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Contingency Contractor Optimization
Phase 3 Extension, User Manual – Contingency Contractor Optimization Tool Engineering Prototype – Release 2.2

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Abstract

This User Manual provides step-by-step instructions on the Contingency Contractor Optimization Tool's major features. Activities are organized by user role.

The Contingency Contractor Optimization project is intended to address former Secretary Gates' mandate in a January 2011 memo [1] and DoDI 3020.41 [2] by delivering a centralized strategic planning tool that allows senior decision makers to quickly and accurately assess the impacts, risks, and mitigation strategies associated with utilizing contract support.

Based on an electronic storyboard prototype developed in Phase 2, the Contingency Contractor Optimization Tool engineering prototype was refined in Phase 3 of the OSD ATL Contingency Contractor Optimization project to support strategic planning for contingency contractors. The planning tool uses a model to optimize the Total Force mix by minimizing the combined total costs for the selected mission scenarios. The model will optimize the match of personnel groups (military, DoD civilian, and contractors) and capabilities to meet the mission requirements as effectively as possible, based on risk, cost, and other requirements.

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NOMENCLATURE

ATL	Acquisition, Technology & Logistics
CCMD	Combatant Command
CCOT	Contingency Contractor Optimization Tool
CCOT-P	Contingency Contractor Optimization Tool Prototype
DOD	Department of Defense
DoDI	Department of Defense Instructions
DOE	Department of Energy
JCA	Joint Capability Area
IE	Internet Explorer (web browser)
LN	Local Nation Contractor
OCS	Operational Contract Support
OSD	Office of the Secretary of Defense
SNL	Sandia National Laboratories
SSA	Support for Strategic Analysis
TCN	Third-Country National Contractor
TPFDD	Time-Phased Force & Deployment Data
U.S.	United States

1. INTRODUCTION

This User Manual provides step-by-step instructions on the Contingency Contractor Optimization Tool (CCOT) engineering prototype's major features. Activities are organized by user role.

1.1. Tool Requirements

Operating System: Windows XP or Windows 7

Internet Browser: Firefox is recommended, but CCOT-P should work in all browsers. However, testing has shown JavaScript issues in IE8, and this issue may occur in other versions of IE as well. It is currently unknown if the problem goes away with IE9. When JavaScript takes too long to generate a graph, IE8 displays the error message, "Stop running this script?" If you receive this message in any browser while trying to view a graph, then that graph will take several minutes to appear. This only affects graphs with "assignments" in their title (see section 3.2.5. Analysis Results & Graphs).

Additional Requirements: Java Runtime Environment 6, Apache Tomcat, .NET Framework 4.0, MySQL

Instructions for installing the CCOT-P engineering prototype and the additional requirements are available in the Installation Instructions included with the software.

1.2. Project Overview

The Contingency Contractor Optimization project is intended to address former Secretary Gates' mandate in a January 2011 memo [1] and DoDI 3020.41 [2] by delivering a centralized strategic planning tool that allows senior decision makers to quickly and accurately assess the impacts, risks, and mitigation strategies associated with utilizing contract support.

Based on an electronic storyboard prototype developed in Phase 2, the CCOT-P engineering prototype was refined in Phase 3 of the OSD ATL Contingency Contractor Optimization project to support strategic planning for contingency contractors. CCOT-P uses a model to optimize the total workforce mix by minimizing the combined total costs for the selected mission scenarios. The model will optimize the match of personnel groups (military, DoD civilian, and contractors) and capabilities to meet the mission requirements as effectively as possible, based on risk, cost, and other requirements.

1.3. Mission Scenarios and Planning Baselines

The Contingency Contractor Optimization Tool determines the optimal workforce mix (military, DoD civilians, contractors) that minimizes total cost for selected mission scenarios. Before analysis can begin, a planning baseline must be created, and mission scenarios must be added to this planning baseline.

Mission Scenarios - A mission scenario represents a single mission, ranging from disaster relief and humanitarian assistance to a major combat operation. The mission scenario in CCOT-P is focused on the manpower requirements by phase and by capabilities needed to implement the mission. Using the manpower requirements, policies, and risk settings, CCOT-P will calculate an optimized workforce mix to support the mission.

Planning Baseline - A planning baseline is a group of mission scenarios that analysts consider in their planning.

Joint Capability Areas (JCAs) –JCAs are nine categories that describe functionally similar DoD activities and are used to organize capability requirements in the mission scenarios. The tool translates TPFDD Unit Type Codes (UTC) to JCAs using the translation rules in the Contractor Estimator Tool (CET). JCAs are used because the tool needs a capability coding scheme that is universal across the services. Each service has its own coding scheme, and, while some UTCs are consistent across services, JCAs were the only universal code available.

1.4. User Roles

Administrator - The administrator sets high-level parameters that are constant across all analyses. These are high-level, static parameters that should not change with every new planning baseline. The administrator also helps to maintain CCOT-P and to manage user access to the planning tool.

Planning Manager - The planning manager is in charge of creating new planning baselines and adding and creating the relevant mission scenarios. The planning manager is expected to have enough knowledge about the mission scenarios to be able to set reasonable default values. Planners at the combatant command (CCMD) or service level, who are very familiar with the mission scenarios, are good candidates for planning manager. More than one person can be planning manager.

Analyst - The analyst is a planner who will be using CCOT-P to perform "what-if" analyses. Through these analyses, the analyst will be able to provide estimates on the number of contractors needed, what capabilities they will need to have, and when they will be needed in theater.

There are two types of planning that can be performed. First, the analyst can perform planning limited to scenarios within a CCMD or service. Second, the analyst can perform an integrated, centralized analysis using scenarios across all CCMDs and all services.

1.5. Permissions Overview

Error! Reference source not found. provides a summary of which actions can be performed and which values can be modified by each user role.

Table 1. User role permissions overview.

	Actions & Input Values	Admin	Planning Manager	Analyst
	Modify **preset baseline values**	X		
	Create/modify **planning baselines** (modify title, add/remove mission scenarios, modify notes/comments/guidance)		X	
	Create/modify **mission scenarios**		X	
	Start a **new analysis**			X
Budgets & Costs	Modify **budgets**		X	X
	Modify **annual cost**: all personnel groups	X		
	Modify **annual cost**: 3rd Country and Local Nation Contractors	X	X	X
Manpower Substitutions & Requirements	Modify **manpower substitution rules**: all personnel groups	X		
	Modify **manpower substitution rules**: 3rd Country and Local Nation Contractors	X	X	X
	Modify **manpower requirements** (import TPFDD or TPFDD-like data during mission scenario creation)		X	
	Modify **additional support needs**		X	X
Manpower Availability & Phase Durations	Modify **manpower availability**		X	X
	Modify **phase durations**		X	X
Policies & Guidance	Modify **policies** assigned to missions (*Analysts cannot remove policies added by the planning manager*)		X	X
	Modify **manpower business rules**	X		
Risk in Using Non-Military Personnel	Modify **risk in using non-military personnel**		X	X

1.6. Logging In

These login instructions are for the CCOT-P engineering prototype available on the DoD network as a production pilot. You must have access to the DoD network in order to access the tool.

Note: CCOT-P works best in Firefox. IE (Internet Explorer) may degrade the visual quality of the interface.

First, the administrator must grant you access to the tool. Please contact Anna L. Carter (anna.l.carter10.civ@mail.mil) for access. The administrator will provide you with a username and password for the tool.

1. Go to the CCOT-P website.
2. Enter your CCOT-P username and password.
3. Select a role (defined in section 1.4. User Roles).
4. Click “Continue”.

1.7. Accessing Help

This user manual and the shorter Quick Start guide are accessible through the CCOT-P interface. The links for these help guides are available at the top of every page, above the CCOT-P banner image (Figure 1).

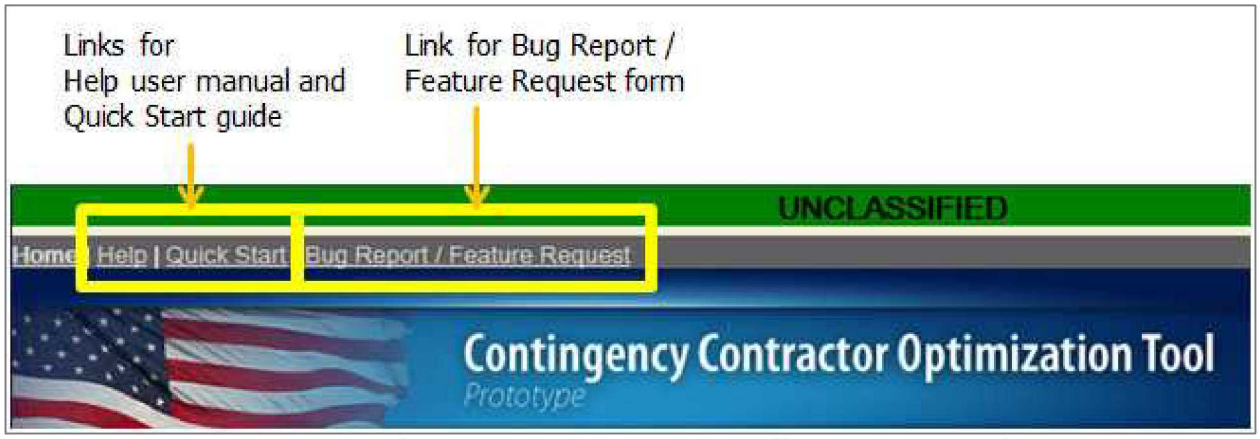

Figure 1. Links for help and the bug report/feature request form.

1.8. Reporting a Bug or Requesting a Feature

1. To report a bug or request a feature, click on the "Bug Report/ Feature Request" link available at the top of every page, above the CCOT-P banner image (Figure 1).
2. A new browser window will open with a form to fill out.
3. Please fill out all fields of the form.
4. Please note that Sandia National Laboratories does not have access to the version of CCOT-P residing on the DoD network. If reporting a bug, please provide sufficient details so that we may attempt to recreate your issue. Attach any data, screen shots, or supporting documents to the email.
5. When the form is complete, click the "Send" button at the bottom of the form.
6. The form will be translated into text that must be pasted into an email.
7. Please send the email to
   abandlo@sandia.gov;crfrazi@sandia.gov;jdurfee@sandia.gov
8. After the email is sent, close the form's browser window.

2. PLANNING MANAGER

The planning manager is in charge of creating new planning baselines and adding and creating the relevant mission scenarios. The planning manager is expected to have enough knowledge about the mission scenarios to be able to set reasonable default values. Planners at the combatant command (CCMD) or service level, who are very familiar with the mission scenarios, are good candidates for planning manager. More than one person can be planning manager.

Figure 2 shows the pages (displayed as tabs in the interface) found on the planning manager main page. They are described below.

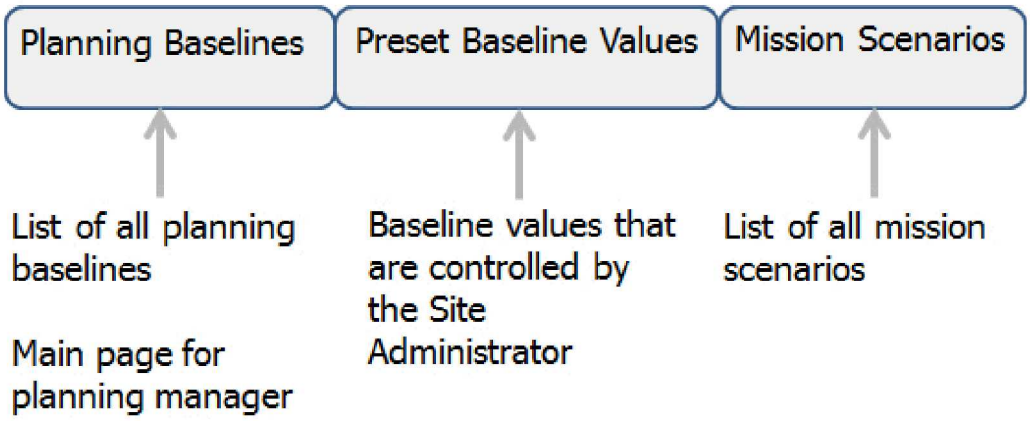

Figure 2. Pages on the Planning Manager main page.

Planning Baselines - This page lists all of the existing planning baselines, their status (draft or public mode), included mission scenarios, and creation date. This is the main page for managing planning baselines. From here, the planning manager can create, view and modify baselines and hide public baselines from analysts (see 2.1.4. Hiding a Planning Baseline).

Preset Baseline Values - The preset baseline values are values that should remain constant across all planning baselines and mission scenarios. It is important to review these values before creating a new planning baseline. They can only be modified by the administrator. If any values need to be updated, contact the administrator BEFORE creating a new planning baseline.

Mission Scenarios - This page lists all of the existing mission scenarios, their status (draft or public mode), and operation type. Mission Scenarios may be created from this page.

Planning baselines and mission scenarios are defined in section 1.3. Mission Scenarios and Planning Baselines.

2.1. Creating a Planning Baseline and Mission Scenarios

Navigation Tips

Select "Main" to exit the planning baseline and to return to the main page (

Figure 3)

- To cancel the creation of the baseline (while it is still in Draft mode), while viewing the baseline, click "Cancel Creation" on any screen. This will permanently remove the baseline from CCOT-P and cannot be restored.
- Use the "Back" and "Continue" buttons to move sequentially through the pages.
- While working on a planning baseline, you can directly access other pages by clicking on the page tabs at the top of the screen (Figure 4).

Figure 3. Navigation buttons within a planning baseline/existing mission scenario.

