of them, then you will have a strong case. Similarly, if the resource only provides minimal improvements in cases where the strategic guidance says we can take risk, it may also be excess, particularly if it is expensive.

It is unlikely that you will get concurrence on excesses from your working group. Everything in the DOD is supported by someone, and they will execute their counterfire plan as soon as they hear you may threaten their program. As a result, you will have to do excess determination within your core team, bring your recommendations forward to your leadership, and do considerable planning on how to introduce your results so they do not suffer crib death.

In these cases, disagreement is unavoidable, so don't waste time trying to avoid it. Instead, ensure you have solid, defensible arguments for excesses, and ensure that your arguments make it to the senior leaders.

8.7. The Overall FSA Process

Figure 16 outlines FSA analytic process we have discussed. The six major tasks are generating alternatives, assessing the effectiveness of alternatives, assessing the feasibility of alternatives (affordability, technical risk, and strategic responsiveness), portfolio planning and generation, identifying game-changing capabilities, and excess analysis.

Note that there is a link between including a game-changing capability in a portfolio if you can come up with a reasonable CONOPS; otherwise, the recommendation would be for experimentation.

You could do the portfolio planning tasks earlier in the CBA if you have the time available. However, leaving those tasks until the FSA gives you the maximum amount of information about alternatives, and doesn't prematurely commit you to a set of portfolio frameworks.

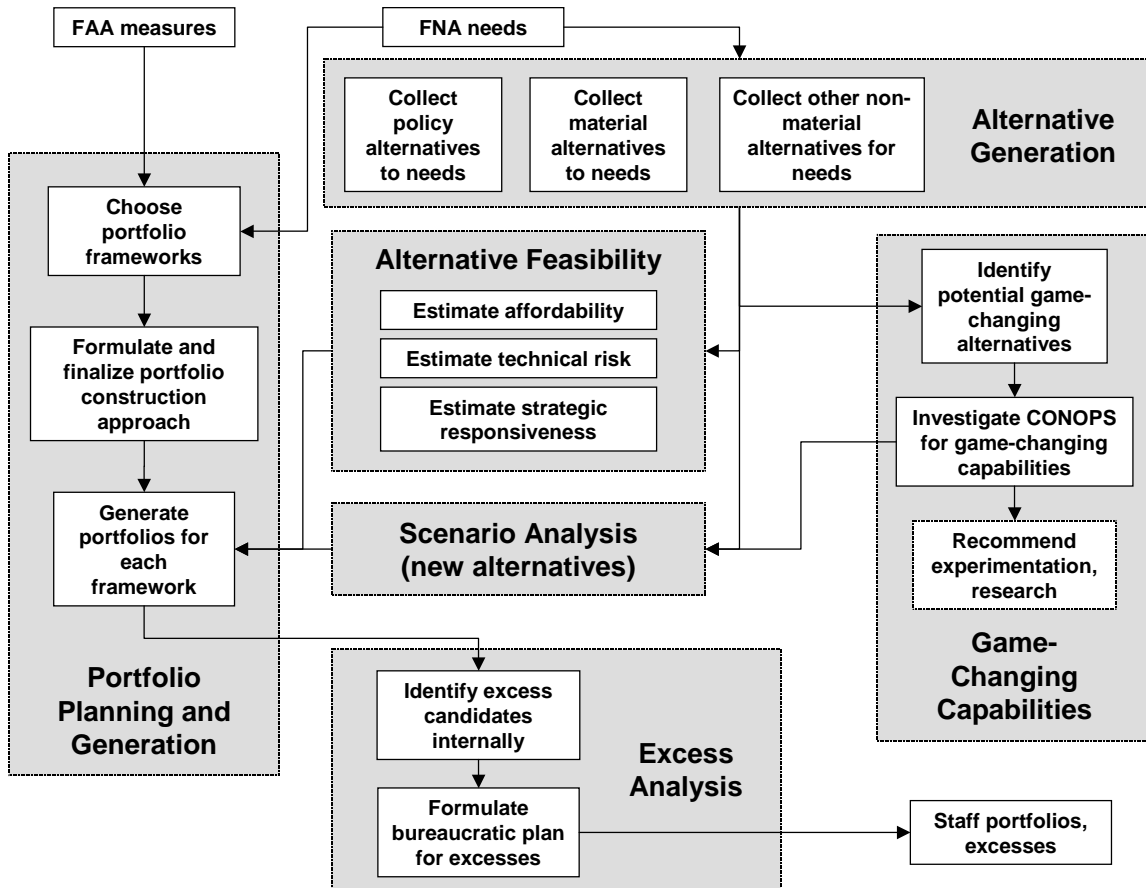


Figure 16. Overall FSA task flow.

9. The Quick Turn CBA

In some cases, you may be tasked with what has become known as a “Quick Turn CBA.” As opposed to the quick look we recommend for a more drawn-out effort, this is a CBA that must be done on a very tight timeline – normally 30 to 60 days. Clearly, you will have to make substantial adjustments to produce an assessment this quickly, so we will offer some advice on what can be done in these cases.

In addition to this section, we include an appendix that describes a Quick Turn CBA done on biometrics in mid-2006. This provides a useful case study for such an assessment.

9.1. Typical Reasons for an Accelerated Assessment

So why would anyone demand that a CBA be done in 30 days? Since this is a central part of the “why are you doing this CBA” question described in Section 2.1, you will again have to devote some time to understanding why the deadlines are so tight. Some common reasons are as follows.

- **To address an imminent budget or programming action.** A common reason for a Quick Turn CBA is that a funding decision of some kind is looming, and those making the decision want one last unified look at the issue. Such cases will normally have been simmering for a long time, and there will be lots of supporting information available. Your challenge will be to find and exploit the best of this information.
- **To break a bureaucratic logjam.** Large bureaucracies like the DOD tend to stall new actions, so frustrated senior officials occasionally sweep aside normal procedures and commission a special effort to get something assessed when the organizations that normally do the work cannot do so. In such cases, you should find out why those organizations could not deliver, and keep those reasons in mind as you execute your assessment. You will probably also have to rely on information those organizations have developed.
- **To react to an unexpected budget or program event.** The collapse of an acquisition program or some other radical change in the plan will tend to paralyze the larger process that produced the plan in the first place. Under these circumstances, someone has put you in charge of recommending the appropriate triage. This will be a very challenging assessment, because the range of options will be broad and you will also have to consider the ripple effects of the unexpected event.
- **To address an emerging need.** While the DOD has a separate Joint Urgent Operational Need process for current warfighting issues, senior officials may decide that immediate examination is required to move the DOD towards finding enduring solutions. The CBA described in Appendix A is such a case. Such assessments normally do not require much FAA or FNA work, because the shortcoming has already been demonstrated. However, it may be very challenging to come up with enduring solutions on a short timeline.
- **To settle a disagreement.** The DOD contains many large organizations which periodically find themselves at odds with each other. In this case, the Quick Turn CBA is a form of arbitration. Of course, the challenge here is that you are in the middle, and you don’t want to be crushed between collisions of large bodies.
- **To pull together a set of disparate examinations.** The division of labor in the DOD sometimes makes it impossible to conduct an integrated examination of an issue. Consider, for example, the issue of distinguishing among friends and foes in combat. While this is everyone’s problem, it does not belong to any particular Service, and has only recently

been examined in any sort of integrated fashion. The challenge in this type of CBA is finding all the pieces and then finding a way to assemble them.

