NAVAL HEALTH RESEARCH CENTER

TML+

Tactical Medical Logistics Planning Tool

Version 2.0

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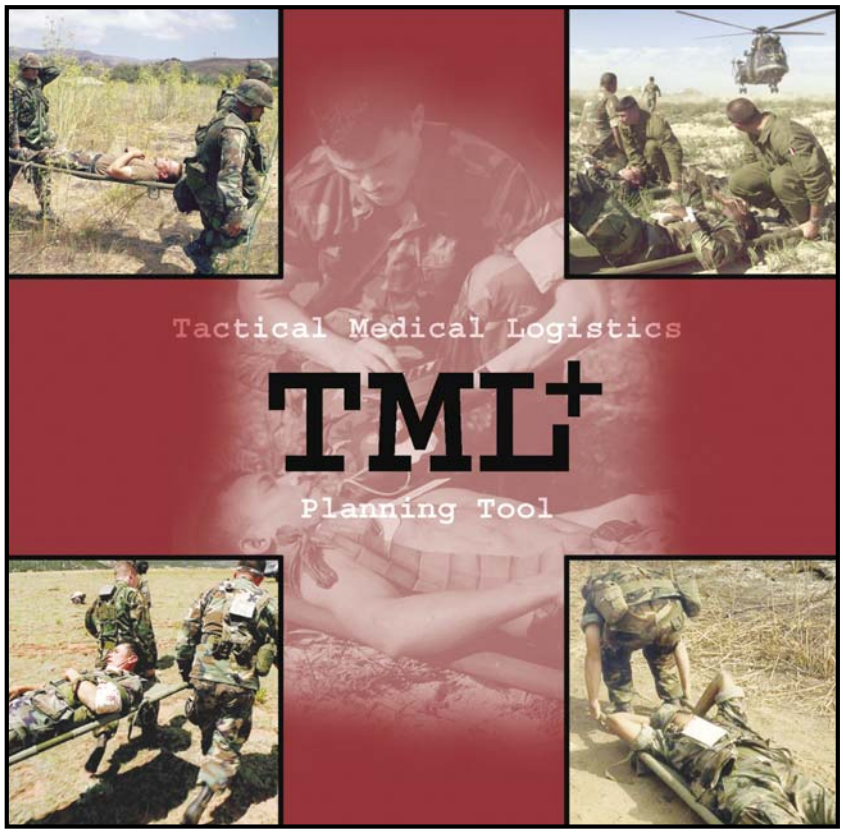
User's Guide



An easy-to-use Windows®-based software program designed for military medical planners that models the flow of patients through battlefield medical treatment facilities.

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Contributors

The TML+ project is a joint partnership between the Naval Health Research Center and Teledyne Brown Engineering, Inc. The following members of the TML+ Team designed and developed the TML+ database and computer application. Their medical and logistics knowledge, research expertise, computer programming capabilities, and technical writing skills contributed to the success of the TML+ project and this document. They also provided encouragement and teamwork, as well as significant creative support for the project.

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For news and information about TML+, please visit our Web site at www.nhrc.navy.mil/programs/TML+

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TML+ At-a-Glance

This manual does not use complex technical language to explain TML+ operations. Regardless of your level of computer skill, you will be able to understand this guide.