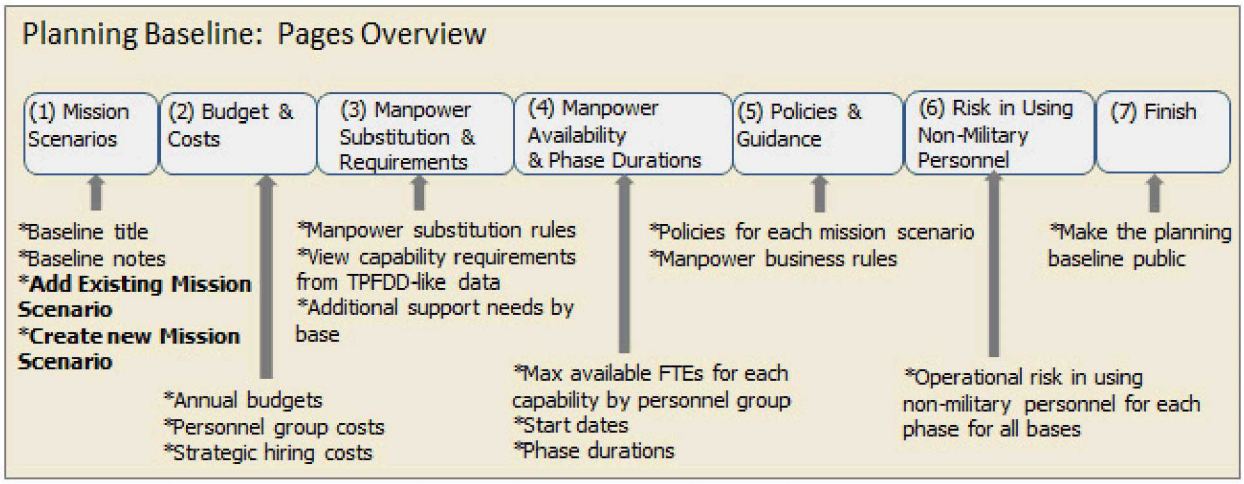

Figure 4. Pages within a planning baseline/existing mission scenario.

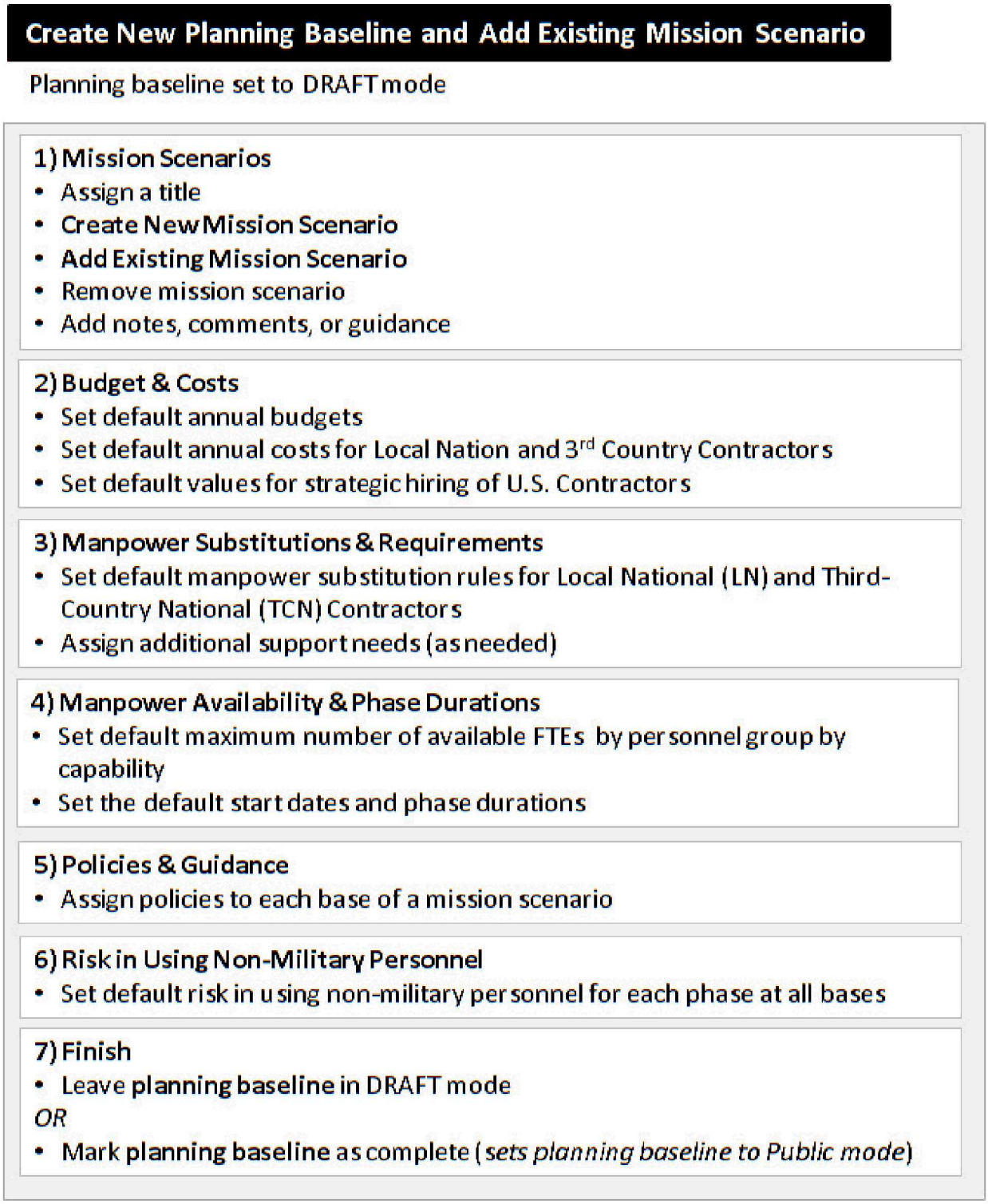

Figure 5. Overview of creating a new planning baseline and adding an existing mission scenario.

2.1.1. Creating a New Planning Baseline

This section presents instructions on creating a new planning baseline. Figure 5 (previous page) shows an overview of the process.

1. Log in to CCOT-P.
2. The planning manager will be taken to the *Planning Baselines* tab.

Page: Preview Preset Values

3. Prior to creating a new planning baseline, preview the preset baseline values (step A in Figure 6). Click the *Preset Baseline Values* tab at the top of the page.
4. Review the preset baseline values to make sure they are correct.
5. Contact the administrator if you believe any of these values should be changed.
    a. Once you create a new planning baseline, these preset values cannot be changed in the baseline. You will have to create another planning baseline after the preset values have been changed.

Page: Planning Baselines

6. Go to the *Planning Baselines* tab (step B in Figure 6).
7. Click "Create New Planning Baseline" (step C in Figure 6).

Figure 6. Creating a new planning baseline.

Page: Mission Scenarios

The initial screen *Mission Scenarios* is displayed. On this page, you will name the planning baseline, add additional notes, comments or guidance, and add or create a mission scenario.

8. **Title:** Enter a title for the planning baseline.
9. To add an existing mission scenario, see section 2.1.2. Adding an Existing Mission Scenario.
10. To create a new mission scenario, see section 2.1.5. Creating a New Mission Scenario.

11. **Notes, Comments, Guidance:** Enter a brief description for the planning baseline. This can include guidance to the analysts about any special cases they should consider during their analysis.

2.1.2. Adding an Existing Mission Scenario

This section presents instructions on adding an existing mission scenario to a planning baseline.

Page: Mission Scenarios
This page allows you to add, remove and create mission scenarios.

1. Click "Add Mission Scenario" (step A in Figure 7). At least one mission scenario must be added/created before the next screen is activated.
2. **Add mission scenario:** Select a mission scenario from the "Scenario" list on the left (step B in Figure 8), and click "Include" (step C in Figure 8).
3. **Remove mission scenario:** Select a mission scenario from the "Included Scenarios" list on the right, and click "Remove".
4. **Create new mission scenario:** See section 2.1.5. Creating a New Mission Scenario for instructions.
5. **Finish:** Click "Done" (step D in Figure 8) when you are finished.
6. Added mission scenarios should be displayed in the table on the *Mission Scenarios* page.

Figure 7. Adding mission scenarios to a planning baseline.

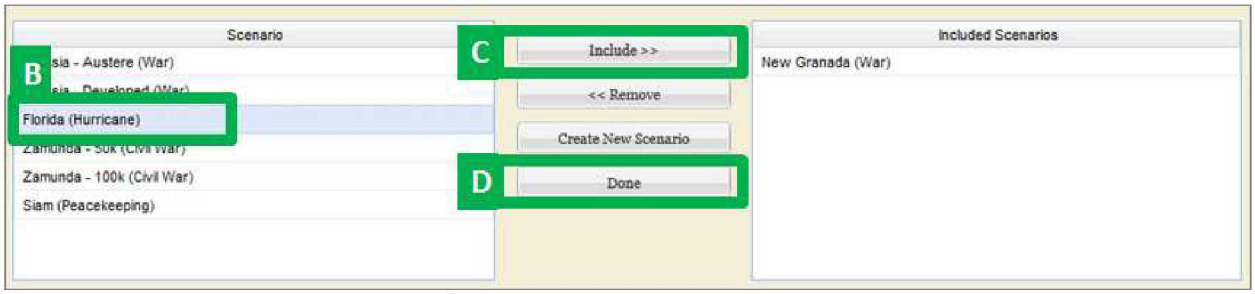

Figure 8. Selecting mission scenarios to add.

7. You must now review and set the default values for the mission scenario(s) by working through the remaining pages (see Figure 4), which are described in the following sections. Once you have worked through all of the pages, you will be able to set the mission scenario(s) and planning baseline to Public on the *Finish* page. Setting the mission scenario and planning baseline to Public status makes them visible to analysts.
8. Click "Continue" to move to the next screen.

Page: Budget & Costs
On this page, you will set budget constraints and annual costs for Local Nation and Third Country National contractors.

9. **Budget:** Set the default annual budget for each fiscal year in thousands of dollars.
    a. If you do not want to add a budget constraint, enter 0.
10. **Personnel Costs:** This table displays the annual costs for each personnel group.
    a. Set the default annual costs for Local Nation (LN) and Third Country National (TCN) contractors for each mission scenario.
    b. The other personnel costs (military, civilian, U.S. contractor) can only be modified by the administrator.
11. Click "Continue" to move to the next screen.

Page: Manpower Substitutions & Requirements
On this page, you will set the manpower substitution rules, view previously entered manpower requirements, and add additional support needs to the pre-existing manpower requirements.

12. **Manpower Substitution Rules:** This table shows you the manpower substitution rules. The substitutions are presented as a comparison to military efficiency. Military will always be 100% efficient in performing each capability.
    a. Set the default efficiency of Local Nation (LN) and Third Country National (TCN) contractors by selecting a value from 50%-100%.
    b. For example, if a contractor is 50% efficient, this means the contractor is half as efficient as the military at performing the capability. You need two contractors to replace one military person.
    c. The other efficiency values (military, civilian, U.S. contractor) can only be modified by the administrator.
13. **Manpower Requirements from TPFDD-like Data:** This table shows the time-phased force and deployment data (TPFDD) requirements (in FTEs) for each capability. This information came from a TPFDD or TPFDD-like data set associated with each mission scenario. This table is view-only.
14. **Additional Support Needs:** This table allows you to add additional support requirements (in FTEs) by base and by operational phase.
    a. Select a base from the dropdown menu. Bases from all mission scenarios will be listed.
    b. The first row is the support planning factors (additional FTE needs or percent "plus up"). Enter the percent additional support needed for each capability. Use the Tab key to move to the next cell.

c. Additional support is calculated as shown in **Error! Reference source not found.**.
    i. The force requirements by capability (JCA) are taken from the Manpower Requirements table.
    ii. The calculated additional support needed values are shown by phase in the table below the planning factors row.

15. Click "Continue" to move to the next screen.

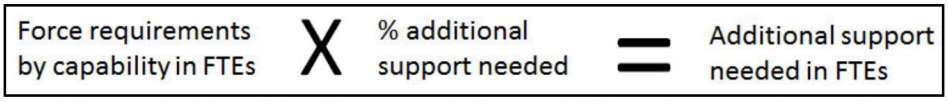

Figure 9. Equation for calculating additional support needs.

Page: Manpower Availability & Phase Durations

On this page, you will enter manpower availability limits for the personnel groups by capability. You will enter the phase start dates and durations for the mission scenarios.

16. **Manpower Availability:** For each capability, set the default for the maximum number of FTEs available in each personnel group.
    a. All of the mission scenarios in this planning baseline will be competing for these resources.
    b. It assumed that contractors are an unlimited resource. To add limits to Local Nation (LN) and Third Country National (TCN) contractors, click the "Allow Contractor Limits" checkbox above the table. Columns will appear for TCN and LN so that limits can be added. U.S. Contractors are not shown because they are always treated as an unlimited resource.
17. **Phase Durations:** For each mission scenario, set the default start date and duration (in weeks) for each operational phase (phases 0-5).
    a. Click on the date in the Start Date column (step A in Figure 10).
        i. A calendar will appear.
        ii. Click on the right/left arrows to move forward or backward a month. Or click on the month name (step B in Figure 10).
        iii. A month and year view will appear.
        iv. Select a start month from the list on the left (step C in Figure 10).
        v. Select a start year from the list on the right (step D in Figure 10).
            1. Fiscal Years start in October and end in September.
            2. Example 1: FY14 runs October 2013 through September 2014.
            3. Example 2: If planning for a start date in December of FY20, you would select December and year 2019.
        vi. Click "OK" (step E in Figure 10).
        vii. You will be returned to the calendar view. Click on a Sunday (last column on the right) for the start date of the scenario (step F in Figure 11).
            1. If you click on any other weekday, the tool will automatically select the previous Sunday of your selected date.
        viii. The start date and FY will be updated in the table (step G in Figure 11).
    b. For each phase, enter the number of weeks the phase will last. Use the Tab key to move to the next phase duration value/cell.