9.2. Scoping, Downscoping, and Negotiating the Objective

One thing you should do for a Quick Turn CBA is to negotiate the scope and objectives of the effort *at the start*. You do not have time to start over, so if you begin facing the wrong direction, you'll never get back.

The only foolproof way to do this is to write some sort of memo in English, *not PowerPoint*[®], that describes your understanding of the CBA, what you plan to deliver, and how to whoever tasked you. This will often be difficult, because short-fuse tasks that come from on high are inevitably spun through multiple levels of management before they get to you. You may not be able to get an audience with the originator, so your only real option is to write something down and pass it back up.

So what do you write?

This is not a study plan; in fact, what you want is more akin to a five paragraph order. In that vein, here's a possible outline:

BACKGROUND (i.e., Situation).

Circumstances leading to the tasking. Try to use the taxonomy in Section 9.1 to describe why this is being done.

Tasking events. Write a sentence or two that describes how the job landed on you. This will help expose any inaccuracies in message transmission.

Sources of uncertainty. Describe what is currently not known (or not sufficiently proven or disproved) that prevents a decision.

TASKING (i.e., Mission).

Questions to be answered. This is also known as "essential elements of analysis" in some circles. List the major questions.

Decisions being informed. Write what decision you believe you are informing. Will this assessment inform an imminent budget action? Provide language for upcoming strategic guidance? Save or kill a program?

Timeline. Write a sentence or two on when the deliverables are due, and to whom.

ASSESSMENT PLAN (i.e., Execution).

Scenarios and functions considered. List the scenarios you will use and the functions you will examine. This section specifies the operational scope of the assessment.

Alternatives considered. Describe how you will generate alternatives, or list the alternatives you believe you have been given. This will frame the solution scope.

Operational evaluation methodology. Describe how you will do this (or if it is even required). Will you use expert judgment, tabletop wargames, or ...?

Technical risk methodology. Say whether this is required, and if so how you plan to do it.

Costing methodology. Say whether this is required, and if so how you plan to do it.

Portfolio methodology. Say whether this is required, and how you plan to address it if that is the case.

Schedule. List the major phase points only; there will not be more than two or three of them in a 30- to 60-day effort.

RESOURCES (i.e., Service Support).

Organizations supporting the working group. List the people you'll use and their providing organizations, if known.

External resources. Estimate the funding necessary, or describe what tasks you are diverting resources from to support the CBA.

Classification. State the classification level of the CBA, and whether obtaining higher-level accesses (or people who already have those accesses) is a limiting factor to meeting the deadline.

OVERSIGHT (i.e., Command and Signal)

Governance. List the groups (hopefully not more than two) that will oversee your assessment.

Communications. List the final products to be delivered (briefing, report).

You should write this *immediately* based on what you know, and you should be able to fit the initial versions into two or three pages. If you have some part of your team assembled, work it over with them. Then, walk it back up the tasking chain as far as time and bureaucratic constraints will allow.

Typically, you will have an initial meeting where you find out you're running a Quick Turn CBA, with an invitation to come to the next meeting to finalize the tasking. If you're really agile, you'll show up at the follow-on session with a document like the one outlined above. Working over the words will prevent a great deal of misunderstanding, which you cannot afford in an accelerated effort.

Also, you can maintain this document as a management tool for your working group.

9.3. Forming a Team

With such a short timeline, you will have to build a team while you are negotiating the assessment. Furthermore, you will have to be economical about who you bring in, and people who can cover more than one area of expertise will be very valuable.

Referring to the list of expertise areas in Section 2.6, you will probably not have to dedicate people to providing bureaucratic agility and study management, as the person who commissioned your work is probably far up in the DOD hierarchy. When the Vice Chairman or an Under Secretary of Defense tells you to do something in 30 days, you can simply ignore many protests you might otherwise have to address.

This still leaves a number of expertise areas that have to be covered. Suppose you can get rid of the need for a dedicated bureaucratic navigator and a study manager, and you (the study lead) will be the communicator. Doctrinal knowledge will be essential, as you have to have access to real expertise on how things are currently done. Also, the right doctrinal expert will always be able to estimate the operational performance of alternatives from his experience, so you will at least have that.

You still may need analytical ability, cost estimation, technical knowledge, adversary knowledge, and policy knowledge. Of these, the need for technical and cost expertise will depend on how much uncertainty is associated with the alternatives (particularly materiel alternatives). If the reason you are compressing the CBA is to settle a disagreement or to break

a logjam, there are likely competing views on the availability and costs of the alternatives. You may be able to do the assessment using these views as bounds (e.g., what should we do if the thing actually costs X), but if these parameters are truly unknown, you will have to devote some time to estimating them.

The issue is similar for adversary and policy expertise. If your CBA is aimed at a particular scenario and a specified enemy with well-understood policy and force employment boundaries, you may not need dedicated experts. We warn you, however, that the choice of opponent and operational situation drives the conclusions, so be careful about dismissing these needs too quickly.

The question of streamlining your organization really boils down to this: where is the uncertainty? What is it about this decision that we need to investigate? The answer to this question really defines what you need on your team and how much you can accomplish in a short timeline.

Furthermore, the type of analytic work that can be done is dictated by the area(s) of uncertainty and the timeline. If you attempt to do analytics that involve operational evaluation or portfolio construction, then you will need a lead analyst that is very creative. In particular, you will not have time to execute the normal way of estimating operational outcomes (unless you are in the rare position of being able to find and exploit work that has already been done). Mass won't help, either; adding more analysts will slow you down. Instead, insist on getting someone who has shown he can do the job under these conditions.

It is highly unlikely that the decision makers that task you with the assessment will give you a team. It is also unlikely that the right team is in place and available (or even known) to you. So, you will have to conduct some sort of draft. Now, here is where you can exploit your chain of command, as they have been around longer than you and generally have a broader range of contacts. What you should do, once you have some understanding of the task, is write down the types of people you need as part of your five-paragraph order. Then, take that list back up the chain and see if you can get help in getting those types of people. Even if you are very confident that you know who you need, you should try to exploit your seniors' knowledge of their organizations to get the right expertise.

You will also have to control the number of people who want to subscribe to your study. Most short-fuse efforts have high priority, and will attract a large number of rubbernecks. In this case, you will have to be brutal and combine the working group and study group into one team, and simply banish spectators that are neither contributors nor decision makers. The process we recommend in Section 3 of having a study group produce and a working group review will be problematic; if you cannot avoid such an arrangement, at least force the working group to be as small as possible, and do not produce extra materials for them beyond what you are producing in the course of the effort. Unless your needs for functional skills dictate otherwise, you should not allow more than one representative on your team from any external organization.

An aside: directed telescopes and theater critics. Historian Martin Van Creveld coined the term "directed telescope" to describe a commander's use of a special, trusted officer or agent to bring him information directly (see Griffin [1985] for a complete discussion). If you are assessing a hot issue on a short timeline, you may end up with such a person on your team. If that person is serving the decision maker who commissioned the CBA, then you may have to deal with some difficult issues.

First, recognize that the best arrangement is for you to be in regular contact with the decision maker, rather than someone who ostensibly is working for you but instead is someone else's agent. If that arrangement is impossible, all is not lost. After all, it is likely that the directed

telescope will give you more direct access and faster feedback than you could get otherwise. So, see if you can make the situation better support your assessment.