How the Guide Is Organized

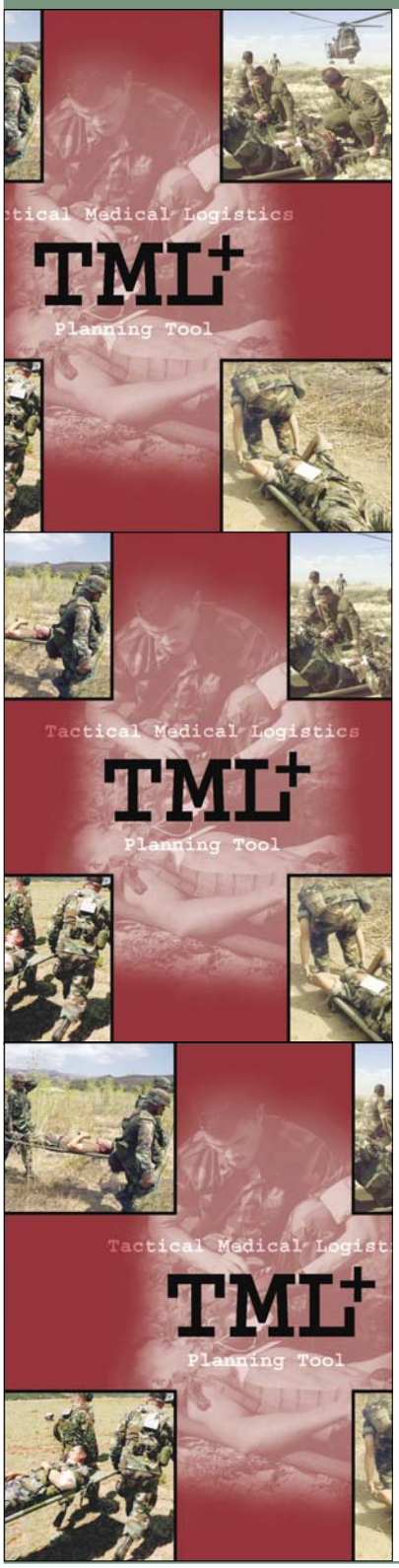
This guide is organized so you can quickly find the answers you need. The manual is divided into seven chapters. Chapter 1 provides background information, explains the development of TML+, and discusses why TML+ is important. Chapter 2 provides an overview of TML+ as well as in-depth instructions for basic program operations. Chapter 3 explains how to select a scenario, while Chapter 4 describes how to set up your casualty streams. Chapter 5 outlines how to identify the levels of care you expect to provide treatment for your patients. Chapter 6 explains how to insert the transportation assets for your network of care facilities. Chapter 7 explains how to generate reports and interpret them most effectively. You can also find an at-a-glance set of directions for running TML+ at the back of this guide.

Understanding the Symbols

The (a) symbol indicates an underlying assumption for how TML+ operates.

The ✓ symbol indicates tips for running the program. The information following the check mark is a suggestion for how to use TML+ most effectively.

Chapter One | Introduction



Welcome to TML+

The Tactical Medical Logistics Planning Tool (TML+) is a software program designed for Navy and Marine Corps medical planners as:

- a simulation tool that models the flow of patients from the point of injury (POI) through more definitive care; and
- a research tool that supports systems analysis, operational risk assessment, and field medical services planning.

TML+ is a joint project between the Naval Health Research Center (NHRC) and Teledyne Brown Engineering (TBE). This project was sponsored by the Bureau of Medicine and Surgery and the Office of Naval Research.

Background

The Development of FRSS

The Marine Corps Combat Development Command and the Marine Corps Systems Command (MARCORSYSCOM) developed the Forward Resuscitative Surgery System (FRSS) in response to changing warfighting doctrine. Marine Corps concepts and doctrine state that warfighting will require increased mobility and dispersion, and reflect a higher tempo of operations among combat elements. These goals require medical assets to achieve greater mobility and faster response without compromising the high level of care traditionally administered.

Answering these needs, FRSS is a highly mobile, rapidly deployable, trauma surgical unit that provides emergency surgical interventions required to stabilize casualties who might otherwise die or lose limbs before reaching treatment. FRSS

may be used as the initial surgical capability ashore in the traditional amphibious assault, or it may be the only surgical capability ashore, as in an Operational Maneuver From the Sea scenario. FRSS is designed to respond to the demands of rapid phase changes that require the ability to shift operational objectives quickly and efficiently. To meet this mission, FRSS requires a small logistical footprint that supports early introduction into the operating area, rapid movement, deployment, and re-deployment in forward areas.

Introducing this new capability into the Marine Corps continuum of care has raised many questions as to its impact on medical treatment and resources. Therefore, MARCORSYSCOM sponsored an effort to represent the medical assets required to support FRSS in all stages of operations. Assisting in this effort, NHRC developed TML+ as a tool to research how FRSS could most efficiently use medical resources such as supplies, personnel, and transportation, to provide patients with the best protection and medical care possible.

Role of NHRC in Medical Modeling

NHRC was chosen to develop TML+ because of its expertise in Marine Corps medical assets. The Modeling and Simulation Department at NHRC has been at the forefront of developing casualty rates and streamlining Marine Corps medical resources for several years. Three primary NHRC initiatives are the development of casualty rates, the supply review process, and the development of the Estimating Supplies Program (ESP).

Development of Casualty Rates

TML+ incorporates NHRC's projection rates for wounded in action (WIA), nonbattle injuries (NBI), and diseases (DIS).