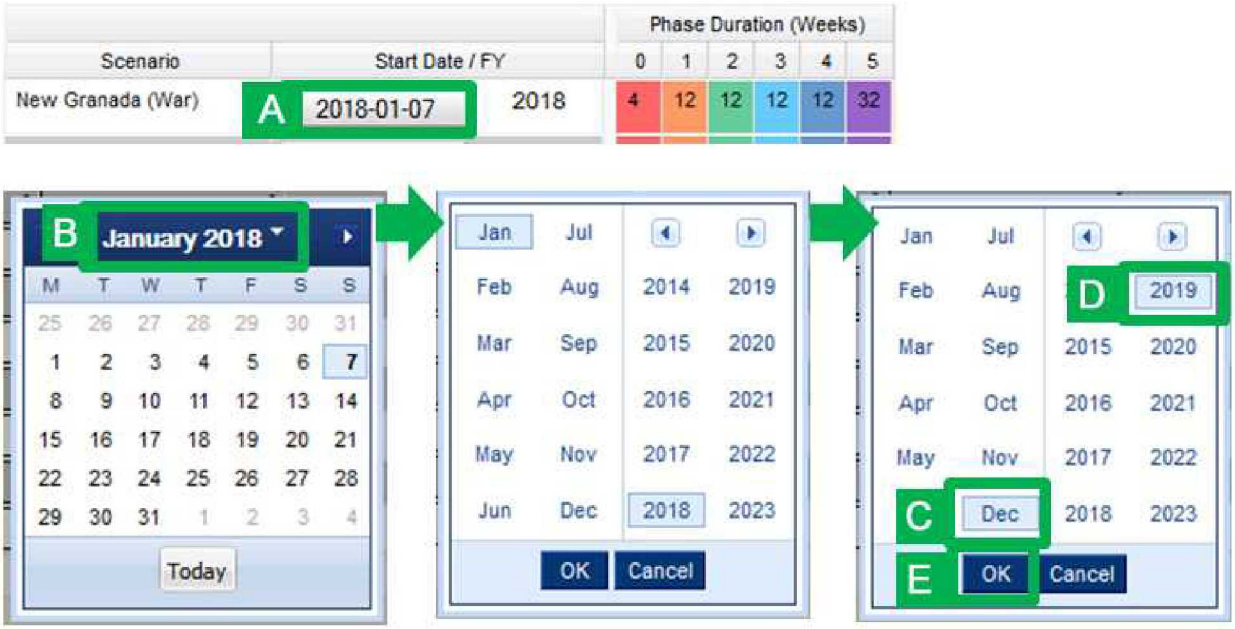

Figure 10. Selecting the month and year for a start date.

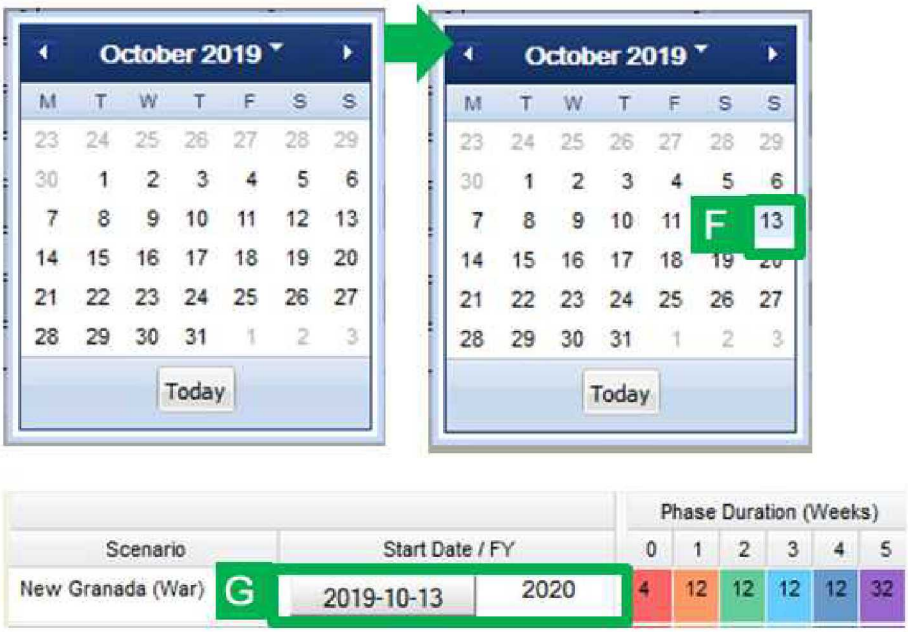

Figure 11. Selecting the day for a start date.

18. Click “Continue” to move to the next screen.

Page: Policies & Guidance

On this page, you will enter policies (as needed) for each base of a mission scenario. The table shows which policies have been applied to each base. For each policy, the table provides a visual representation by displaying which personnel groups can (Yes/green) or cannot (No/red) be used

according to the policy. The row shown next to the base name shows the combined effect of the policies applied to the base.

19. **Policy Selection:** Add and modify policies for each base as needed. [*Analysts cannot remove any policies that have been added by a planning manager.*]
    a. If the bases for a mission scenario are not displayed, click the arrow next to the folder icon to expand the bases list.
    b. Every base of a mission scenario must have at least one policy. The default policy is "All Personnel Groups".
    c. **Add policy:** Click the "Add Policy" button next to the appropriate base name.
        i. A pop up window will display all available policies. Select the policies you want to add to the base by clicking the checkbox in the "Add" column.
        ii. Click the "Add selected policies" button. The policies now appear below the base.
    d. **Remove policy:** Click "Remove" next to the policy. "All Personnel Groups" cannot be removed as it is the default setting.
20. **Available Policies:** This view-only table shows all available policies.
21. **Manpower Business Rules:** This table shows the manpower business rules, based on DoDI 1100.22 [3]. For each capability, this table shows whether or not each personnel group is allowed to perform that capability.
    a. These values can only be modified by the administrator.
22. Click "Continue" to move to the next screen.

Page: Risk in Using Non-Military Personnel
On this page, you will enter the level of risk in using non-military personnel at each base of a mission scenario.

23. **Risk in Using Non-Military Personnel:** Set the default operational risk in using non-military personnel for each phase of war.
    a. If the bases for a mission scenario are not displayed, click the arrow next to the folder icon to expand the bases list.
    b. For each mission scenario, set the operational risk for each base. Click in each cell to activate the dropdown menu.
24. Click "Continue" to move to the next screen.

Page: Finish
You have now completed reviewing and setting the default values. If you would like to revisit any pages, you can return to any page by clicking on the page tab at the top of the screen.

You can also complete this process later by selecting "Quit & Return Later".

If you are ready to complete this planning baseline, select the "Complete – Make this baseline available to Analysts" button. (See Figure 13 for more on the differences between Draft and Public mode.) Keep in mind that setting the planning baseline to "Complete" means:

- The baseline title cannot be changed.

- Mission scenarios cannot be removed.
- Additional mission scenarios can still be added, but their policies cannot be modified.
- Existing policies cannot be removed, and new policies cannot be added.
- The planning baseline will be set to Public mode which means Analysts can begin using it to run analyses.

2.1.3. Modifying an Existing Planning Baseline/Mission Scenario

This section presents instructions on returning to an existing planning baseline to modify it and its mission scenarios.

1. Go to the *Planning Baselines* tab.
2. Click on the name of the planning baseline you'd like to work on.
3. Return to any active page by clicking on the page tab at the top of the screen (Figure 12).
4. **Add more mission scenarios:** See section 2.1.2. Adding an Existing Mission Scenario**.**
5. **Create a new mission scenario:** See section 2.1.5. Creating a New Mission Scenario.

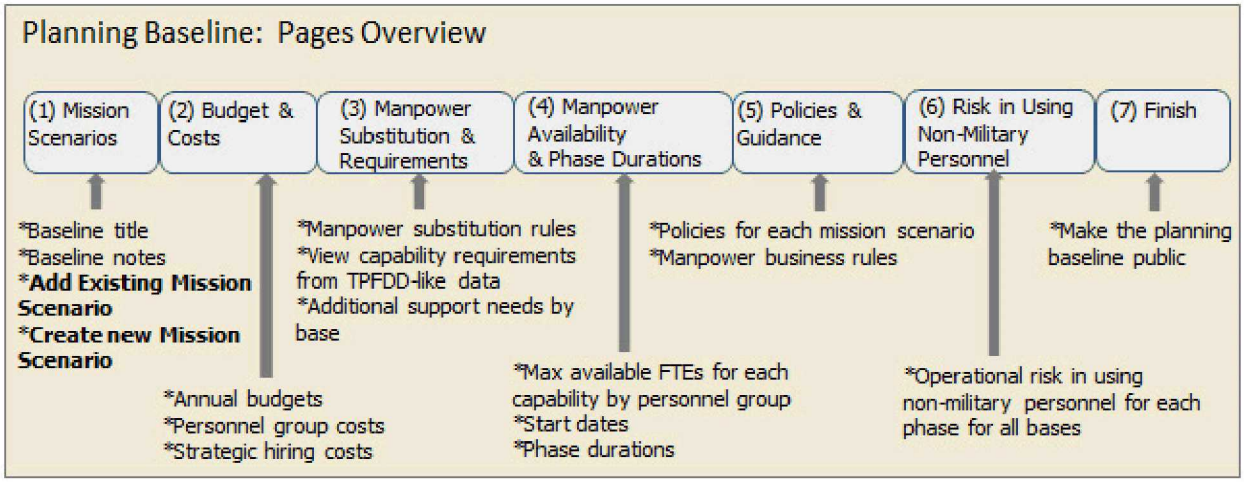

Figure 12. Page tabs within a planning baseline.

2.1.4. Hiding a Planning Baseline

Public planning baselines cannot be removed. They can be hidden so that analysts cannot view or use them.

1. Go to the *Planning Baselines* tab.
2. Uncheck the box in the "Display?" column.
3. The planning baseline will no longer appear on the analysts' screens.

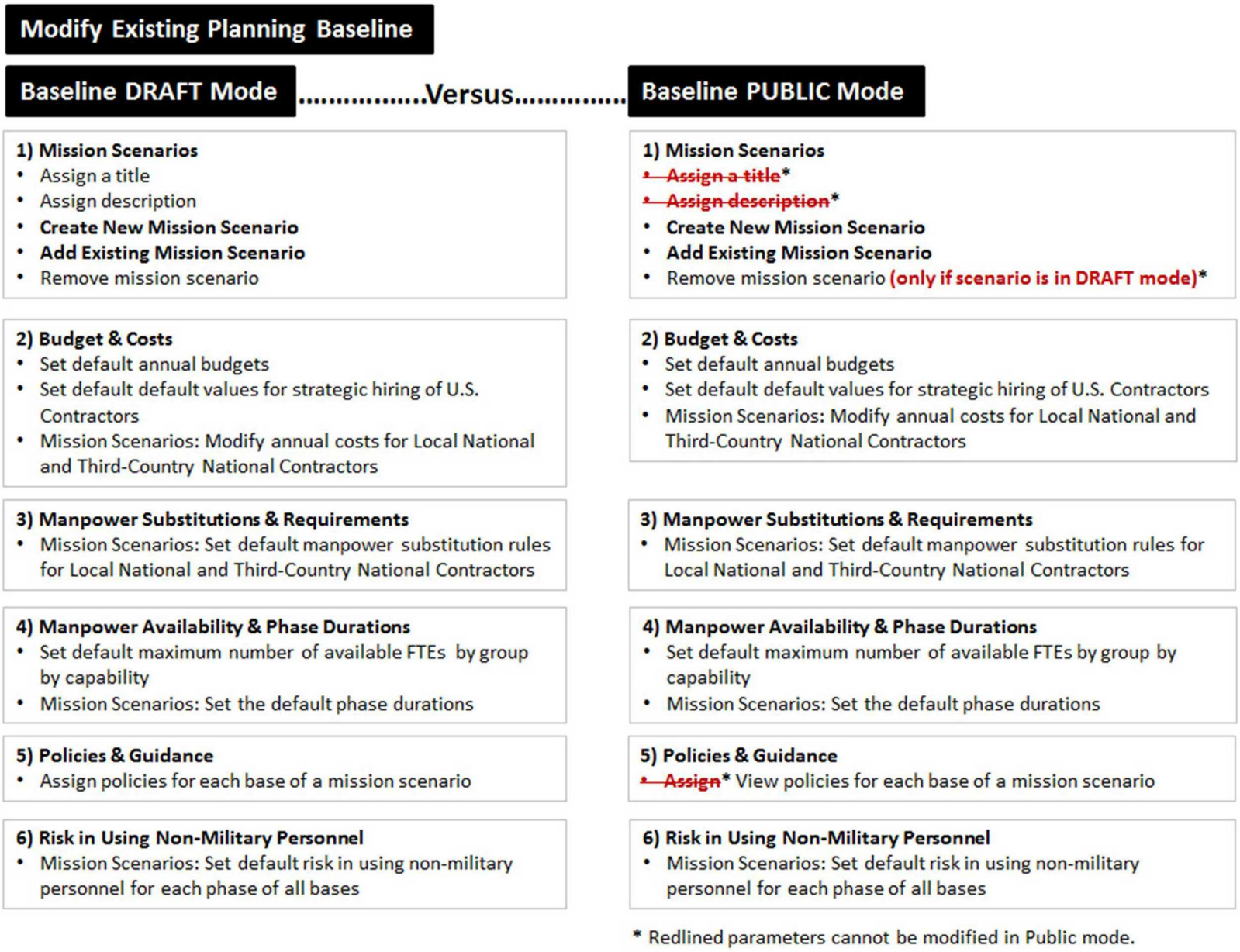

Figure 13. Differences between Draft and Public modes for planning baselines.

2.1.5. Creating a New Mission Scenario

This section presents instructions on creating a new mission scenario. In this engineering prototype, you must create a new mission scenario in one session. You cannot quit and return later to finish.