Second, you need to make sure that you are in the lead, and that the directed telescope does not take over. Decision makers will usually appoint someone who does not attempt this sort of thing, but occasionally you will encounter a liaison who feels compelled to wave his patron's gun in your face. In these cases, you will have to fall back on your experience to reassert your authority.

The notion of a "theater critic" is less well-documented, but is nonetheless a substantive issue. This situation arises when some organization refuses to provide representation for your Quick Turn CBA. Ordinarily, this would be fine. But, if that organization also has veto authority over your results, you have a theater critic – a person, group, or organization that does not participate in the production, but will judge, and possibly kill off, the finished product.

Almost any organization can opt to play theater critic, and you will not have the time to maneuver, cajole, or shame them into participation. What you can do, however, is to offer them one or two progress briefings during the course of your assessment. This will eat into your already-tight schedule, but will allow you to expose issues that you might not see coming until the end game (when it is too late).

9.4. Working Arrangements

You will naturally have to find dedicated work space for your team, along with computer support, phones, white boards, ready sources of caffeine, and all the other things you require when crashing on a project. But, a larger issue is how you will operate your team.

We cannot give you much scientific advice, because the best way to make your team work is a complex function of the topic and the participants. In general, though, you have an early choice as to whether to attempt some reasonable division of labor or to operate your CBA team as a committee of the whole. Most of us would immediately opt for the former, as we know that difficult jobs generally must be divided up.

Unfortunately, you probably don't know much about the people you've gotten, so you won't have a very good idea of who can really do what. Under those circumstances, wasting a day or two in discussions that don't seem to result in much isn't really a waste. Instead, view those sessions as a way to find out the abilities and beliefs in the group, as well as a way to get people used to each other. Now, we are not suggesting you begin with some sort of team-building exercise; while that may be very effective, it may not suit your style (much less the styles in your team). But, you will have to find some way to begin functioning, and planning for a day or two of loosely-structured debate isn't unreasonable. You will probably find it much easier to divide the tasks among the group after such an exercise.

There is, however, one arrangement you should set up immediately, and that is having someone function as a recorder for all the meetings. You will be moving very quickly, and it will be very difficult to remember at the end how something was decided. Save yourself some trouble and assign someone to man a keyboard for every session to capture the essentials of the discussions. The usual summary briefing slides will NOT capture this information, and you will invariably need it as a reference when you try to build your final story. You don't want a stenographer; you need someone who can *summarize* the discussions in English, and who can detect and document when important conclusions and decisions are made.

Having such a diary also helps your team. As much as you would like to have total control of your people, the reality is that you will have some important members of your group that

simply cannot work full-time on your effort. If you have summaries, they can scan them and catch up on what happened while they were working elsewhere.

9.5. Designing to Time

Figures 9, 15, and 16 suggest tasks and flows for a normal CBA. But, since a Quick Turn CBA is highly compressed, the natural question is what can be skipped or accelerated.

Before you panic, go all the way back to Figure 3, which reduces a CBA to the most pedestrian representation possible. Can you skip any of these questions? If so, then you can concentrate on the questions that you do have to address. In what follows, we discuss how each of the major parts of a CBA may be compressed, under the assumption that your Quick Turn CBA may have to consider any or all of them. But, start with Figure 3 before getting into too much detail.

It is likely that whoever tasked your Quick Turn CBA felt there was enough information on tasks, conditions, and standards that you won't need to do the activities in an FAA. Regardless of the truth of this belief, you must get concurrence at the start on two things:

- scenarios to be considered (specify conditions); and
- functions to be addressed (derive tasks).

You will still need a task structure of some kind and a set of measures, but you don't need to have those perfected at the start.

Figure 17 below shows a possible adjustment of the FAA process. It makes several steps parallel; more importantly, it assumes that the scenarios and functions are settled in the initial negotiations over the assessment, along with some guidance on relevant standards. Consequently, you will *specify*, rather than coordinate, what operational cases and functions will be assessed, and you will be drafting task structures and final measures.

Note that gathering doctrinal experts is an important first step. Getting them will allow you to draft a five-paragraph order that is coherent enough to discuss with your management.

Figure 18 shows how an FNA might be compressed. You still will have one or more operational situations that you are considering, but you will not have to go through a lengthy reconciliation step with a number of outside organizations. In a Quick Turn CBA, your working group will do the work and then move on to the next situation.

Remember that the FNA is designed to evaluate *doctrinal* approaches using *programmed forces*. If this evaluation has occurred in a prior study or in an actual operation, your FNA evaluation just consists of citing that work and justifying that the work is valid and applies to your assessment. Furthermore, if the needs are specified as part of the tasking, you may not need to do an FNA at all.

Figure 19 shows how you might collapse an FSA to accommodate Quick Look timelines. You will note that it doesn't appear to be compressed much; in fact, the only task that drops out is the need to staff excess candidates.

But, several major tasks may not apply to your Quick Turn CBA. For example, there may be no need to do excess analysis. In addition, the issue of portfolios may collapse to recommending one alternative from several choices, so the entire need for portfolio generation under different frameworks disappears. Also, you may not uncover any game-changing capabilities, or you may decide that the ones you have found can be executed adequately with existing CONOPS.

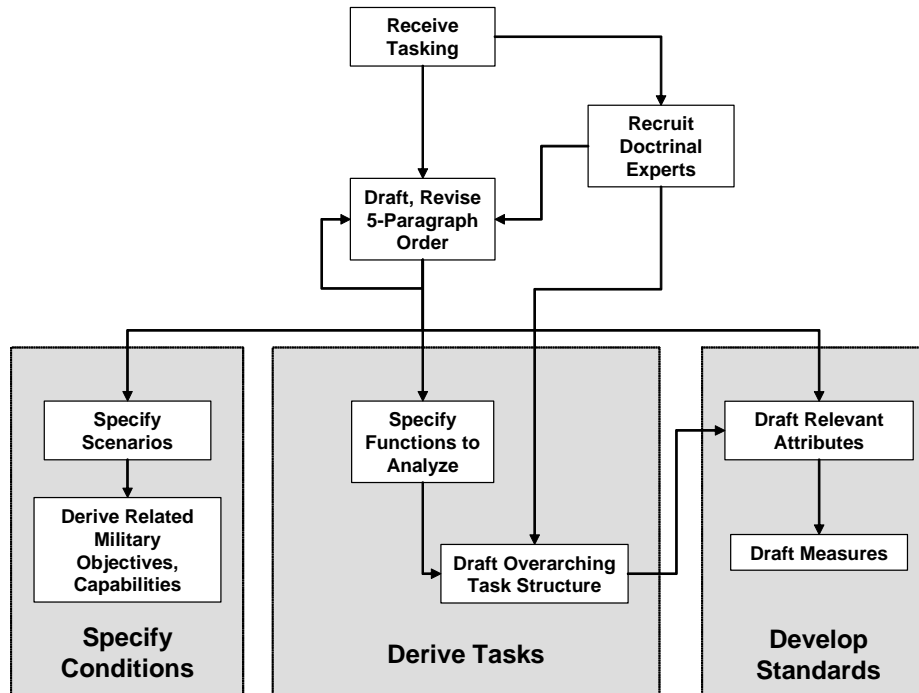


Figure 17. Example Quick Turn CBA FAA task flow.

The important point in this entire discussion is that the Quick Turn CBA is not *event-driven*; it is *time-driven*. Your challenge is to first, decide which tasks need to be done, and second, divide your available manpower and calendar time to those tasks. As a starting tactic, you may take all these tasks and group them into three categories:

- tasks that do not need to be done in the Quick Turn CBA;
- tasks that have been already been answered (either by management direction or previous study); and
- tasks that the Quick Turn CBA must address.