Three separate methods were used to calculate the casualty rates:

- WIA rates are based on the percentages of various injury types and the anatomical locations of those injuries during previous combat operations.
- NBI rates are also based on observed injury types and anatomical locations, but were adjusted for environmentally dependent injuries like heat or cold injuries.

- DIS rates are based on first mapping diseases into patient condition (PC) clusters, estimating the percentage for each PC code within that cluster, and adjusting for regional differences and changes in incidence distributions occurring during the operations.

NHRC adjusted the data for factors such as recency and type of operation, number and type of troops, and medical advances, and computed the rates for intensity levels light, moderate, heavy, and intense.

Supply Review Process

NHRC's second initiative is the supply review process. In the early 1990s, NHRC developed this systematic process to review medical supplies at far-forward areas of care. NHRC started with the PCs developed by the Joint Readiness Clinical Advisory Board (JRCAB) and then (1) identified the medical tasks required to treat each PC, and (2) determined the supplies and equipment required by each medical task. This supply review model included only those items with an identified clinical requirement in the supply stream, thereby eliminating the weight, cube, and cost of extraneous items. This process achieved substantial reductions (approximately 30%) in the number of items, weight, and cube.

Development of ESP

NHRC used the data gathered from the supply review process to develop a third initiative, ESP. ESP is a software program for medical planners, providers, and trainers that calculates the supplies needed to treat an expected patient stream. ESP contains treatment briefs for over 400 PCs treated at far-forward areas of care. Using the data from the NHRC review process, each medical task in ESP is linked to the specific materiel needed to perform that task. The user inputs the number and types of patients and selects the functional areas expected to provide treatment; ESP then estimates the items and quantities required to treat those patients.

NHRC, through a partnership with TBE, has incorporated ESP's data into TML+. In addition, we expanded TML+ capabilities to include the additional data required to stochastically model casualty flow through a network of treatment facilities.

TML+ Capabilities

TML+ includes the following underlying data:

- PCs, tasks, supplies
- Task sequences
- Treatment times
- Weight, cube, and cost of supplies
- Died of Wounds due to time (DOW)
- Died of Wounds due to complications (DOC)
- Type, speed, and capacity of transportation assets
- Levels of care and their respective functional areas
- Number of personnel
- Personnel skills sets

TML+ uses stochastic processes to model patient treatment and outcomes. TML+:

- generates the PCs for a patient stream in an identified theater.
- prioritizes the treatment and evacuation of patients based on the severity of injuries.
- models mortality as killed in action, died of wounds due to complications, and died of wounds due to a delay in treatment.
- simulates patient flow through a network of treatment facilities, including arrival times, wait times, and treatment times.
- provides the ability to customize a treatment facility with user-defined medical capability and personnel assets.
- models the routing and utilization of transportation assets.
- generates dynamic reports in graph and tabular formats that show status of the treatment facilities, patient disposition, and resource utilization.

Assumptions

You can obtain a list of the assumptions of TML+ through the Reports Navigator. See page 7-3 to learn how to select a report.

Future Work

NHRC is currently working to expand the functionality of TML+ by expanding the customization of levels of care, including data for equipment simulation-based acquisition, incorporating geographic information system (GIS) mapping features, and providing smart reporting.

Customizing Medical Capability

TML+ currently offers you the ability to customize medical capability of a treatment facility by allowing you to modify the number and type of personnel as well as the quantity of supply items in the inventory. In future versions, TML+ will modularize medical capability by grouping medical tasks into capabilities-based sets. For example, the resuscitation module would include all those tasks necessary to resuscitate a patient at a specific functional area. You will be able to customize the medical capability of a facility by identifying its modular medical capabilities as well as the quantity and types of supplies and personnel required to perform those capabilities.

Equipment Simulation-Based Acquisition

NHRC is working to incorporate information useful for equipment simulation-based acquisition. Such data will include when each equipment item needs maintenance or repair and how many times it can be used before it needs to be replaced. This information will be useful in determining the quantity of equipment items for a scenario as well as how the operational capability of these items affect the treatment of the patient stream.

GIS Mapping System

NHRC is working to incorporate GIS mapping system into TML+. This feature will allow you to choose any location in the world on which to lay down your level of care (LOC) treatment network. In addition, the GIS mapping system will automatically calculate the distances between the treatment facilities.