Checklist: Before You Begin
Gather the following information about your mission scenario before beginning:

- Scenario title
- Type of operation (Humanitarian assistance/disaster relief (HA/DR), major combat operations (MCO), etc.)
- Scenario summary description
- Annual cost of Local Nation and Third-Country National contractors *(default values provided)*
- Phase duration (in days) from the Base Plan (level 2 plan)
- Related TPFDD or TPFDD-like data set
    - If importing a file, it must be in Excel
- Planning factors for additional support needs
- Manpower policies (who can/cannot be used at each base)
- Operational risk in using non-military personnel at each base for every operational phase

When should you reuse an existing mission scenario versus create a new one? See Figure 14 on the next page to understand the differences.

Figure 14. Creating a new mission scenario versus adding an existing mission scenario.

Navigation Tips

- To cancel the creation of the mission scenario at any time, click "Cancel Creation" (Figure 15). This will delete the mission scenario.
- Click the "Continue" buttons to move sequentially through the pages (Figure 15).
- While working on a mission scenario, you can access other pages by clicking on the page tab at the top of the screen (Figure 16).

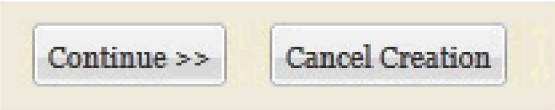

Figure 15. Navigation buttons within a new mission scenario.

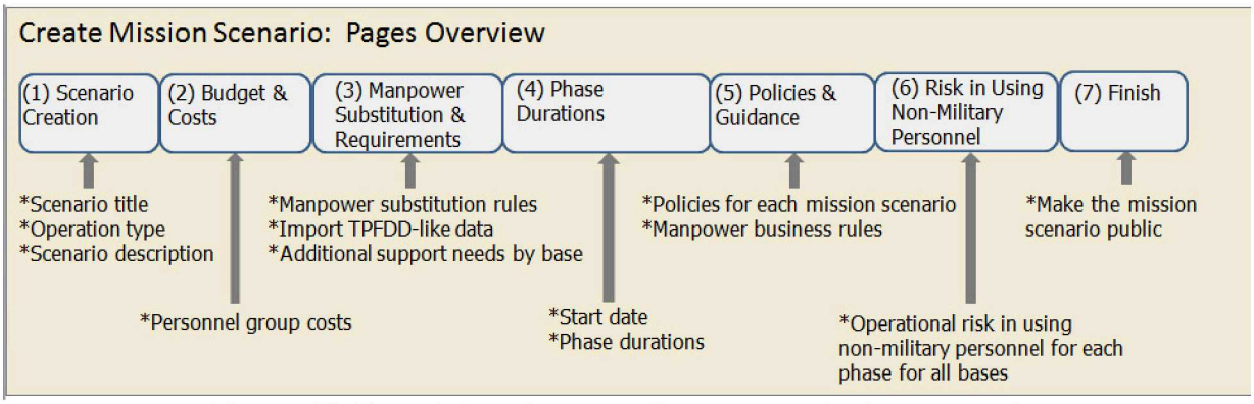

Figure 16. Page tabs when creating a new mission scenario.

Start

1. Log in to CCOT-P.
2. Go to the *Planning Baselines* tab.
3. There are two ways to create a new mission scenario:
    i. As part of an existing planning baseline. Select a planning baseline from the planning baseline index page.
    ii. As part of a new planning baseline. See section 2.1.1. Creating a New Planning Baseline.

Page: Mission Scenario

This page allows you to add, remove and create mission scenarios.

4. Go to the first page of the planning baseline, *Mission Scenario.* Click "Add Mission Scenario" (step A in Figure 17).
5. On the next page, click "Create New Scenario" (step B in Figure 18).

Figure 17. Creating a new mission scenario for a planning baseline.

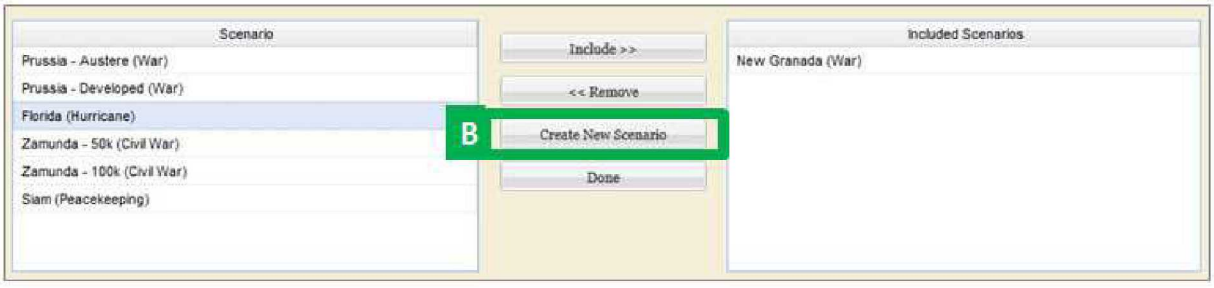

Figure 18. Starting a new mission scenario.

Page: Scenario Creation
On this page, you will enter descriptive information about the new mission scenario.

6. **Title & Description:** Enter a title for the new mission scenario.
7. **Operation Type:** Select an operation type from the dropdown menu. The operation type will create preset values for the Risk in Using Non-Military Personnel page. The same values will be set for all bases. You will be able to change these values later.
8. **Description, Notes, Guidance:** Enter a description of the mission scenario and any planning or analysis guidance for the analysts.
9. Click "Continue" to move to the next screen.
10. If you do not want to continue creating this mission scenario, click "Quit – Do not create this mission scenario". The mission scenario will be deleted.

Page: Budget & Costs
On this page, you will set the annual costs for Local Nation and Third Country National contractors.

11. **Personnel Costs:** Set the annual costs for Local Nation (LN) and Third Country National (TCN) contractors.
    a. The other personnel costs (military, civilian, U.S. contractor) can only be modified by the administrator.
12. Click "Continue" to move to the next screen.

Page: Manpower Substitutions & Requirements
On this page, you will set the manpower substitution rules, enter the manpower requirements for the scenario (via time-phased force and deployment data (TPFDD) or manual entry), and add additional support needs to the pre-existing manpower requirements.

13. **Manpower Substitution Rules:** This table shows you the manpower substitution rules. The substitutions are presented as a comparison to military efficiency. Military will always be 100% efficient in performing each capability.
    a. Set the efficiency of each contractor group by selecting a value from 50%-100%.
    b. For example, if a contractor is 50% efficient, this means the contractor is half as efficient as the military at performing the capability. You need two contractors to replace one military person.
14. **Phase Durations:** Enter the phase durations (in days) for the mission scenario. These can be found in the scenario's base plan (level 2 plan).
    a. Enter the End Day for each phase.
    b. The Start Day for subsequent phases will automatically be updated.

15. **Manpower Requirements - Import:** After entering the phase durations above, you will need to import the TPFDD or TPFDD-like data related to this mission scenario. The TPFDD provides the manpower requirements for each capability by phase.
    a. Click "Browse" (step A in Figure 19).
    b. In the file browser, locate the TPFDD. It must be an Excel file (xls or xlsx). Select the TPFDD, and click "OK" or "Open".
    c. Click "Import" (step B in Figure 19).

Figure 19. Importing a TPFDD.

    d. In the *TPFDD Import* window, all tabs (or worksheets) found in the Excel file will be presented in the dropdown menu (step C in Figure 20). Select the tab that contains the TPFDD data for the scenario. Click "Select".

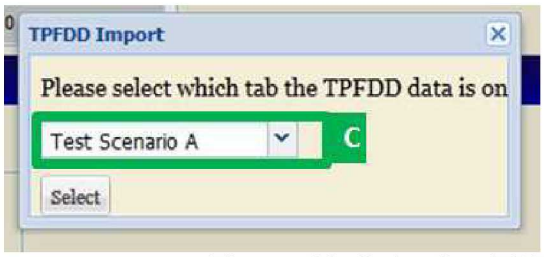

Figure 20. Selecting TPFDD data.

e. All column names from the Excel tab will be listed in the dropdown menus (step D in Figure 21). Select which column names map to the needed data types. Common TPFDD column names are listed in Table 2 as an aid. Your TPFDD may use different column names.
f. Click "OK" when finished.

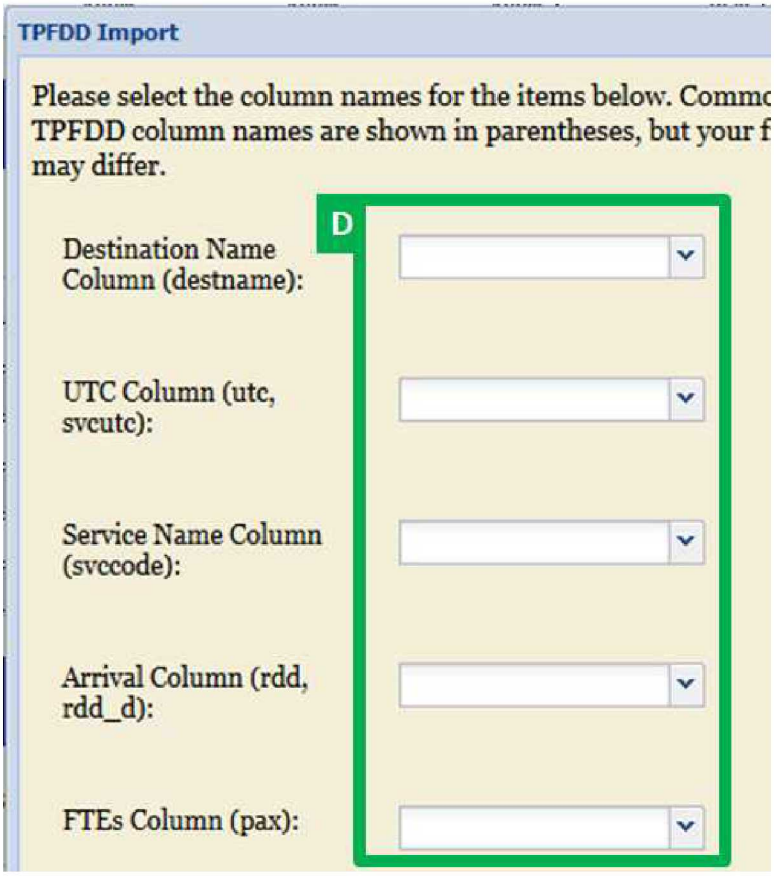

Figure 21. Selecting column names for TPFDD data.

Table 2. Common TPFDD column names.

Destination name (base name):	*destname*
UTC (excluding the service name):	*utc, svcutc*
Service Name (single letter representing the service):	*svccode*
Arrival (date of arrival):	*rdd, rdd_d*
Bodies (number of people in unit):	*pax*

g. You should see numbers appear in the table.
h. CCOT-P will organize the TPFDD data by the destination name column. If no value is listed in the destination column, then these rows will be grouped together with a blank base name. The unit type codes (UTCs) will further be mapped to joint capability areas (JCAs) and operational phases.

16. **Manpower Requirements – Manual Entry:** You can also manually enter the TPFDD or TPFDD-like data related to this mission scenario. The TPFDD provides the manpower requirements for each capability by phase.
    a. Click "Manually Enter Requirements".
    b. Enter a base name, and click "Create".
    c. The base name will appear in the dropdown menu above the manpower requirements table.
    d. Enter the manpower requirements (in FTEs) for each JCA for each phase.
    e. Add additional bases as needed.
    f. To remove a base, select the base name in the dropdown menu. Click "Remove selected base".
    g. Click "Done" when completed.
        i. NOTE: Once "Done" is clicked, the added bases cannot be removed or modified.
    h. The bases will appear in the manpower requirements table on the main page. Only the sum total of the JCAs will appear.
17. **Additional Support Needs:** This table allows you to add additional support requirements (in FTEs) by base.
    a. Select a base from the dropdown menu. Bases from all mission scenarios will be listed.
    b. The first row is the support planning factors (additional FTE needs or percent "plus up"). Enter the percent additional support needed for each capability. Use the Tab key to move to the next cell.
    c. Additional support is calculated as shown in Figure 22.
        i. The force requirements by capability (JCA) are taken from the Manpower Requirements table.
        ii. The calculated additional support needed values are shown by phase in the table below the planning factors row.

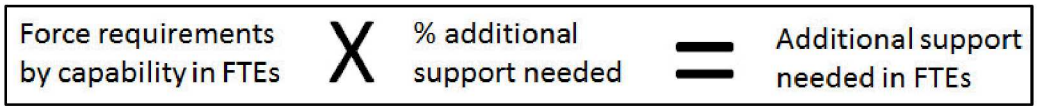

Figure 22. Equation for calculating additional support needs.

18. Click "Continue" to move to the next screen.

Page: Phase Durations
CCOT-P will convert the phase durations (in days) from the previous page to phase durations in weeks. If you do not like how CCOT-P converted the phase durations, you can modify the phase durations in weeks here.

Conversion rules:
Phase durations less than 7 days are set to 0.
Phase durations of 7-13 days are set to 1.
The "rounding" value for all other phase durations is 7. For example:

- A phase of 10 days will be converted to 1 week (10/7 = 1 remainder 3, where 3 < 7).
- A phase of 50 days will be converted to 7 weeks (50/7 = 7 remainder 1, where 1 < 7).

a. Click in a phase's cell to enter or modify the duration (in weeks).
b. Click the Tab key to move to the next cell.
c. Click "Continue" to move to the next screen.

Page: Policies & Guidance
On this page, you will enter policies (as needed) for each base of a mission scenario. The table shows which policies have been applied to each base. For each policy, the table provides a visual representation by displaying which personnel groups can (Yes/green) or cannot (No/red) be used according to the policy. The row shown next to the base name shows the combined effect of the policies applied to the base.