Another aside on group methods. Recall that in Section 7.2 we warned against using group methods as the primary means of estimating outcomes, causes, and needs. Unfortunately, the time-driven nature of the Quick Turn CBA may drive you to do exactly what we warn against, because your schedule won't allow you to do anything else. So, how do you reconcile this conflict?

First of all, if you have clear, logical, qualitative arguments for your causes, needs, and recommendations, you should use them. In this case, you have to make the case using short papers and not briefing slides, because slides simply do not allow you to transmit enough information to make a logical argument in a short document (for more on this, see Tufte [2003]). Also, assigning scores to some sort of qualitative argument just to make the analysis appear quantitative usually obscures the argument. Worse, if your target audience detects that you did this, they will more often than not conclude that you are trying to deceive them. They understand that you are operating under tight deadlines, so there is no need to add unnecessary numerological veneer. The Gettysburg Address worked just fine without stoplight charts or weighting schemes.

If you do rely on group methods such as value-focused thinking or the analytic hierarchy process, be *very clear* about what you used those methods for. Were you using them to estimate

your study team during that week, so you can do some tasks in parallel. But the fact is that if you must go out to the Combatant Commands, it will take them a few days to understand what you want and give you coherent responses. Clearly, you can move faster and retain more schedule control if you gather the information yourself. But, if you gather input by a staff action, it will *not* happen overnight.

9.6. Communicating Results and Risks

Section 5.1 describes the Quick Look as a throwaway – that is, a pilot effort to help shape the actual assessment. The Quick Turn CBA we are describing here may seem to you like a rushed product sacrifices quality for timeliness, which is exactly the sort of thing that Frederick Brooks said you that shouldn't give to a customer.

Nonetheless, the DOD's leadership will continue to ask difficult questions on tight timelines, and make substantial decisions based on quick examinations. Being a loyal subordinate, you will deliver a product on time. But, you will probably be uneasy about it. Consequently, it is important in a Quick Turn CBA to communicate the risk of the assessment – that is, where it might be wrong and what the consequences might be.

We are not recommending that you try to find some quantitative way to absolve yourself of subsequent blame, or that you simply leave your findings on the decision makers' doorstep and run away before someone discovers your work led to unintended detonations. Instead, we are saying that you have to communicate which parts of your assessment are solid, which are judgment calls (conclusions with some analysis tempered by experience), and which are highly uncertain.

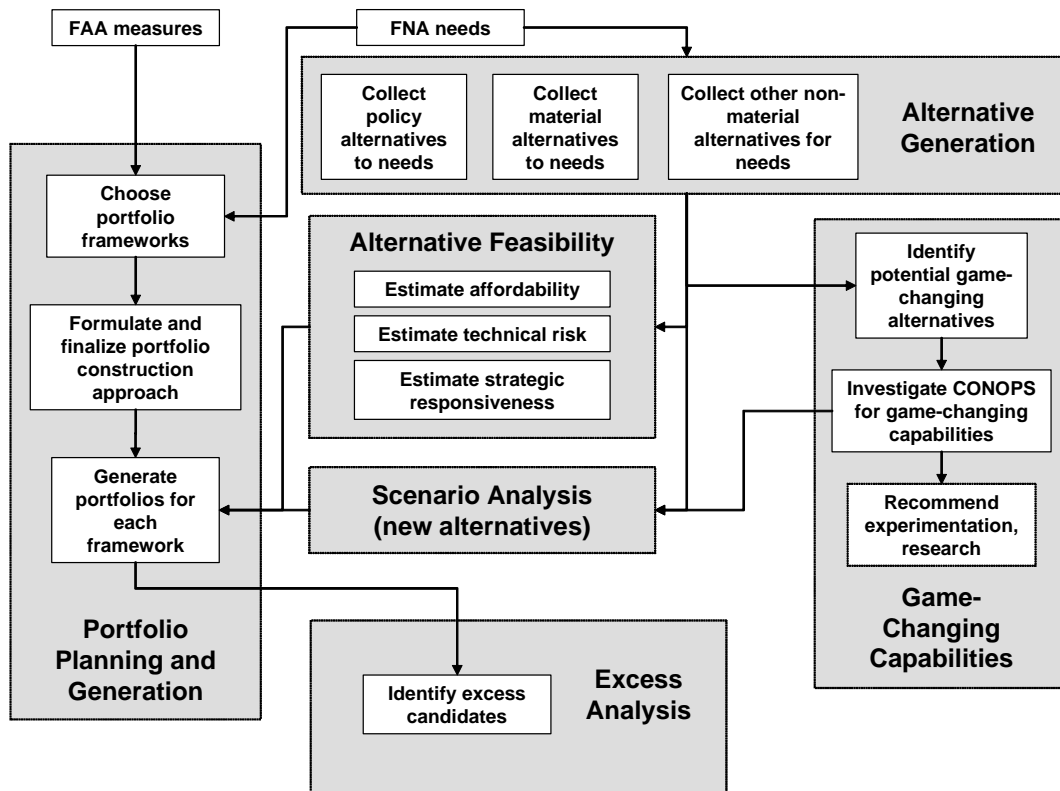


Figure 19. Example Quick Turn CBA FSA task flow.

Since the Quick Turn CBA does not allow for a lengthy oversight and staffing process, you will not have multiple independent reviews of your work and your conclusions. In most cases that is exactly what the leadership wants, because they do not want another study that regresses to the status quo. But, you will have to justify, either by the expertise of your group or the existing work that you cite, any recommendations that substantively change the current program. The only case where this will not apply is when the status quo is unexecutable, such as an assessment done in the wake of a major program cancellation.

Finally, do not forget that you can recommend experimentation. We experiment to test theories and avoid risky commitments, and it is perfectly legitimate for you to point out the cases where this would be a good approach. Now, if your marching orders expressly forbid recommending more study or experimentation; don't violate them. However, ensure you communicate that you have not been able to reduce the uncertainty of an option sufficiently to make a clear-cut recommendation, and ensure that your results contain sufficient information so that the decision makers can decide whether to take the risk.

To conclude, remember that the circumstances that generate Quick Turn CBAs mean that a *decision is imminent*, and will be made regardless of what you deliver (or don't deliver). Consequently, a Quick Turn CBA is large opportunity to influence the direction of the DOD. As such, it is critical that you scope and negotiate the tasking quickly, recognize and plan around the time-driven nature of the assessment, and communicate the strengths (and weaknesses) of your results.

10. A Twenty-Question Summary

In this paper, we have put ourselves in your position, that of someone trying to execute a CBA. We have covered what JCIDS is trying to do and how it connects to the overarching Defense Strategy and the Joint Operations Concepts. We have translated what it asks for into an analytical framework that should be directly applicable to your assessment. We have advised you on what talent you have to procure, how to organize, how to execute, and where and when to expect resistance.

But, it has taken us quite a few pages to explain all those things clearly. So, as a summary, we offer something common in the military: a checklist. What follows are the most important things you have to do to conduct an effective CBA.

So, ask yourself the following questions as you fight your CBA campaign.