Smart Reporting

TML+ will include smart reporting features that compare reports from different runs of a scenario. As you make changes and rerun the simulation, you will be able to compare the same reports across runs to learn how your changes affected specific metrics in your scenario.

In addition, TML+ smart reports will have dashboard indicators (such as red, yellow, and green lights) that signal the availability of resources at treatment facilities. These indicators will give you a quick, top-level view of when and where deficiencies occur within the current setup of the treatment network.

Uses for TML

TML+ can help you identify the best course of action for the anticipated patient stream with the projected assets. You can use TML+ to determine:

- whether a particular treatment facility can successfully handle a specific patient stream.
- how changing the distances among treatment facilities with different capabilities affects patient treatment.
- which and how much of the supply, personnel, and transportation assets are utilized by the expected patient stream.
- whether one treatment network (type, location, and number of assets) is more efficient for treating patients than another.

TML+ is a versatile tool that allows you to perform different types of planning:

- Deliberate planning: use TML+ before deployment to determine the medical assets and the treatment network that would optimally treat the expected patient stream.
- Crisis-action planning: use TML+ during deployment to reconfigure the treatment network in response to contingency events.
- Near real-time planning: use TML+ to track how patient treatment and evacuation events proceed as the mission is performed.

Program Overview

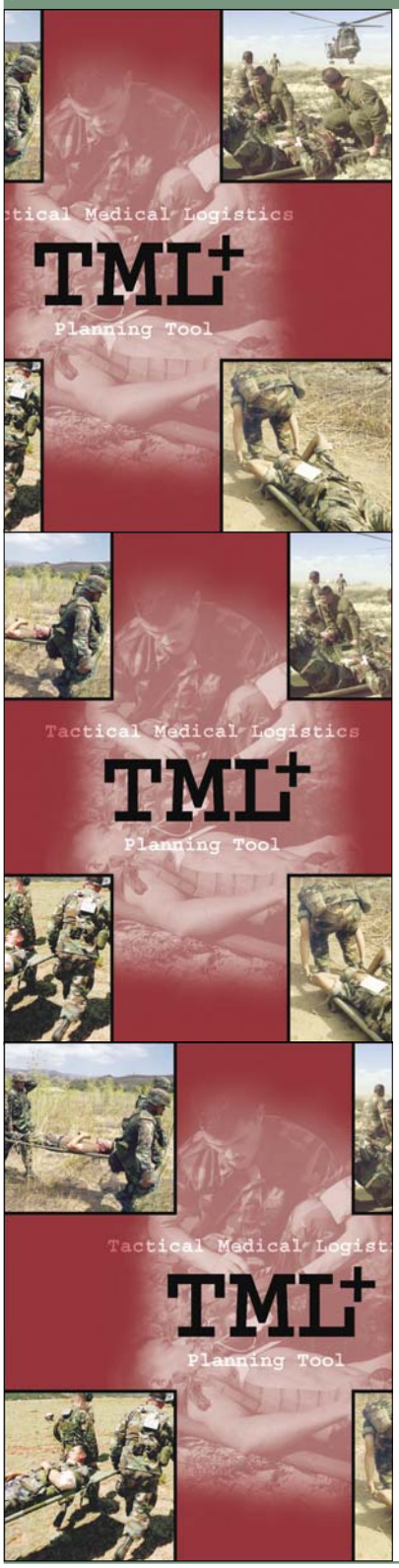
TML+ basically works like this:

1. Open TML+.
2. Select a defined scenario or create a new scenario.
3. Enter the time periods of your scenario in hours or days.
4. Enter the number of WIA, DIS, and NBI for each time period.
5. Identify the number of POIs, the types and number of LOCs, the distance between the LOCs, and the types and number of transportation assets.
6. Modify, if you desire, the types and number of personnel at each level of care, the capabilities of a specific level of care or functional area, and the speeds and capacities of transportation assets.
7. Run reports on casualty generation, care providing, and transportation.

TML+ traces how patients proceed through the treatment network by calculating where patients are treated, how long patients wait for treatment, and how long evacuation takes with the identified assets.