20. **Policy Selection:** Add and modify policies for each base as needed. [*Analysts cannot remove any policies that have been added by a planning manager.*]
    a. If the bases for a mission scenario are not displayed, click the arrow next to the folder icon to expand the bases list.
    b. Every base of a mission scenario must have at least one policy. The default policy is "All Personnel Groups".
    c. **Add policy:** Click the "Add Policy" button next to the appropriate base name.
        i. A pop up window will display all available policies. Select the policies you want to add to the base by clicking the checkbox in the "Add" column.
        ii. Click the "Add selected policies" button. The policies now appear below the base.
    d. **Remove policy:** Click "Remove" next to the policy. "All Personnel Groups" cannot be removed.
21. **Available Policies:** This view-only table shows all available policies.
22. Click "Continue" to move to the next screen.

Page: Risk in Using Non-Military Personnel
On this page, you will enter the level of risk in using non-military personnel at each base of a mission scenario.

23. **Risk in Using Non-Military Personnel:** Set the operational risk in using non-military personnel for each phase of war.

a. If the bases for a mission scenario are not displayed, click the arrow next to the folder icon to expand the bases list.
a. For each mission scenario, set the operational risk for each base of each mission scenario.

25. Click "Continue" to move to the next screen.

Page: Finish

When you reach the ***Finish*** page, you have completed reviewing and setting the default values. Keep in mind that setting a mission scenario to complete means:

- You can no longer change the TPFDD/manpower requirements data.
- It will be set to Public mode, which means it can be viewed and used by analysts once the planning baseline is also set to Public mode.
- It can be included in other planning baselines.

26. If you would like to revisit any pages, you can return to any page by clicking on the page tab at the top of the screen.
27. To complete this mission scenario, click the button "Complete: make this mission scenario available to analysts". If you do not complete the mission scenario, it will not be saved. You cannot leave and return later to continue working on it.
28. On completion, you will be returned to the planning baseline *Mission Scenarios* page. Your new mission scenario should appear in the mission scenarios table. If not, you may need to go to the Main page and then return to the planning baseline to force the table to update.

2.2. Modification Rules for Planning Baselines & Mission Scenarios

1. A new mission scenario must be created as part of a planning baseline (it cannot exist independently).
2. Mission scenarios are reusable. Once a newly created mission scenario is completed, it can be used by other planning baselines.
    a. The TPFDD/manpower requirements data and bases cannot be changed. All other parameters are modifiable.
3. Analysts can only see planning baselines and mission scenarios that are set to Public.
4. For Public planning baselines, the planning manager can continue to add mission scenarios and to modify all parameters (except for the TPFDD-like data, bases and policies). In addition,
    a. Mission scenarios cannot be removed from a Public planning baseline.
    b. Policies cannot be modified in a Public planning baseline.
    c. Policies applied to mission scenarios by the planning manager cannot be removed by analysts.
5. In creating a baseline or creating/adding a mission scenario, the planning manager has to review all of the values (click through all the screens) before he is allowed to set either to Public.

3. ANALYST ACTIVITIES

The analyst is a planner who will be using CCOT-P to perform "what-if" analyses. Through these analyses, the analyst will be able to provide estimates on the number of contractors needed, what capabilities they will need to have, and when they will be needed.

There are two types of planning that can be performed. First, the analyst can perform planning limited to scenarios within a CCMD or service. Second, the analyst can perform an integrated, centralized analysis using scenarios across all CCMDs and all services.

3.1. Analyses Manager

3.1.1. Browsing Existing Analyses

The analyses manager allows you to start a new analysis and to view results from existing analyses. The analyses manager is designed like a file browser (Figure 23). Planning baselines are the top level directories, and analyses are organized beneath them. Analyses that are children of other analyses are called "branches". Each analysis has a unique Analysis ID (first column) to simplify locating and referencing existing analyses.

- Expand a planning baseline to view its analyses.
- Expand an analysis to view its branches.

Analyses have two status modes:

1. *Initial* or *Ready* means that the analysis has not been run. It is a work in progress.
2. *Solved* means that the analysis has been run. It has results. Its input values can no longer be modified.

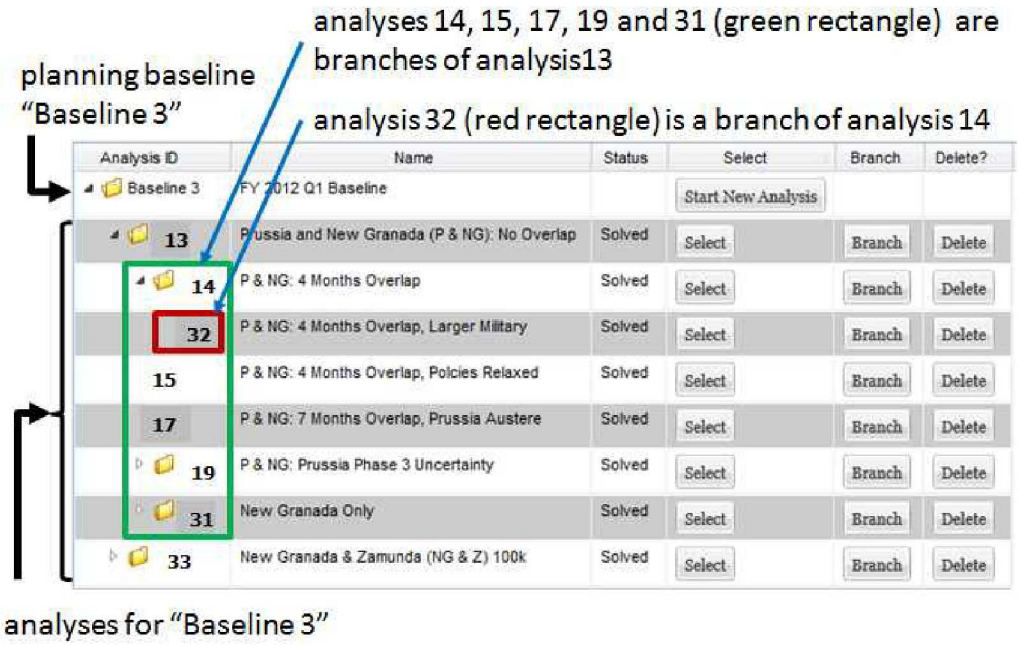

Figure 23. Overview of the Analyses Manager.

3.1.2. Viewing Results of an Existing Analysis

This section provides instructions on accessing analyses to view their results. Only solved analyses will have results.

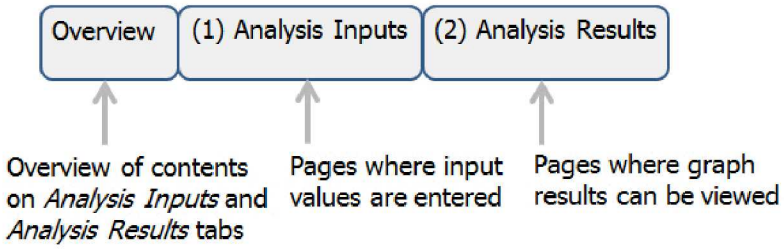

Figure 24. Main pages for an analysis.

An analysis has three main sections, as shown in Figure 24.

1. **Overview** – The Overview page shows what tasks can be performed on each of the Analysis Inputs pages. It also includes links to Analysis Inputs sub-pages. If the analysis has been solved, the Overview page will display links to the Analysis Results pages.
2. **Analysis Inputs** – The Analysis Inputs page is where the analyst will modify input values for the "what if" analysis. It contains six sub-pages, which can be seen in Figure 26.
3. **Analysis Results** – The Analysis Results page contains all of the graph results (Figure 27). These results can only be viewed when the analysis is solved. Otherwise, this page appears blank. The graphs are described later in this section.

Start

1. In the Analyses Manager, find the existing analysis you wish to view.
2. Click the "Select" button in the same row as the analysis (step A in Figure 25).
3. You will be taken to the *Overview* tab of the analysis.
4. To view the inputs, click on a page on the *Overview* page, or click on the *Analysis Inputs* (Figure 26) tab at the top and then click on a sub-page.
5. To view results and graphs, click on the *Analysis Results* tab (Figure 27).

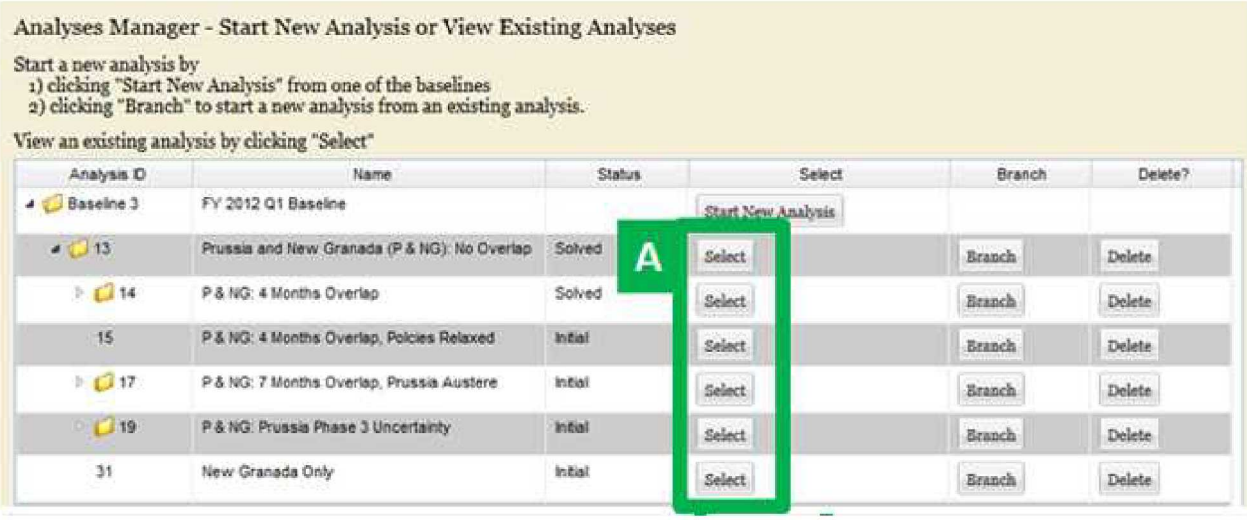

Figure 25. Selecting an analysis to view.

Figure 26. *Left*: Overview of Analysis Inputs pages.

Figure 27. *Right*: Overview of Normal (Deterministic) Analysis Results pages.

3.2. Analyses

An analysis run is a single "what-if" scenario. You set the input values for the "what-if" scenario, run the analysis, and then view the results. Once an analysis is solved, the input values cannot be changed. You can create as many analyses as you want.

3.2.1. Two Types of Analyses

Whether creating a new analysis (section 3.2.2. Starting a New Analysis) or branching off an existing one (section 3.2.3. Branching a New Analysis), you must decide what kind of analysis you want to create.

Normal – Deterministic analysis that includes no uncertainty. Most of your analyses will probably be normal.

Uncertainty of Phases 3-5 Durations – The optimization model is also capable of assessing how uncertainty impacts contingency contractor decisions. This is important because most analysis uses predetermined profiles and start dates for each mission scenario. In reality, the exact requirements for executing mission scenarios are uncertain. In this version of CCOT, the user is able specify a range of possible durations for phases 3, 4 and 5 of each mission scenario.

Additional insight can be gained when uncertainty is added to an analysis. Without uncertainty, all of the outputs described above are a single estimate given one possible outcome for the mission scenarios. Uncertainty introduces a range of situations that can occur, and this in turn introduces a range of outcomes. For example, instead of a single estimate of cost, variability around costs can be understood. A longer discussion can be found in section

3.2.6. Analysis Results for Uncertainty of Phases 3-5 Durations.

3.2.2. Starting a New Analysis

1. Login to CCOT-P.
2. In the Analyses Manager, select a planning baseline to work on.
3. Click “Start New Analysis” next to the planning baseline (step A in Figure 28).
    a. NOTE: Starting a new analysis will populate it with the default values entered by the planning manager. If you want to start with the values in an existing analysis, you need to branch (see section

b. 3.2.3. Branching a New Analysis).

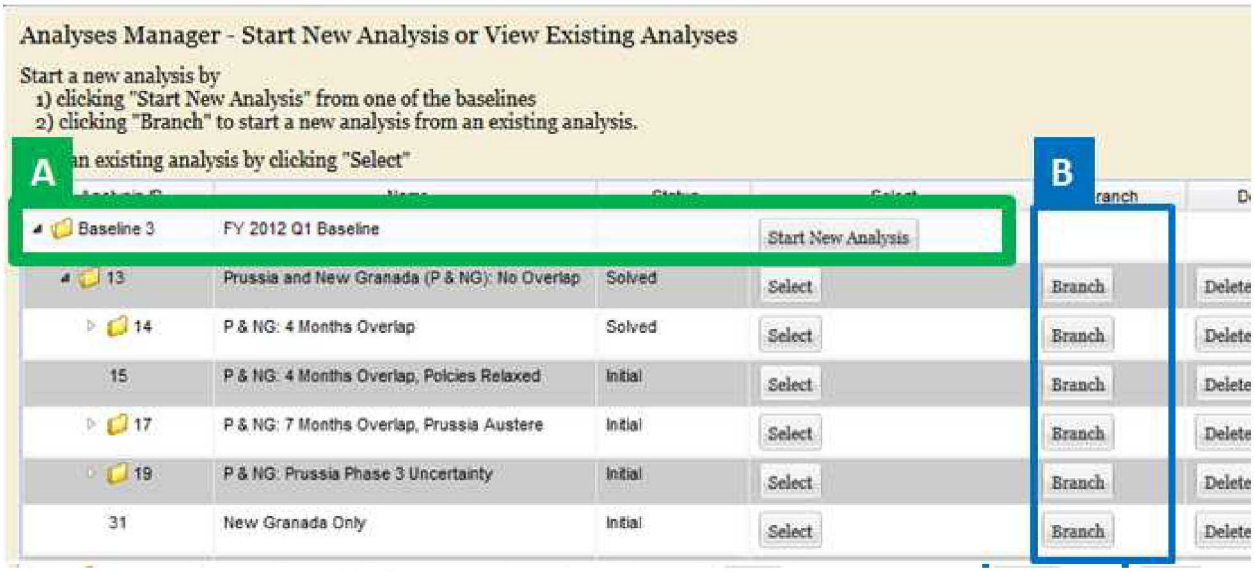

Figure 28. Starting a new analysis from baseline values.