1. **Do I really know why I'm doing this CBA?**
2. **Do I really understand the relevant strategic guidance, including the concepts?**
3. **Do I have the right people for my core team?**
4. **Do I know how I'm going to lead my core team?**
5. **Do I know how I'm going to function with an external working group?**
6. **Is my set of scenarios sufficient to cover the breadth of the strategy, and are they tied to a relevant strategic framework?**
7. **Have I scoped my assessment in such a way that it both answers the questions and is doable in a reasonable amount of time?**
8. **Do my operational depictions, task structures and measures flow directly from the scenarios and CONOPS?**
9. **Does my quick look assessment provide an adequate view of the road ahead and bound what I expect to conclude?**
10. **Do I have an analysis approach that is agile enough to consider a broad set of alternatives, and does it account for the enemy's operational alternatives?**
11. **Does my analysis approach represent the contributions of the alternatives of interest and estimate the measures of interest?**
12. **Have I collected a solid, defensible set of doctrinal approaches using the programmed force?**
13. **Do I have solid, defensible estimates of the mission effectiveness of those approaches?**
14. **Have I correctly identified the causes and resulting needs from my estimated operational outcomes?**
15. **Have I developed promising policy, materiel, and CONOPS alternatives?**
16. **Have I found any game changing capabilities, and have I been able to describe feasible CONOPS for them?**
17. **Do I have reasonable estimates of the affordability, technical feasibility, and strategic responsiveness of my materiel alternatives?**
18. **Do I have a good set of alternative portfolio frameworks?**

19. Have I generated a compelling set of portfolios for each framework that gives my decision makers a *real* set of options?

20. Have I identified excess capabilities, and do I have a bureaucratic plan for bringing them forward?

If the answers to all of the above are “yes,” you probably won’t have to ask yourself the following question:

In the future, do I want to tell people that I ran this CBA, or do I want to deny any involvement?

We hope you find this checklist useful – if for no other reason than your leadership will probably use it. JCIDS asks for a great deal out of a CBA, but if you succeed, you will move the DOD forward in a significant way.

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12. List of Acronyms

AoA	Analysis of Alternatives
CAIG	Cost Analysis Improvement Group
CBA	Capabilities-Based Assessment
CCJO	Capstone Concept for Joint Operations
CJCS	Chairman of the Joint Chiefs of Staff
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJCSM	Chairman of the Joint Chiefs of Staff Memorandum
COCOM	Combatant Commander
CONOPS	Concept of Operations
CONPLAN	Concept of Operations Plan
CPG	Contingency Planning Guidance
DIA	Defense Intelligence Agency
DOD	Department of Defense
DODAF	Department of Defense Architecture Framework
DODD	Department of Defense Directive
DODI	Department of Defense Instruction
DSB	Defense Science Board
FAA	Functional Area Assessment
FCB	Functional Capability Board
FFRDC	Federally Funded Research and Development Center
FNA	Functional Needs Assessment
FSA	Functional Solutions Assessment
FYDP	Future Years Defense Plan
GIG	Global Information Grid
HPT	High Payoff Target
HVT	High Value Target
IAMD	Integrated Air and Missile Defense
ICD	Initial Capabilities Document
IPL	Integrated Priority List
ISR	Intelligence, Surveillance, and Reconnaissance
JADMSC	Joint Analytic Data Management Steering Committee
JCA	Joint Capability Area
JCB	Joint Capabilities Board
JCD	Joint Capabilities Document
JCIDS	Joint Capabilities Integration and Development System
JCS	Joint Chiefs of Staff
JDS	Joint Data Support
JFC	Joint Functional Concept
JFCA	Joint Force Capability Assessment
JFCOM	Joint Forces Command
JIC	Joint Integrating Concept
JOC	Joint Operating Concept
JPG	Joint Programming Guidance
JROC	Joint Requirements Oversight Council
JROCM	Joint Requirements Oversight Council Memorandum
JSAP	Joint Staff Action Package
KMDS	Knowledge Management and Development System
MOE	Measure(s) of Effectiveness

MOP	Measure(s) of Performance
NDS	National Defense Strategy
NMS	National Military Strategy
NSS.....	National Security Strategy
OA	Operational Availability
OPLAN.....	Operations Plan
OSD.....	Office of the Secretary of Defense
OSD/PA&E	OSD Program Analysis & Evaluation
PDM	Program Decision Memorandum
QDR	Quadrennial Defense Review
SIPRNET.....	Secret Internet Protocol Router Network
SOF.....	Special Operations Forces
SPG.....	Strategic Planning Guidance
TEWA	Target Evaluation and Weapon Assignment
TOR.....	Terms of Reference
TPG	Transformation Planning Guidance
TRL	Technology Readiness Level
UARC.....	University Affiliated Research Center
UCP	Unified Command Plan
UJTL.....	Unified Joint Task List
USAF OAS.....	US Air Force Office of Aerospace Studies
WMD.....	Weapons of Mass Destruction

13. Appendix: The Biometrics Quick Turn CBA

From 28 August to 28 September 2006, a small team conducted a Quick Turn CBA on DOD biometrics (the measurable physical and behavioral characteristics that allow an individual to be identified). We offer a brief description of this CBA as an example of how a Quick Look effort was conducted, particularly with respect to the need to design to time.

13.1. Background

The DOD has long had some biometrics capabilities, but the events of September 2001 greatly increased the need to be able to accurately identify individuals. At that time, the Secretary of the Army was designated to lead, consolidate, and coordinate all biometric information assurance programs in the DOD. In addition, ASD(NII), the Assistant Secretary of Defense for Networks and Information Integration, was given significant responsibility, since biometrics was viewed as part of the overall information assurance program.

However, the need for biometrics capabilities was further accelerated by Operation IRAQI FREEDOM. While the Army had stood up a Biometrics Task Force (BTF) to address these issues, many senior leaders believed that something more had to be done. US Central Command had submitted two Joint Urgent Operational Needs requests for biometrics capabilities (one for base access biometrics and another for better distribution of biometrics information) in the summer of 2005, but progress had been slow.

In March 2006, the Army presented a briefing on the biometrics program to senior group including the Vice Chairman of the Joint Chiefs of Staff (VCJCS). As a result, the VCJCS directed that a team be formed to write a DOD biometrics CONOPS, and that a separate “Tiger Team” review the architecture of biometrics data flow in the CENTCOM theater [DAMO-ZA, 2006]. The Tiger Team visited a number of sites in Iraq in March-April 2006 and reported the following “recurring themes.”

- Who is in charge of biometrics?
- Units see the inherent value of biometrics and have adapted biometrics at all echelons.
- Lack of user feedback on the biometric information collected, otherwise known as the “so what.” The user requires the acknowledgement that data collected was received, processed, and a report sent back to the collecting organization. The user requires a rapid response capability at the point of collection to enable missions on the battlefield.
- No theater-wide biometric operational architecture or communications plan.
- Limited logistics and training.
- Information sharing is restricted between systems and sites.
- Multiple systems are performing similar operational activities. [DOD, 2006]

In addition, the Under Secretary of Defense for Acquisition, Technology, and Logistics commissioned a Defense Science Board Task Force on the subject in April 2006. His memorandum noted that

The Department of Defense (DoD) created a biometrics management approach defined by pre-9-11 documentation. As a result, all activities in the post-9-11 period are reactive with ad hoc resources and management teams responding to warfighter applications that attempt to leverage emerging developments in biometric technologies. Today, DoD must

develop a cogent plan of action to institutionalize biometrics as a vital element of the Department's identity management capability [Krieg, 2006].

The Task Force was directed to report interim results in May 2006, and deliver a final report in November 2006.