Customer Support

If you have questions about TML+, check our Web site at www.nhrc.navy.mil/programs/tml. In addition, feel free to email us at tml@nhrc.navy.mil



Installing TML+

System Requirements

Before you install TML+, check to see that your system meets the following requirements:

- Pentium® III class processor
- Microsoft Windows® 2000, Windows XP
- 128 MB of RAM recommended
- Microsoft Internet Explorer 6.0 or higher

TML+ requires the installation of the two files listed below. You must download and install these files before running TML+.

1. Microsoft .NET Framework Version 1.1 Redistributable Package
2. Microsoft Data Access Components (MDAC) 2.8

Installing the Program

To install TML+ from a CD:

① Close all applications.

② Insert the CD into the CD-ROM drive.

③ Double-click the My Computer icon located on your desktop.

④ Double-click the CD-ROM drive icon.

⑤ Double-click the TML.exe icon and follow the dialog boxes.

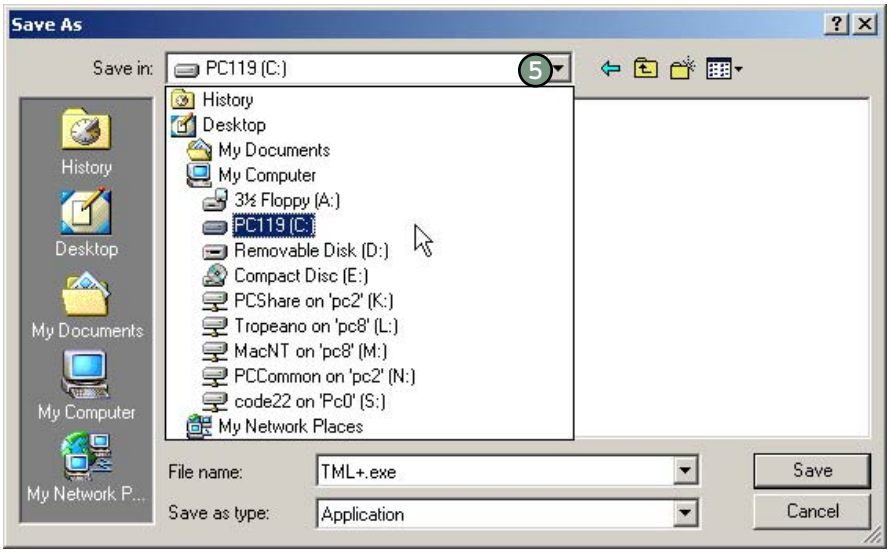
Downloading TML+

TML+ is available for download to those who have a .mil address.

To download TML+:

1. Type the following address into your browser and press Enter: www.nhrc.navy.mil/programs/tml
2. Click the Download button and then click the Register button.
3. Type the registration information into the form and click Submit Registration.
4. Click the TML+ icon.
5. In the Save As dialog box, select the C:\ drive from the drop-down menu and click Save.
6. Close all applications.

To install TML+, use Windows Explorer to navigate to where you just saved the program. Double-click the TML+ icon and follow the dialog boxes.



Starting TML+

To start TML+:

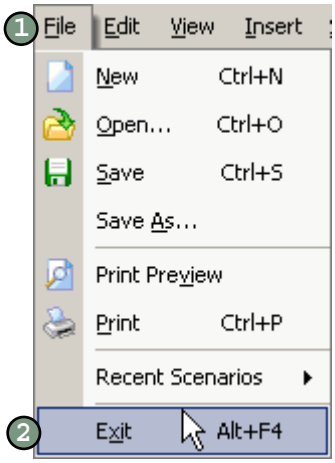
1. Click Start in the lower left-hand corner of your screen.
2. Open the Programs folder, then the TML+ folder.
3. Click the TML+ icon to open the program.

Turn to Chapter 3 to learn how to select an existing scenario or create a new scenario.

Quitting TML+

To quit TML+:

1. Click the File menu.
2. Click Exit.

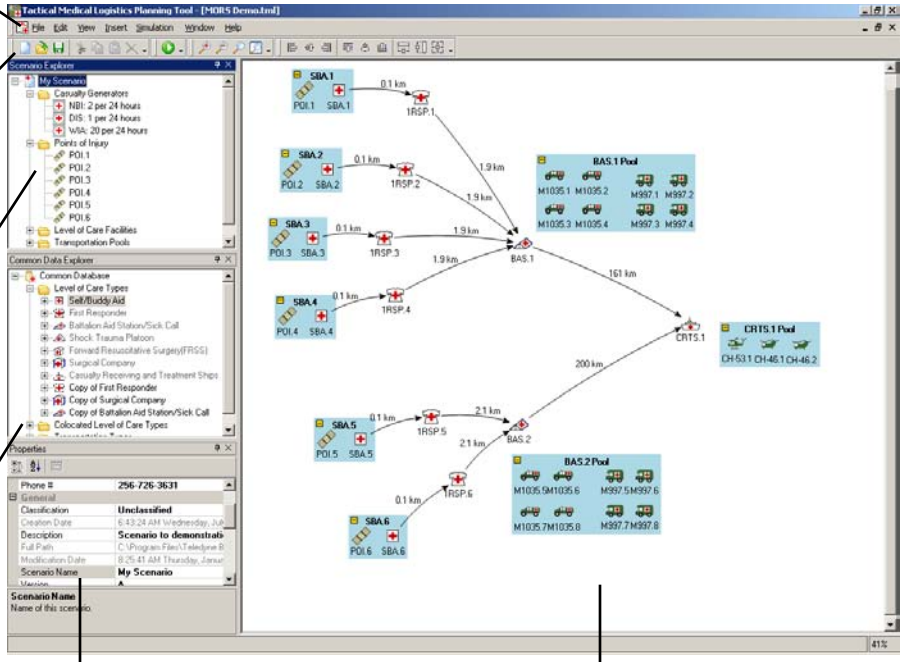


The Menu bar provides primary TML+ functions, such as inserting casualty generators, running the scenario, and opening the reports.

Toolbars provide shortcuts for basic functions, such as saving, deleting, and zooming.

The Scenario Explorer shows the different parts of the scenario you select.

The Common Data Explorer shows the predefined types of LOCs and transportation assets in TML+. You drag and drop these icons onto the Network View to add them to your scenario.

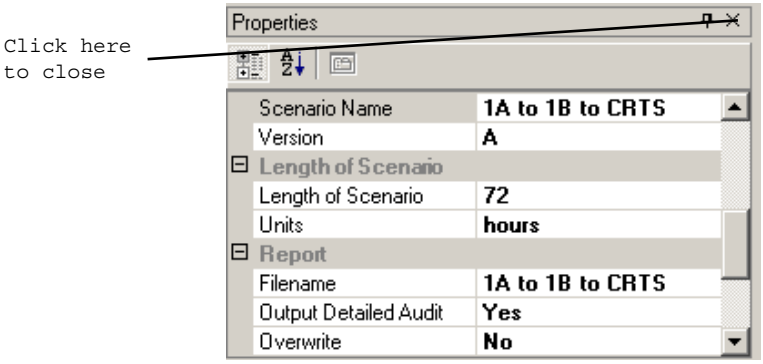


The Properties box shows the information associated with the item you select in the Scenario Explorer, Common Data Explorer, or Network View. You enter the majority of the scenario information here.

The Network View displays a graphic view of the inputs you select for your scenario. You connect treatment facilities in this window.

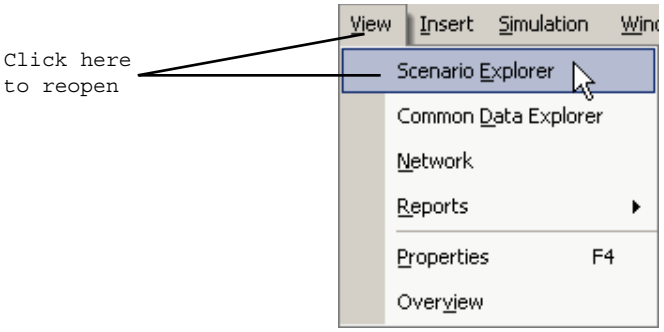
Closing Windows

To close the Scenario Explorer, Common Data Explorer, Properties box, or Network View, click the X in the upper right-hand corner of the window you want to close.



Reopening Windows

To reopen the Scenario Explorer, Common Data Explorer, Properties box, or Network View, go to the View menu and select the window to reopen.



Moving Windows

To move the Scenario Explorer, Common Data Explorer, and Properties box around the screen:

1. Place the cursor over the title of the window (i.e., the words “Scenario Explorer,” “Common Data Explorer,” or “Properties”).
2. Hold down the mouse, drag the box to the desired location, then release the mouse.

Commands in the Menu Bar

Seven menus are located on the menu bar at the top of the screen: File, Edit, View, Insert, Simulation, Window, and Help.