Page: Scenario Selections
On this page, you will enter descriptive information about your analysis. This will help you and other analysts understand the purpose of this analysis.

4. Enter a unique title for the analysis.
5. Enter a description for the analysis (optional). The description can help you and others understand the goal of this analysis.
6. Select the type of analysis you wish to create. You may only select one option. See section 3.2.1. Two Types of Analyses for Descriptions.
    a. Normal
    b. Uncertainty of the Duration of Phases 3-5
7. Select a mission scenario from the list on the left, and then click “Include”. Or select a mission scenario and drag-n-drop it to the list on the right.
8. To remove a mission scenario, select a mission scenario from the list on the right, and then click “Remove”. Or select a mission scenario and drag-n-drop it back to the list on the left.
9. Click “Continue” to move to the next screen.

Page: Budget & Cost
On this page, you will set budget constraints and annual costs for Local Nation and Third Country National contractors.

10. **Budget:** Set the budget for each fiscal year.
    a. If you do not want to add a budget constraint, click the checkbox for “No budget constraints”. The optimization model will determine the cheapest possible manpower mix.
11. **Personnel Costs:** This table displays the annual costs for each personnel group.

a. Set the default annual costs for Local Nation and Third-Country National contractors for each mission scenario.
b. The other costs can only be modified by the administrator.

12. Click "Continue" to move to the next screen.

Page: Manpower Substitutions & Requirements

On this page, you will set the manpower substitution rules, view previously entered manpower requirements, and add additional support needs to the pre-existing manpower requirements.

13. **Manpower Substitution Rules:** This table shows you the manpower substitution rules. The substitutions are presented as a comparison to military efficiency. Military will always be 100% efficient in performing each capability.
    a. Set the efficiency of each contractor group by selecting a value from 50%-100%.
    b. For example, if a contractor is 50% efficient, this means the contractor is half as efficient as the military at performing the capability. You need two contractors to replace one military person.
    c. The other values can only be modified by the administrator.
14. **Manpower Requirements Imported from TPFDD-like Data:** This table shows the force requirements (in FTEs) for each capability. This information came from the TFDD or TPFDD-like data set associated with each mission scenario. This table is view-only.
15. **Additional Support Needs:** This table allows you to add additional support requirements (in FTEs) by base and by operational phase.
    a. Select a base from the dropdown menu. Bases from all mission scenarios will be listed.
    b. The first row is the support planning factors (additional FTE needs or percent "plus up").
    c. Additional support is calculated as shown in Figure 29**Error! Reference source not found.**.
        i. The force requirements by capability (JCA) are taken from the Manpower Requirements table.
        ii. The calculated additional support needed values are shown by phase in the table below the planning factors row.
16. Click "Continue" to move to the next screen.

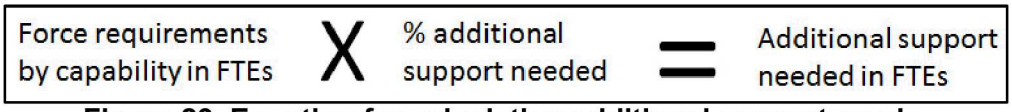

Figure 29. Equation for calculating additional support needs.

Page: Manpower Availability & Phase Durations

On this page, you will enter manpower availability limits for the personnel groups by capability. You will enter the phase start dates and durations for the mission scenarios.

17. **Manpower Availability:** For each capability, set the maximum number of FTEs available in each personnel group.
    a. All of the mission scenarios in this planning baseline will be competing for these resources.

b. It assumed that contractors are an unlimited resource. To add limits to TCN and LN contractors, click the "Allow Contractor Limits" checkbox above the table. Columns will appear for TCN and LN so that limits can be added. U.S. Contractors are not shown because they are always treated as an unlimited resource.

18. **Phase Durations:** For each mission scenario, set the default start date and duration (in weeks) for each operational phase (phases 0-5).
    a. Click on the date in the Start Date column (step 1 in Figure 30).
        i. A calendar will appear.
        ii. Click on the right/left arrows to move forward or backward a month. Or click on the month name (step 2 in Figure 30).
        iii. A month and year view will appear.
        iv. Select a start month from the list on the left (step 3 in Figure 30).
        v. Select a start year from the list on the right (step 4 in Figure 30).
            1. Fiscal Years start in October and end in September.
            2. Example1: FY14 runs October 2013 through September 2014.
            3. Example 2: If planning for a start date in December of FY20, you would select December and year 2019.
        vi. Click "OK" (step 5 in Figure 30).
        vii. You will be returned to the calendar view. Click on a Sunday (last column on the right) for the start date of the scenario (step 6 in Figure 31).
            1. If you click on any other weekday, the tool will automatically select the previous Sunday of your selected date.
        viii. The start date and FY will be updated in the table (step 7 in Figure 31).
    b. For each phase, enter the number of weeks the phase will last. Use the Tab key to move to the next phase duration value/cell.

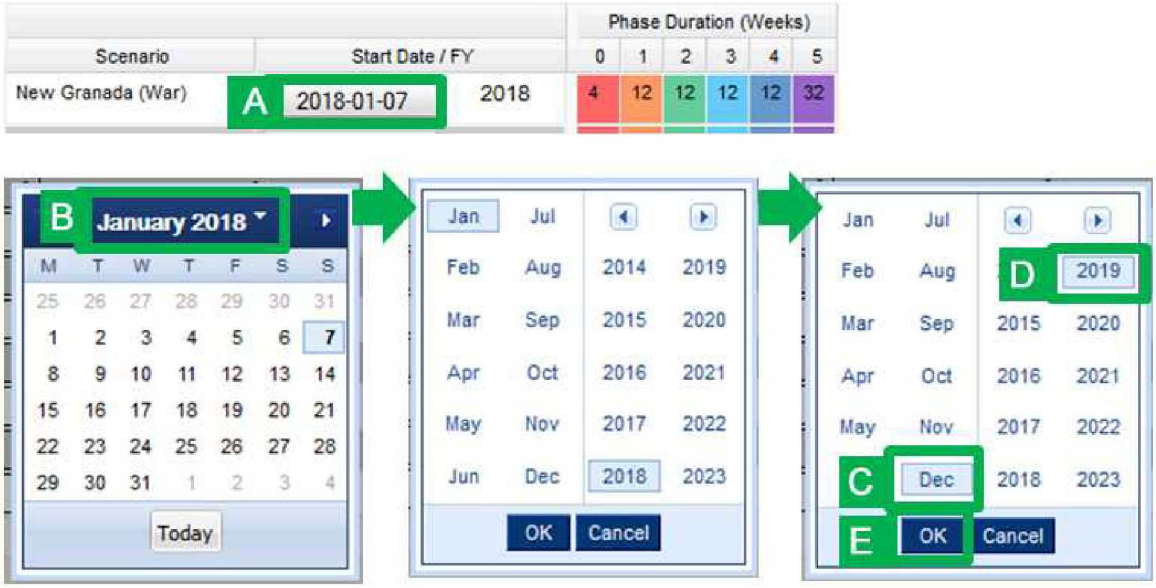

Figure 30. Selecting the month and year for a start date.

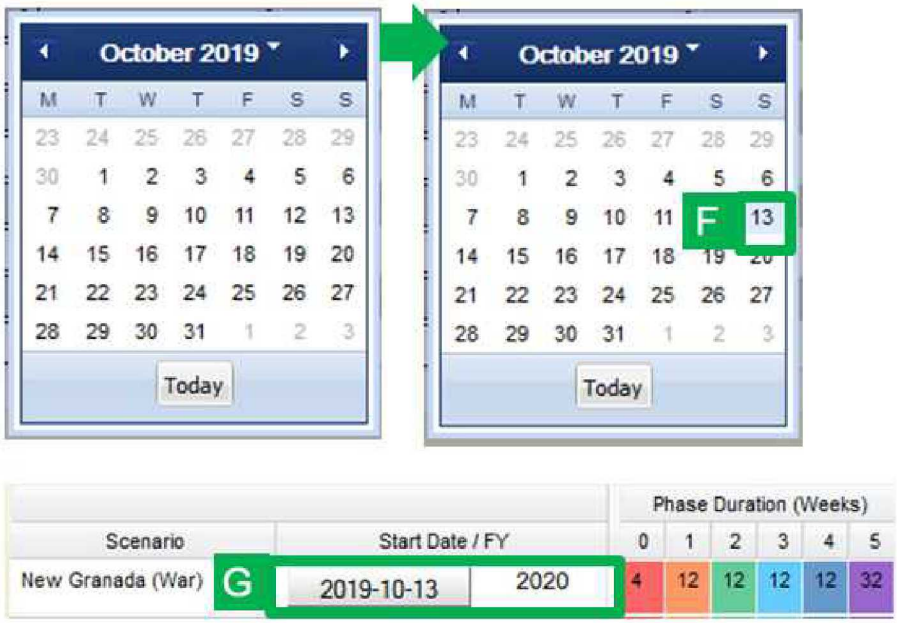

Figure 31. Selecting the day for a start date.

19. If you selected to create an analysis with uncertainty of phase durations:
    a. Select the start date as described in the previous step.
    b. Set the duration of phases 0-2 (in weeks).
    c. Set the minimum and maximum duration (in weeks) for phases 3, 4 and 5. It is okay if you want only one of the phases to have uncertainty. Set the min and max duration to the same number if you do not want uncertainty for one of the phases.

    d. NOTE: The tool uses a sampling technique optimized to handle uncertainty cases for two scenarios with a few months of uncertainty. Running more complex uncertainty cases is possible with the current configuration, but the results will be less accurate (see section The Optimization Model & Uncertainty). If you need to run several uncertainty analyses for more than two scenarios and/or several months of uncertainty, please contact the Administrator. Settings in the tool will need to be modified to handle the increased calculations.
20. To view how mission overlap (or lack thereof) impacts resource requirements, there are two links to graphs under the Phase Durations table.
    a. NOTE: These graphs may be slow to load. Have patience.
    b. NOTE: If you make any changes to the Manpower Availability or Phase Durations tables, click "Save Changes" before opening a graph. This will ensure that your changes are reflected in the graphs.
    c. *Total Personnel Requirements by Scenario* – displays resource requirements over time by scenario
    d. *Required vs. Available Personnel by Capability* – displays resource requirements for a selected capability against availability of a selected personnel group
        i. NOTE: Maximum availability of a personnel group can be modified in the first table on this page.

21. Click “Continue” to move to the next screen.

Page: Policies & Guidance
On this page, you will enter policies (as needed) for each base of a mission scenario. The table shows which policies have been applied to each base. For each policy, the table provides a visual representation by displaying which personnel groups can (Yes/green) or cannot (No/red) be used according to the policy. The row shown next to the base name shows the combined effect of the policies applied to the base.

22. The first table allows you to add policies to the bases of the mission scenarios.
    a. NOTE: *You cannot remove any policies that have been added by a planning manager.*
    b. If the bases for a mission scenario are not displayed, click the arrow next to the folder icon to expand the bases list.
    c. Every base of a mission scenario must have at least one policy. The default policy is “All Personnel Groups”.
    d. **Add policy:** Click the “Add Policy” button next to the appropriate base name.
        i. A pop up window will display all available policies. Select the policies you want to add to the base by clicking the checkbox in the “Add” column.
        ii. Click the “Add selected policies” button. The policies now appear below the base.
        iii. **Remove policy:** Click “Remove” next to the policy. “All Personnel Groups” cannot be removed as it is the default setting.
23. The second table shows all available policies. This is a view only table.
24. The third table shows whether or not each personnel group is allowed to perform each capability. This information is derived from DoDI 1100.22.
25. Click “Continue” to move to the next screen.

Page: Risk in Using Non-Military Personnel
On this page, you will enter the level of risk in using non-military personnel at each base of a mission scenario.

26. The first table allows you to set the operational risk in using non-military personnel for each phase of war.
    a. If the bases for a mission scenario are not displayed, click the arrow next to the folder icon to expand the bases list.
    b. For each mission scenario, set the operational risk for each base. Click in each cell to activate the dropdown menu.
27. **Personnel Group Availability:** This table shows you which personnel groups are available for use based on values entered on this page and on the *Policies & Guidance* page. Every base will have two rows.
    a. “baseline availability” shows availability based on the default values entered by the planning manager.

b. “risk and policy impacts” shows availability based on the values entered by the analyst. This allows the analyst to see how his/her inputs have changed personnel group availability.

Page: Running the Analysis

28. If you are finished entering values for this analysis and do not need to make further changes, click “Continue: Run Analysis” to run the analysis.
    a. NOTE: *Once you run the analysis, you can no longer modify the input values for this analysis.*
29. The optimization model will now compute the optimal total workforce mix. This may take a few minutes. Analyses with uncertainty will take longer to run.
30. Once the optimization model has completed computation, results will be available on the *Analysis Results* tab. Please see section 3.2.5. Analysis Results & Graphs for more information on the results.

3.2.3. Branching a New Analysis

Branching allows you to create a new analysis by copying all of the input values from an existing analysis. This makes it easier to perform "one off" analyses.

1. Login to CCOT-P.
2. In the Analyses Manager, find the existing analysis you wish to copy.
3. Click the "Branch" button in the same row as the analysis (step B in Figure 32).
4. All the input values from the selected analysis will be copied over into your branched analysis. If you want the new analysis to be populated with the default values set by the planning manager, you need to start a new analysis.
5. Your branched analysis is essentially a new analysis. See 3.2.2. Starting a New Analysis for instructions on how to set input values and how to run the analysis.