The Task Force reported their initial findings on 1 June 2006, and the VCJCS subsequently met with his counterparts from the Army, Marine Corps, and several OSD organizations to develop a coordinated action plan. The VCJCS had a package drafted by mid-June and sent it to the DEPSECDEF for signature. Subsequently, the OSD Director of Administration and Management (OSD DA&M) recommended on 19 July that premises of the action plan were correct, but that the timelines for organizational changes were not practical. On 20 July the DEPSECDEF, after discussion with the VCJCS, agreed and opted not to endorse the package. Instead, he asked that OSD DA&M to lead an effort to determine how DOD should organize to provide biometrics capabilities [DA&M 2006].

He and the VCJCS agreed, however, that the DOD needed to determine the current state of biometrics capabilities and funding, and also needed to determine whether or not to make any changes in the Fiscal Year 2008 budget. After some subsequent discussion, the VCJCS directed a Quick Turn CBA for biometrics on 18 August. His guidance was to:

- capture current biometrics capabilities;
- determine the gaps between near-term capabilities and needs;
- develop options for the Fall 2006 program and budget review; and
- provide a foundation for a more detailed assessment and formal JCIDS needs documents.

He also established that this team would report to the JROC on 28 September, giving them approximately 30 days to complete the assessment and present results to any lower-level decision bodies.

13.2. Forming the CBA Team

Prior to the release of the formal memo on 18 August, various action officers representing the VCJCS, the J-8, the Joint Staff Director of Operations (J-3), and the Director of the Joint Staff had been discussing responsibilities for the assessment and how it might be done. This group recommended that J-3 have overall responsibility for the assessment, and that J-8 would provide expertise on CBAs and JCIDS requirements. Within J-3, action officers from the Deputy Directorate for Antiterrorism, Force Protection, and Homeland Defense (JCS J34) would provide primary staff support for the study.

Although J34 ultimately provided 3 officers to support the Quick Look, they did not actually lead the study. Instead, the VCJCS wanted US Joint Forces Command to lead the assessment to ensure that the combatant commands' needs were articulated directly. Consequently, an O-6 from that organization was named to lead the study. This officer, who had had recent experience in Iraq, traveled to the Pentagon and remained there for the duration of the effort, and was totally dedicated to the study.

At this point, the team consisted of the study lead, the J34 officers, the representative from J-8, and a representative from the VCJCS staff. This group wrote a Joint Staff Action Package (JSAP) asking for OSD, Joint Staff, Service and Combatant Command representatives for the Quick Look, and established a first meeting date of 28 August.

The team eventually evolved to a group of 18 people, about half of whom worked on the assessment 90% of the time. The rest attended the sessions 15%-60% of the time; also the team spent time with representatives from other organizations, such as FBI, US Coast Guard, and the Department of Homeland Security. The study lead made an early decision to limit participation on the team to at most one person per organization (not including J34) to ensure that debates were not unbalanced by force of numbers. Overall, each session averaged around 10 people, which the team found to be workable.

13.3. Initial Planning and Scheduling

In the first week, the team developed several products: an overall methodology, a proposed schedule, terms of reference, and supporting materials for a data call on desired biometrics capabilities.

The overall methodology the team decided on was:

1. identify and prioritize operational use cases (scenarios), and decide on a manageable, representative set of cases;
2. determine the necessary biometrics capabilities for each use case;
3. identify existing biometric capabilities, relevant policies, and legal constraints;
4. determine capability gaps and possible alternatives;
5. estimate costs and risks of alternatives; and
6. develop several possible collections of alternatives for near-term funding.

Initially, the team proposed a schedule that had the following milestones:

1. build requirements matrix for data call (31 August);
2. receive input on requirements from the Combatant Commands (7 September);
3. determine gaps (15 September);
4. draft initial results (22 September);
5. present results to the Director, JCS J34 (26 September);
6. present results to the Director, JCS/J3 and Director, JCS/J8 (27 September);
7. present results to the VCJCS (28 September); and
8. present results to the JROC (29 September); and
9. begin socializing an issue paper for FY08 program and budget review (15 September).

As it turned out, the team was able to stay within a few days of this schedule. An important addition, however, resulted from the decision to route the final briefing through the normal JCIDS chain. This meant that the results would have to be presented in turn to the Force Protection Working Group (chaired by an O-6), the Force Protection Functional Capabilities Board (chaired by a 2-star general), the Joint Capabilities Board (chaired by a 3-star admiral), and the JROC (chaired by the VCJCS). This meant that at least one week would be spent in presentations.

Having established how the final product would flow, the team then turned to the question of determining use cases. An important part of the assessment was soliciting for needed capabilities, and the team recognized that it would have to develop products that allowed for useful and economical input.

We will discuss the details of how the team determined the use cases and the structure for soliciting needs in Section 12.5. It is worth noting, however, that J-8 had solicited for information on existing biometrics initiatives in mid-June [Chanik, 2006], but the team did not find this information to be useful, and ended up recollecting most of it.

So, by the end of the first week, the team had a methodology, a presentation plan, a tentative schedule, and the products in place for a data call; in addition, they had collected most of the available reports on the topic. The formal request for information went out on 1 September, with a deadline of 7 September [J-3, 2006].

13.4. Team Evolution

In a 1965 article, Bruce Tuckman published a theory of team development which he called the “forming, storming, norming, performing” model [Tuckman, 1965]. Several members of the Biometrics Quick Turn CBA suggested that this model is exactly what they experienced during the assessment.

- **Forming.** The team did not know each other when they first met, and had to rely on the CBA lead for background, objectives, and methods. Several of the members, who came from organizations with substantive stakes in the results, challenged the initial objectives, scope, and operating rules.
- **Storming.** This stage manifested itself as the team began determining the use cases. While the team had at this point agreed on its purpose and objectives, there was considerable debate and a number of power struggles within the group. The team lead had to intervene often to move the group forward.
- **Norming.** By the end of the week, the team had become functional enough to produce a data call that was coherent and could be distributed to external organizations, and had achieved a degree of unity with respect to what was going to be done and how.
- **Performing.** In Tuckman’s performing stage, the team reaches the point where tasks can be divided among subgroups and disagreements resolved without team lead intervention. It does not appear that this group really reached this stage in the first week, as they continued to operate as a committee of the whole until they began to cost alternatives.

J34 did provide one officer to function as sort of a scribe for the assessment. This person was largely responsible for capturing the discussions and developing briefings. Eventually, the J34 representatives on the team adopted the habit of spending some time summarizing what had gone on after the rest of the team left for the day.

Also, the VCJCS’s high interest in the assessment led him to put a member of his own staff full-time in the working group, so he had regular information on the groups’ progress. This arrangement had both strengths and weaknesses; while there were some collisions between the VCJCS representative and the formal study lead, the representative facilitated very quick resolution of things such as data requests, and was able to get immediate feedback from very high levels.

Another issue the team had to confront was that the OSD Program Analysis and Evaluation (PA&E) was getting ready for the fall program review and felt they could not provide a representative to the CBA. Unfortunately, PA&E was a critical organization, because they execute the program review and would ultimately manage the recommendations of the issue paper the CBA was supposed to produce. Consequently, the study lead opted to brief PA&E on

a weekly basis (normally during the lunch hour) to keep them informed of the progress of the effort. By all accounts, this approach worked well.

This is not to say that the assessment was not contentious. The study team lead had to simply shut off debate and force decisions many times, and various team members had to walk out of heated discussions occasionally to gather themselves.