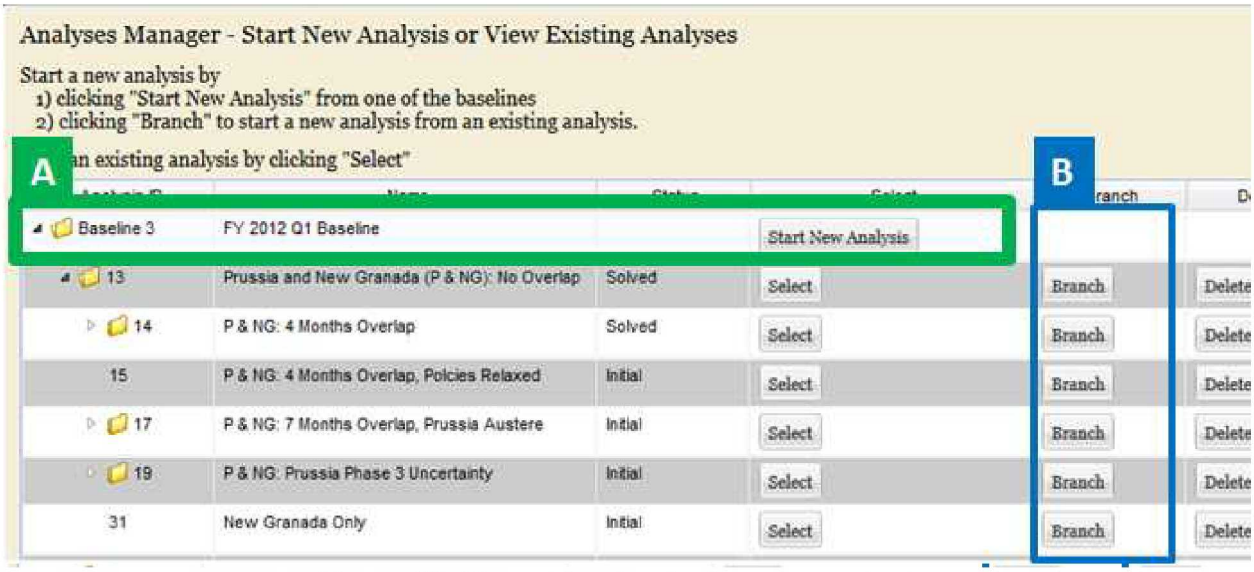

Figure 32. Branching to start a new analysis.

3.2.4. Removing an Analysis

Removing an analysis will permanently remove it from the tool. It cannot be restored later.

1. Login to CCOT-P.
2. In the Analyses Manager, find the existing analysis you wish to remove.
3. Click the "Delete" button (last column) in the same row as the analysis.
4. The analysis will immediately be removed.

3.2.5. Analysis Results & Graphs

This section describes the graph results for normal (deterministic) analysis (

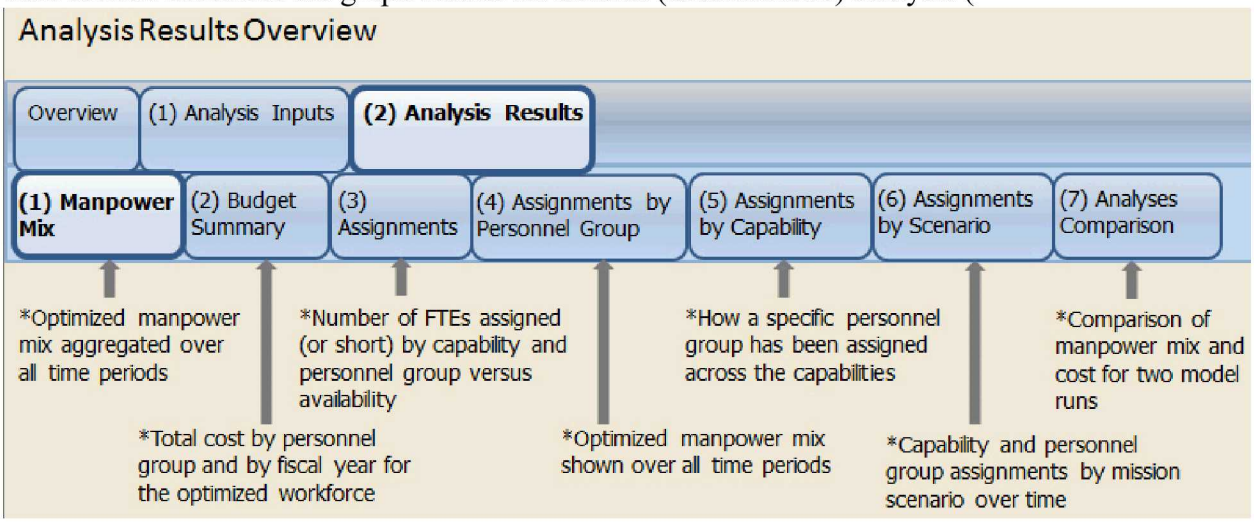

Figure 33). All of the values displayed in the graphs are based on the optimization model's optimized workforce mix. Except for Manpower Mix and Analyses Comparison, all of these graphs are displayed on a timeline. Graph results for uncertainty analyses (phase duration uncertainty) are described in section

3.2.6. Analysis Results for Uncertainty of Phases 3-5 Durations.

Some graphs may be slow to load. Have patience.

Known Browser Issues
CCOT-P should work in all browsers, but we do not recommend Internet Explorer (IE) 8. Testing has shown JavaScript issues in IE8, and this issue may occur in earlier versions of IE as well. When JavaScript takes too long to generate a graph, IE8 displays the error message, "Stop running this script?" If you receive this message in any browser while trying to view a graph, then that graph will probably never appear. This only affects graphs with "Assignments" in their title.

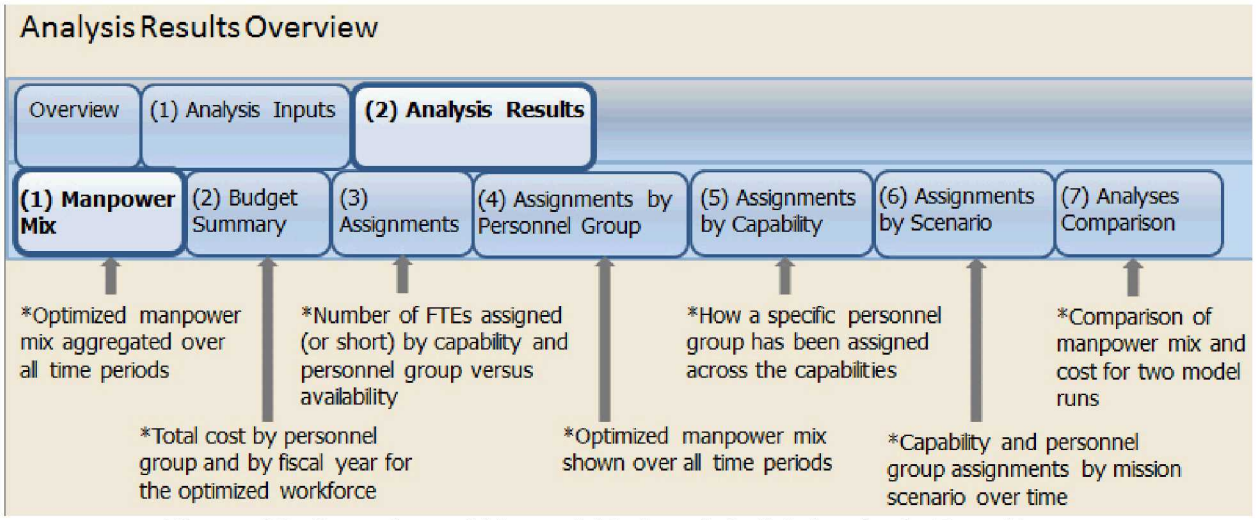

Figure 33. Overview of Normal (Deterministic) Analysis Results pages.

(1) Manpower Mix
This pie chart displays the optimized workforce mix aggregated over all time periods. By default, all scenarios and all capabilities (Joint Capability Areas) are shown. This graph can be limited to a specific scenario or capability by using the dropdown menus.

Annex W can be downloaded from this page by clicking the "Create Annex W" button. The Excel file contains tables with estimated contractor needs (organized by mission scenario, phase, JCA and contractor type) based on the optimized workforce mix.

(2) Budget Summary
This graph displays the total cost (sum of all mission scenarios) by fiscal year for the optimized workforce.

(3) Assignments
This graph displays the number of personnel assigned or short by capability and personnel group versus the availability over time.

Assignments are displayed as the number of FTEs from a specific personnel group used to perform a specific capability. The personnel group and capability (Joint Capability Area) must be selected from the dropdown menus.

Availability is shown as a capacity line – the maximum number of personnel available in FTEs with that capability. The capacity line value is set on Analysis Inputs sub-tab *Manpower Availability & Phase Durations*. Contractors do not have a capacity line (maximum availability) since they are assumed to be an unlimited resource.

Overages are displayed as the number of additional FTEs for the selected personnel group and capability that would be required to accomplish the requested workload. When there are insufficient resources to accomplish workload the optimization model will identify the cheapest resource pool that could be used to fulfill the unsatisfied demand.

(4) Assignments by Personnel Group
This graph displays the optimized workforce mix over all time periods. This graph displays how the need for a specific capability (Joint Capability Area) has been distributed across the personnel groups. The capability must be selected from the dropdown menu. By default, the workforce mix is shown over all scenarios and all capabilities are shown. This graph can be limited to a specific capability and/or scenario using the dropdown menu.

(5) Assignments by Capability
This graph displays how a specific personnel group has been assigned across the capabilities (Joint Capability Areas). The personnel group must be selected from the dropdown menu.

(6) Assignments by Scenario
This graph displays the number of personnel from a specific personnel group with a specific capability assigned to each mission scenario over all time periods. The personnel group and capability (Joint Capability Area) must be selected from the dropdown menus.

(7) Analyses Comparison
This graph allows you to compare the manpower mix and the use cost of two analyses. The manpower mix pie charts are shown side-by-side. The use costs (broken down by personnel groups) are displayed in a table. This comparison quantifies how changes to the input values (change in policy, mission overlap, manpower business rules, etc.) impact the optimal manpower mix and total cost. Only two, normal (deterministic) analyses can be compared.

The graphs can further be filtered by capability and by mission scenario.

3.2.6. Analysis Results for Uncertainty of Phases 3-5 Durations

This section describes the graph results for uncertainty analyses (Figure 34. Overview of Uncertainty Analysis Results pages.). The graph results from analyses that include uncertainty of phases 3-5 durations are not as straightforward to interpret. This section begins with summary descriptions of each graph. This section ends with a description of how the optimization model handles uncertainty.

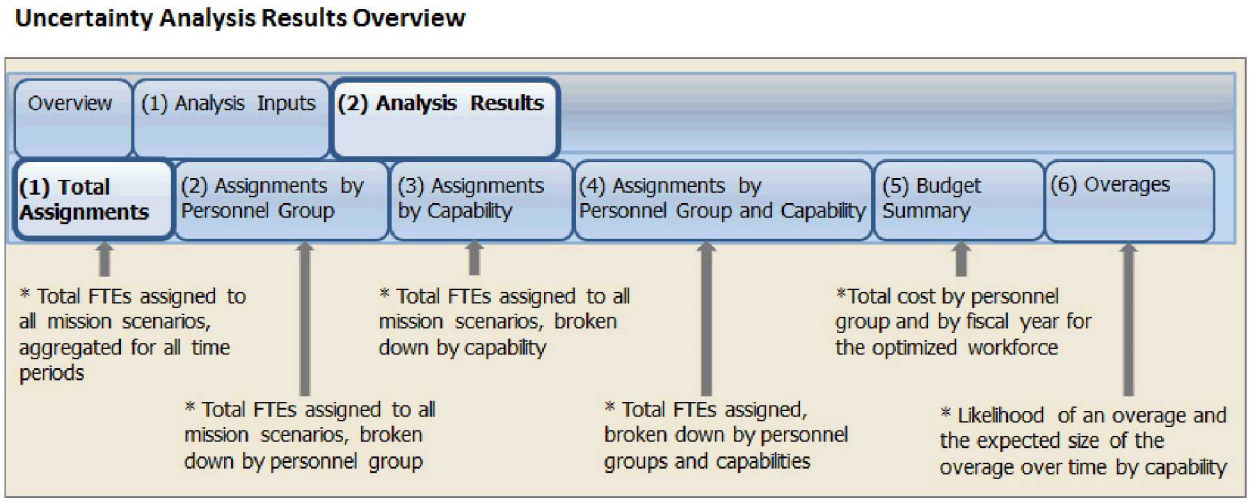

Figure 34. Overview of Uncertainty Analysis Results pages.

(1) Total Assignments

This graph displays the total number of personnel assigned to all mission scenarios over all time periods. Since these results capture uncertainty in the demand for resources, the total number of assigned personnel is shown for the 25th, 50th and 75th percentiles. A percentile is a measurement that is used to capture the value at which a given percentage of observations will fall below.

Consider a case where the 25th, 50th, and 75th percentiles for a given week are 5,000, 10,000 and 11,000 personnel. This implies that given the uncertainties around mission scenario durations, there is only a 25% chance that fewer than 5,000 personnel will be required. The same idea is true for the 50th and 75th percentiles. A detailed description of percentiles is provided later in this section.

This output provides insights into the impacts of uncertainty with respect to demand for personnel. When the three percentile results have the same values or are close, this is an indication that impacts of uncertainty are minimal. When there are differences between the three percentiles, this allows the analyst to understand how the total demand might vary.

In the previous example, the 50th and 75th percentiles only differed by 1,000 personnel. This indicates that 25% of the time the demand will be between 10,000 and 11,000 personnel and that there is only a 25% chance of requiring more than 11,000 personnel. These results can be used to identify cases where normal (determinist) analysis should be conducted to understand impacts of specific mission scenario durations.

(2) Assignments by Personnel Group
This graph displays the same information as the graph on the Total Assignments tab, except that it displays assignments by personnel group. The personnel group must be selected from the dropdown menu.

(3) Assignments by Capability
This graph displays the same information as the graph on the Total Assignments tab, except that it displays assignments by capability. The capability must be selected from the dropdown menu.