13.5. Methodology and Execution

As mentioned above, the team first had to decide on a set of scenarios to provide operational context for the assessment. The Army's Biometrics Task Force had drafted a capstone concept of operations for biometrics in response to the VCJCS's March guidance, and had sent the document out for staffing on 18 July [DAMO-ZA, 2006]. This document contained a list of 11 operational biometrics tasks (e.g., identify friendly force individuals) as well as a set of 12 vignettes (e.g., United States law enforcement support) that each required some set of the biometrics tasks. The Army had also drafted a JCD on biometrics that contained considerable information.

Unfortunately, these documents were not approved at that time, so there was considerable debate whether to use the draft frameworks. Since the direction from the VCJCS had been to concentrate on near-term alternatives and the Global War on Terror, the team opted to synthesize a set of eight use cases from the various documents, and further divided the use cases into vignettes as shown in Table A.1.

The team then ranked these use cases from top to bottom with respect to the following factors: direct effect on the warfighter, tactical application, operation application, strategic application, documented DOD responsibility, and near term likelihood. The ranking was not designed to be used in subsequent analyses; instead, it was used to cut down the scope of the assessment to something manageable.

After this exercise, the team decided to concentrate on the following cases:

- locate, ID, and track persons of interest (raids and high-value targets);
- Control physical access (in particular, forward operating bases); and
- manage local populations (internment, resettlement, vetting for positions and benefits, and border and checkpoint security).

The team next had to assemble a format to solicit desired capabilities in the data call. For this, the team used the overarching functions in the draft CONOPS, which were:

- *collect* biometric samples;
- *match* collected samples to standardized databases to establish identity;
- *store* collected biometric information;
- *share* collected biometric information and results (e.g., where and when matches occurred); and
- *analyze* collected biometric information and fuse it with other information.

Use Case	Category	Subcategory
Locate, ID, Track Persons of Interest (during tactical ops)	MIO/EMIO	
	Raid	Counter IED Forensics
	Global tracking of HVT	
	Local tracking of HVT	
	Rescue/recovery ops	
Control Physical Access	CONUS Base Access	
	OCONUS (non FOB) Base Access	
	FOB Base Access	
	Facilities/Area Access	
Manage Local Populations	Refugee Management	
	Identify Friendly Personnel	Vetting Grey Personnel Vetting Blue Personnel
	Detainee Ops	
	Source Management	
	Check Points	
	Verify identity of local population for pay, benefits	Green Gray Blue
	Vet personnel for law enforcement (CPATT/CMATT)	
	Verify identity of intel sources	
	Verify identity of friendlies	
	Interagency Operations in a Foreign Country	
Personnel Recovery		
Law Enforcement Support	Support US Law Enforcement	
	Support Local Law Enforcement	
Disaster Relief/Humanitarian Assistance	Med/Dent Cap	
	Non-US personnel access to services	
	Identify personnel eligible to receive aid	
Support to First Responder		

Table A.1. Candidate biometrics use cases, with categories and subcategories.

The team also subdivided these functions to allow for more detailed input; for example, the collect function was subdivided into the proportion of time the collection could fail, collection modality (e.g., face, iris, fingerprints), mobility of the collection system required, and time to collect.

Once the data call went out on 1 September, the team turned to the identification of existing capabilities, policies, and legal constraints (step 3). They spent about three days on this step, and used the same spreadsheets they had sent out in the data call to record all the fielded capabilities. Since all of the DOD biometrics systems were all off-the-shelf systems and there was no integrated program of record, the team had to rely on the information built up by other groups such as the Tiger Team, the Army’s BTF organization, and other draft JCIDS documents. The team also met with various interagency organizations, such as the FBI, to document their current capabilities in the biometrics area.

After collecting and documenting the current capabilities, the team began turning the input from the data call into a set of capability gaps, and also began compiling alternatives (step 4).

This activity, which took about seven days, was the most intense part of the assessment, and probably completed the “norming” of the CBA team.

To screen the large amount of input that was arriving from the data call, the team used the familiar red-amber-green system of classifying shortcomings. As a result, the team opted to minimize work on the collect function, because the largest and most glaring performance gaps were in the other areas. Also, a seemingly minor language problem caused some rework in the data call. Under the store function, one of the subdivisions was called “reliability,” which, unfortunately, was interpreted in several different ways. After some struggling, the team renamed this subdivision to “data confidence,” which better reflected the metric of interest.

Unfortunately, the team discovered that the structure they had opted for resulted in 18 capability gap areas. In addition to being unwieldy, this structure did not allow for a straightforward matching of solution alternatives to gaps, since multiple gaps could be addressed by an alternative (and vice versa). Finally, while the red-amber-green mechanism provided quick visual evidence of where the bulk of the issues were within a use case and a function, the team did not have any sense of how important the problems were *among* use cases and functions.

After some debate, the team settled on a compact list of capability gaps, and decided to use a modified version of the Analytic Hierarchy Process (which one of the team members had implemented in a spreadsheet) to order the gaps and get some sense of where to focus their efforts. This effort led to the interim results shown in Table A.2.

Capability Gap Pairwise Matrix (What is the relative weight of the row to the column? 1/9, 1/3, equal=1, 3, 9)	Wireless Capability	Size/weight	Match Time	Match Information	Match Scope	Store Latency	Database Confidence	Share	Time to Analyze	Intel Analysis Rqmt	Raw Score	Normed Value	Prioritized Capability Gaps	Normed Score
	Wireless Capability	Size/weight	Match Time	Match Information	Match Scope	Store Latency	Database Confidence	Share	Time to Analyze	Intel Analysis Rqmt	Raw Score	Normed Value		
Wireless Capability	1.00	1.00	0.33	0.11	0.33	1.00	0.11	9.00	9.00	9.00	30.89	50	Database Confidence	100
Size/weight	1.00	1.00	0.33	0.11	1.00	1.00	0.33	9.00	9.00	9.00	31.78	51	Match Information	89
Match Time	3.00	3.00	1.00	0.33	3.00	3.00	0.11	9.00	9.00	9.00	40.44	65	Match Time	65
Match Information	9.00	9.00	3.00	1.00	3.00	3.00	0.33	9.00	9.00	9.00	55.33	89	Match Scope	54
Match Scope	3.00	1.00	0.33	0.33	1.00	1.00	0.11	9.00	9.00	9.00	33.78	54	Size/weight	51
Store Latency	1.00	1.00	0.33	0.33	1.00	1.00	1.00	3.00	3.00	3.00	14.67	24	Wireless Capability	50
Database Confidence	9.00	3.00	9.00	3.00	9.00	1.00	1.00	9.00	9.00	9.00	62.00	100	Store Latency	24
Share	0.11	0.11	0.11	0.11	0.11	0.33	0.11	1.00	1.00	0.33	3.33	5	Time to Analyze	10
Time to Analyze	0.11	0.11	0.11	0.11	0.11	0.33	0.11	1.00	1.00	3.00	6.00	10	Intel Analysis Rqmt	9
Intel Analysis Rqmt	0.11	0.11	0.11	0.11	0.11	0.33	0.11	3.00	0.33	1.00	5.33	9	Share	5
HIGHEST OVERALL SCORE:											62.00		SORTED BY NORMED SCORE	

Table A.2. The pairwise comparison of the revised set of capability gaps.

The team employed this more as a clustering device than a weighting method. By limiting the row and column comparison to only six ratios, the team used this as a means to divide the gaps into groups. Fortunately, there was little variation among use cases; although the team specified three difference sets of situations, the shortcomings had similar scores among the cases.

The team had also begun collecting solution alternatives, and found it easier to group them by the following capability categories:

- match information (ability to match the particular biometric data);
- match scope (the range of databases searched);
- match time (time to achieve a match);

- share (ability to easily share data and results); and
- database confidence.

The team further decomposed the alternatives by whether they addressed doctrine, organization, training, materiel, leadership, personnel, or facilities (DOTMLPF), since that deconstruction would be necessary to determine what implementation steps would be necessary if the alternative was adopted.

Interestingly enough, there was not a great deal of competition among solution alternatives. Due to the time compression, organizations that could have offered alternatives did not offer irrelevant options. Also, the fact was that biometrics was really not a part of the core culture of any part of the DOD, so there were not that many factions that had any solutions to offer.

At this point, the team was ready to move to identifying costs and risks of alternatives (step 5), but the move to a new solution taxonomy forced them to regroup the gaps into that taxonomy and reassess priorities among the newly-regrouped gaps. The team employed a different spreadsheet tool to aid in this assessment; this one exploited some of the metrics and tasks that had come back from the data call, and allowed the team to have more operationally-focused discussions on what really needed to be done. This resulted in the following priority list:

1. match time;
2. match information;
3. share; and
4. match scope.

At this point, the team had to disentangle the confusion caused by the “reliability” label in the data call. In various sessions, the Combatant Commands pressed the view that database confidence was absolutely essential; without decent information to match against, the fastest, most complete, totally accessible, and widest-range biometrics solution was useless. Essentially, database confidence became not just the top priority, but a prerequisite.

Once again, the team discovered that the labels they were using were not really helping to convey either the shortcomings or the alternatives. Consequently, their briefings were modified to present gaps, alternatives, and courses of action in terms of following set of prioritized descriptors:

1. match fast;
2. match accurate;
3. complete intel analysis; and
4. share.

Database confidence was dropped as a separate category (since as a prerequisite it *had* to be addressed), and solutions binned to this category were spread among the match fast and match accurate categories.

With the taxonomy finally settled, the team undertook one more ranking exercise, which was ordering the specific gaps under each of the categories so they could begin evaluating solutions, costs, and solution portfolios. This was done via a simple ranking process; an example for the Share category is shown in Table A.3.

<u>Share</u>			
Priority	Time Frame	DOTMLPF	Capability Gap
1	Near	Materiel	No program of record for an authoritative database
2	Near & Long	Materiel	No ability to link to databases outside of DOD, and no metadata tagging
3	Near & Long	Doctrine	Insufficient sharing strategy and policies for biometric data with repositories, agencies, or governments
4	Long	Materiel	No automated multi-level security capability when sharing outside of DOD
5	Near	Doctrine	Joint doctrine does not address biometric-enabled capabilities

Table A.3. The top five capability gaps for the Share category.

Having spent four days on this effort, the team moved to the final step of their methodology, which was to recommend courses of action (COAs; in this document, we call these portfolios). The team had been able to agree on the best alternative for each particular category and gap, but there was considerable debate on how to structure alternatives. One natural scheme considered was to simply recommend funding in order of priority, i.e., COA 1 would be to fund all of the match fast solutions, COA 2 would be to add funding for match accurate, and so on. This method, however, would result in unbalanced COAs unless everything was funded. Consequently, the team decided to organize their recommendations incrementally as shown below.

- **Increment 1: improve biometric collection, matching, and recommendation to the end user.** This contained the solutions to the top five gaps from Match Fast, all from Share, and the top two from Match Accurate, and represented investments of approximately \$230M.
- **Increment 2: improve data integrity and confidence, and increase capability to exploit latent fingerprints.** This contained the remaining Match Fast solutions, and the next four Match Accurate solutions, and represented an additional \$42M investment.
- **Increment 3: provide the end user with in-depth analysis enabled by biometrics.** This increment contained the remaining solutions, and would require an additional \$28M.

The team spent roughly three days on this step, and then embarked on presentation refinement and socializing the program review issue paper.

During the presentations, the team received two reviews. The first was provided by the Army's G-8 staff, which went over the cost estimates for the alternatives and provided a solid external review. The second review was a formal "Red Team" effort conducted by two general officers from J-8 and several O-6s. Although the study lead had not requested such a review, he accepted the offer for such a review, and felt it greatly improved the final product. In particular, the questions posed by the Red Team better exposed the rationale for the team's conclusions and strengthened the case for the recommended alternatives.

The team gave its first briefing on 19 September, and presented their results and recommendations to the JROC on 28 September as required by the original tasking. The JROC endorsed their findings and recommended funding all three increments in 2007 and 2008.

13.6. Observations

This assessment followed many of the ideas in this paper. The study team's methodology specified operational cases, used a functional taxonomy, estimated where the crucial gaps were among the functions, considered the full spectrum of materiel and non-materiel alternatives, considered costs, and presented alternative solution portfolios. When you consider that the group went from its introductory meeting to briefing near-final results recommending over \$300M in initiatives in 21 days, it is clear that this effort was far from easy or routine – and that *very* few ad hoc groups could have done it.

The Biometrics Quick Turn CBA also typified many reasons for an accelerated assessment: the need to take imminent budget action, the need to address an emerging need, and the need to pull together a set of disparate examinations. As noted above, the DOD was simply not treating biometrics as a core competency, so there was also a need to break a bureaucratic logjam.

One thing the CBA team benefited from was the fact that the VCJCS provided a realizable scope that did not require extensive renegotiation. Indeed, the stipulation that the JROC would be briefed 30 days after the assessment started probably swept aside the majority of the bureaucratic hurdles that would normally plague a CBA.

The team appears to have come together quickly and operated effectively, particularly at the end. Although it appears that the team was assembled more to provide organizational representation than functional coverage, it had the essential doctrinal knowledge and enough process and quantitative skills to do the assessment. While there were no quantitative methods used beyond rudimentary decision analysis, the methods that were used lent structure to the assessment, helped the team focus its efforts, and also provide a means to settle debates.

This CBA was also a perfect example of a design-to-time exercise. Everything that was done was done to meet a schedule, and the various ranking exercises were designed to remove less-important considerations and focus on a handful of critical shortcomings. Also, the recognition that 25-30% of the available time would have to be dedicated to briefings and repackaging was an important concession to an unpleasant, but unavoidable, reality.

One thing that may strike the reader as inefficient were the repeated restructurings of the capability gaps and solutions. While this probably could have been done better, we must again point out that this assessment was done for a mission area with *no* approved doctrine. If the draft CONOPS had not been available, the study team could have easily spent the entire 30 days trying to agree on a workable functional structure for the assessment.

Certainly, the Biometrics Quick Turn CBA did not contain all the analysis that this paper recommends, and no one would offer it as an exemplar of a comprehensive quantitative study. But, that is not what the VCJCS asked for. Instead, he asked for a short-term assessment to generate solution options for an emerging mission area with well-documented shortfalls. In fact, it is likely (at the time this was written) that the DOD will commission a much more comprehensive CBA on biometrics, one that would do all the things described in this guide. Nonetheless, this CBA presented alternatives linked to operational situations, used a coherent functional structure, identified the most important gaps, and suggested multiple portfolios that contained a spectrum of materiel and non-materiel solutions – precisely what this guide does recommend.

13.7. References

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