(4) Assignments by Personnel Group and Capability
This graph displays the same information as the graph on the Total Assignments tab, except that it displays assignments by personnel group and capability. The personnel group and capability must be selected from the dropdown menus.

(5) Budget Summary
This graph displays the total cost (sum over all mission scenarios) by fiscal year for the optimized workforce. It shows the costs by the expected value (average) and percentile. The stacked bar charts show the expected costs by personnel group. A detailed description of the expected value is provided later in this section.

The line graph shows the 25^{th}, 50^{th} and 75^{th} total cost percentiles. These results show how the uncertainty around assignments impacts the total cost. These results can be interpreted in the same manner as the prior four assignments' results (first four tabs).

(6) Overages
This graph displays the likelihood of an overage and the expected size of the overage over time by capability. An overage occurs when more personnel are required than are available.

Two separate vertical axes are used to display these results. The first axis (left) shows the likelihood that an overage occurs for the selected capability in a given week. The second axis (right) shows the expected value (average) of the overage when it occurs. The size of the overage is given in terms of active military personnel (recall that more personnel from a given personnel group may be required due to efficiency factors).

Overages may occur because of budget or resource pool size limitations. The likelihood of an overage helps quantify the risk that the mission cannot be accomplished due to resource limitations. The average size of the overage gives an indication of the scale of additional resources that would be required to satisfy the mission needs.

When analyzing overages, it is important to consider two factors. First, only the average value of the overage is shown. Consider a situation where one case has an overage of 500 personnel and a second case has an overage of 1,000 personnel. In this situation the average overage would be 750 personnel. However, this does not imply that 750 additional resources should be acquired. One strategy might be to acquire 500 additional personnel to guard against one of the scenarios but not the other. Another strategy might be to acquire 1,000 personnel to guard against both scenarios. Second, it is important to understand which personnel groups can be assigned to the

overage. Hiring more contractors would not be useful if the overage occurs for military only activities.

The Optimization Model & Uncertainty

To better understand the graph results, it helps to understand how the optimization model handles uncertainty. Current analysis uses predetermined profiles and start dates for each mission scenario. For each mission scenario, you enter a specific start date and a specific duration for each phase. In reality, the exact requirements for executing mission scenarios are uncertain. In this version of CCOT, you can specify a range of possible durations for phases 3, 4 and 5 of each mission scenario.

Additional insight can be gained when uncertainty is added to an analysis. Without uncertainty, all of the outputs described in section 3.2.5. Analysis Results & Graphs are a single estimate given one possible outcome for the mission scenarios. Uncertainty introduces a range of situations that can occur, and this in turn introduces a range of outcomes.

For example, let phase 3 have a range of 2-7 weeks and phase 4 have a duration of 2 weeks (the minimum and maximum durations are both set to 2 weeks). To make our example easier, phase 5 will have no uncertainty. Instead of solving a single event with fixed values for the phase durations, like in the normal analysis, the optimization model has to consider six different events, each one accounting for a different phase 3 duration (Table 3).

Table 3. Event combinations for phase 3 duration uncertainty.

Event	Phase 3 Duration	Phase 4 Duration
A	2	2
B	3	2
C	4	2
D	5	2
E	6	2
F	7	2

If the phase 4 duration were to vary as well, there would be even more events for the optimization model to solve. Every value of phase 3 would have to be solved with every value of phase 4. For example, let phase 4 now have a range of 2-3 weeks. This results in twelve different events (6 x 2) to solve (

Table 4).

Table 4. Event combinations for phase 3 and 4 duration uncertainty.

Event	Phase 3 Duration	Phase 4 Duration
A	2	2
B	3	2
C	4	2
D	5	2
E	6	2
F	7	2
G	2	3
H	3	3
I	4	3
J	5	3
K	6	3
L	7	3

This is just for a single mission scenario. If two mission scenarios have phase duration uncertainty, every variation of the first mission scenario has to be solved with every variation of the second mission scenario. That's a lot of events. In practice, many analyses will have too many events to test them all within a reasonable amount of time. Instead, only a portion of all the possible outcomes are solved by the tool. Randomly selecting a portion of the events to solve is referred to as sampling. By performing calculations on these samples, the exact uncertainty results can be estimated.

NOTE: The tool uses a sampling technique optimized to handle uncertainty cases for two scenarios with a few months of uncertainty. Running more complex uncertainty cases is possible with the current configuration, but the results will be less accurate. If you need to run several uncertainty analyses for more than two scenarios and/or several months of uncertainty, please contact the Administrator. Settings in the tool will need to be modified to handle the increased calculations.

Each of these events will have a different cost. As the phase duration increases, the cost will increase since you have to pay salaries for longer periods of time. If the mission scenarios overlap, increasing the phase durations in one mission may increase the overlap with the second mission. Increased mission overlap means increased competition for personnel resources. This in turn means that the manpower mix assignments will change as the mission overlap changes in each event. Changes in manpower mix assignments will also impact the total cost.

With all of the variations among the events, a single answer would not accurately describe the entire range of outcomes. This is why the Budget Summary and Assignments graphs show 25th, 50th and 75th percentiles and why the Overages graph shows the likelihood and average size of an overage.

What is a percentile?
In general, the k^{th} percentile is a value such that approximately k percent of all observations fall below that value [4]. In practice, there are several methods for calculating percentiles. This example uses the Inclusive Percentile function used in Microsoft Excel 2010. Consider the following collection of 11 numbers that represent possible phase 4 durations in weeks:

{5, 16, 40, 45, 46, 53, 57, 63, 70, 85, 97}

The percentiles for each of these values are shown in Table 5 below. Percentiles can be used to understand the distribution of data. Observe that difference between the 20th and 80th percentiles is only 30 units/weeks wide (40-70). This region is narrower than the distance between the 0th and 20th percentile (5-40). This indicates that most of the results are confined to a reasonably small region, with some increased variability on the high and low values.

Table 5. Percentile for Example Case

Percentile	Phase 4 Duration
0th (Min)	5
10th	16
20th	40
30th	45
40th	46
50th (Median)	53
60th	57
70th	63
80th	70
90th	85
100th (Max)	97

This example also illustrates why the 25th, 50th and 75th percentiles are reported in the tool instead of values such as the minimum, maximum, 10th or 90th percentiles. Consider the 100th percentile (maximum). If another data value was observed that had a value of 115, the 100th percentile would change from 97 to 115, whereas the 50th percentile would only change from 53 to 55. In general, when only a small set of samples can be taken, percentiles nearer to the 50th percentile are preferred since they are less variable than those nearer to the 0th or 100th percentile.

What is the "expected value"?
Informally, the expected value of a random variable is the average of all values that the random variable can take. Even more informally, "the expected value is what you expect to happen *on average*" [5]. If all values can occur with equal probability, then the expected value is a simple average. If not, then the expected value is a weighted average, as described below.

> *"Expected value" ... is a mathematical definition that assigns a fixed value to an object whose true value is subject to uncertainty.*

Suppose an object might be worth either V_1 or V_2 dollars, and suppose the probability is P_1 that it is worth V_1, and P_2 that it is worth V_2. Then the expected value is defined to be

$P_1 \times V_1 + P_2 \times V_2$.

For instance, suppose you place a bet on a horse that has a 1/10 chance of winning, and the bet pays $100. Then the probability is (1/10) that your ticket will be worth $100 and (9/10) that your ticket will be worth nothing. So, the expected value of the ticket is

(1/10) x $100 + (9/10) x 0 = $10.

Why is $10 a good definition of the value of the ticket? Because if you spent a week at the track and bought, say, 250 such tickets, you'd probably end up winning about 25 times; you'd make $2,500, or $10 per ticket. So, if you were paying more than $10 for each ticket, you'd be a loser; less, and you'd be a winner. [6]

4. ADMINISTRATOR

The administrator sets high-level parameters that are constant across all analyses. These are high-level, static parameters that should not change with every new planning baseline. The administrator also helps to maintain CCOT-P and to manage user access to the planning tool.

4.1. Login Roles

User access is managed through the Login Roles page. Here, new users are granted access to the tool, and roles (administrator, planning manager, and analyst) are assigned and modified. Users must already have a user account on the system (i.e., an active DoD account) before they can be granted access to the tool.

When the user accesses the tool URL, the system will authenticate their CAC credentials. Next, the tool will prompt the user for their CCOT-P username and password to grant access to the tool.

4.1.1. Adding New Users to Tomcat File

1. Contact the system administrator to add a new user to the tool.
2. The system administrator will need to add the new user's username and password to the *tomcat-users.xml* file (usually located in Tomcat's */conf/* directory).
3. The system administrator will need to restart Tomcat/the application after the new user is added.
4. The tool administrator must next complete the steps in section 4.1.2.

4.1.2. Adding New Users

1. First, complete the instructions in section 4.1.1.
2. Login to CCOT-P as Administrator.
3. Go to Login Roles tab.
4. This table displays all active users for the tool and the roles to which they are assigned.
5. Click "Add User".
6. A row for the new user will appear at the bottom of the table.
7. Enter the person's user name.
8. Assign roles to the user by clicking the appropriate checkboxes.
9. Click "Save Changes".
10. The new user will now have access to the tool.

4.1.3. Deleting Users

When users are deleted from the tool, their account isn't actually removed from the tool; it is hidden. To view deleted accounts, click on the "Include deleted login roles". This will display all deleted accounts. These accounts can be restored by clicking "Un-Delete".

1. Login to CCOT-P.
2. Go to Login Roles tab.
3. This table displays all active users for the tool and the roles to which they are assigned.
4. Click the "Delete" button next to the user name.
5. Click "Save Changes".

6. To view all deleted accounts, click on “Include deleted login roles”.

4.1.4. Reactivating Accounts for Deleted Users

1. Login to CCOT-P.
2. Go to Login Roles tab.
3. Click on “Include deleted login roles”.
4. Find the account to be reactivated.
5. Click “Un-Delete” next to the account name.
6. Click “Save Changes”.
7. The “Un-Delete” button will change to “Delete” when the account is activated.

4.2. Preset Baseline Values

The preset baseline values are values that should remain constant across all planning baselines and mission scenarios. They can only be modified by the administrator. These values include:

- Annual costs of all personnel groups
- Manpower substitution rules for all non-military personnel groups
- Manpower business rules
- Model parameter: overuse penalty

New planning baselines will use the current preset baseline values. Modifying preset baseline values will not change these values in existing planning baselines (changes are not retroactive). Only planning baselines created after modification will include the modified values.

4.2.1. Modifying Annual Costs

This table displays the annual cost in thousands ($10 = $10,000) for all personnel groups. The Planning Manager will be able to modify the cost for Third Country and Local Nation Contractors in planning baselines. The remaining values can only be modified by the Administrator.

8. Login to CCOT-P.
9. Go to the Preset Baseline Values tab.
10. The Annual Cost is the first table.
11. Locate the personnel group across the top of the table.
12. Click in the cell below, which will activate editing.
13. Delete the old value.
14. Enter a new value.
15. Click “Save Changes”.

4.2.2. Modifying Manpower Substitution Rules

This table shows the manpower substitution rules for all personnel groups. Only non-military groups are modifiable. The Planning Manager will be able to modify the rules for Third Country and Local Nation Contractors in planning baselines. The remaining values can only be modified by the Administrator.

The manpower substitution rules are presented as a comparison to military efficiency. Military will always be 100% efficient in performing each capability. For example, 50% efficiency means half as efficient as the Military (2 FTEs to replace one Military FTE).

1. Login to CCOT-P.
2. The Manpower Substitution Rules is the second table.
3. Locate the personnel group across the top of the table.
4. Click in the cell below, which will activate editing.
5. Delete the old value.
6. Enter a new value.
7. Click “Save Changes”.

4.2.3. Modifying Manpower Business Rules

Derived from DODI 1100.22, this table shows whether each personnel group is allowed to perform each capability. These values can only be modified by the Administrator.

The dropdown menus do not behave normally (unfortunately). Steps 5 and 6 must both be performed with the mouse button pressed down the entire time.

1. Login to CCOT-P.
2. The Manpower Business Rules is the third table.
3. Locate the personnel group across the top of the table.
4. Locate the capability along the left side of the table.
5. Click on the dropdown menu arrow and keep the mouse button pressed.
6. Drag the cursor to select “Yes” or “No” from the dropdown menu in the corresponding cell.
7. Click “Save Changes”.

4.2.4. Tool Clean Up

It is recommended to clean up the database every 6 months. The time it takes this function to run depends on the number of analyses that have been flagged for deletion. For example, cleaning up (permanently deleting) 80 analyses from the database can take 10+ minutes.

When an Analyst deletes an analysis, the analysis is flagged in the database so that it will no longer appear on the Analyses Manager table. However, the analysis is not actually deleted from the database. To permanently delete the flagged analyses (and thus clean up the database):

1. Login to CCOT-P.
2. Tool Clean Up is the fourth section on the page.
3. Click the “Permanently delete flagged analyses”.

REFERENCES

[1] *Secretary of Defense Memorandum, Strategic and operational planning for operation contract support (OCS) and Workforce Mix,* 2011.

[2] *Department of Defense Instruction (DODI) 3020.31, "Contractors Authorized to Accompany the U.S. Armed Forces",* 2011.

[3] *Department of Defense Instruction (DODI) Number 1100.22, "Policy and Procedures for Determining Workforce Mix",* 2010.

[4] D. Montgomery and G. Runger, Applied Statistics and Probability for Engineers, 3rd Edition, New York: Wiley, 2003.

[5] "Expected value," 1 June 2012. [Online]. Available: http://en.wikipedia.org/wiki/Expected_value. [Accessed 4 June 2012].

[6] J. Ellenberg, "Is Powerball a Mug's Game? It all depends on when you play - and what value you put on a dollar," 31 August 2001. [Online]. Available: http://www.slate.com/articles/life/do_the_math/2001/08/is_powerball_a_mugs_game.html. [Accessed 4 June 2012].


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