File

Use the File menu to create a new scenario, open an existing or recently used scenario, save a scenario, print the screen, and exit the program.

Edit

Use the Edit menu to cut, copy, and paste text into the fields in the Properties box, and to delete items in the Network View.

View

Use the View menu to open the Scenario Explorer, Common Data Explorer, Network View, recent reports, Properties box, and the overview screen of the Network View.

Insert

Use the Insert menu to insert casualty generators and comments on the Network View.

Simulation

Use the Simulation menu to run the scenario.

Window

Use the Window menu to perform commands that organize the open windows. The Cascade command tiles all the open Network Views diagonally. The Tile Horizontally command places the open Network Views one above the other, while the Tile Vertically command places them side by side. You can also use the Window menu to close all open documents or toggle between more than one open document.

Help

Use the Help menu to obtain instructions on how to operate TML+ and for background information. For more information on getting help, turn to page 2-8.

Using the Toolbars

TML+ has four toolbars visible on the screen: standard, execute, zoom, and format.

Standard

Use the Standard toolbar to create a new scenario, open an existing scenario, save a scenario, cut, copy, and paste text and objects, and delete objects.

Execute

Use the Execute toolbar to run the open scenario.

Zoom

Use the Zoom toolbar to zoom in, zoom out, return the Network View to normal, and fit the Network View to the screen.

Format

Use the Format toolbar to align the objects in the Network View.

Customizing Your Toolbars

Each toolbar can be undocked, moved, or closed. In addition, you can add to or remove buttons on the toolbar.

To undock (or redock) it, double-click any gray part of the toolbar. To close it, click the X in the upper right-hand corner of the toolbar. To reopen a toolbar, right click in the gray area at the top of the screen and select the toolbar to open. To move a toolbar, place the cursor on any gray part and drag the toolbar to the desired location.

To add or remove buttons:

1. Click the little black arrow in the lower right corner of the toolbar.
2. Move the cursor to Add or Remove buttons and then over the name of the toolbar you wish to change.
3. Select the button to add or remove. If the button is checked, selecting it removes it from the toolbar. If the button is not checked, selecting it adds it to the toolbar.

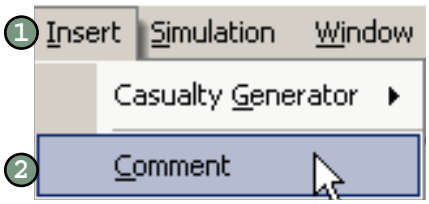
Inserting a Comment

You can insert a comment box in the Network View. Comment boxes are useful for keeping pertinent notes or information you want visible while you build the scenario.

To insert a comment box:

① Go to the Insert menu and select Comment.

② Click on the yellow box and type in your comment.



Getting Help

You can get help through ToolTips and through TML+ Help files.

ToolTips

ToolTips are flags of information that appear when your mouse passes over certain items. Place your mouse near the item in question to view the ToolTip. Keep the mouse still until the flag pops up.

Contents and Index Help

Contents and Index Help are available through an on-line help window.

Contents Help is organized by subject. Index Help shows an alphabetical listing of terms and functions.

To use Contents Help:

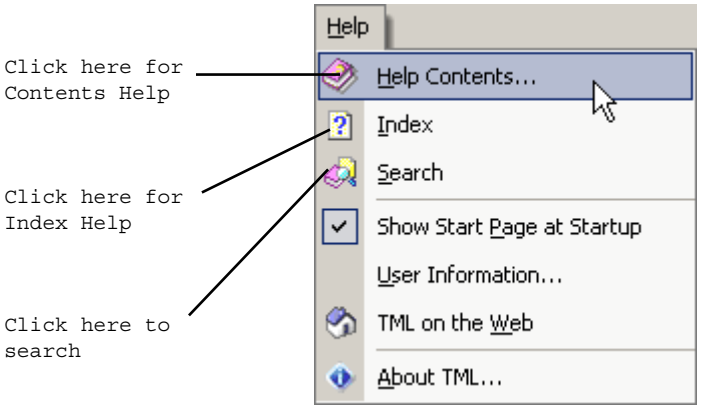
1. Press F1 on your keyboard or click the Help menu and select Help Contents.
2. Click a folder icon to display a list of topics on a subject. Click a topic to display the information.

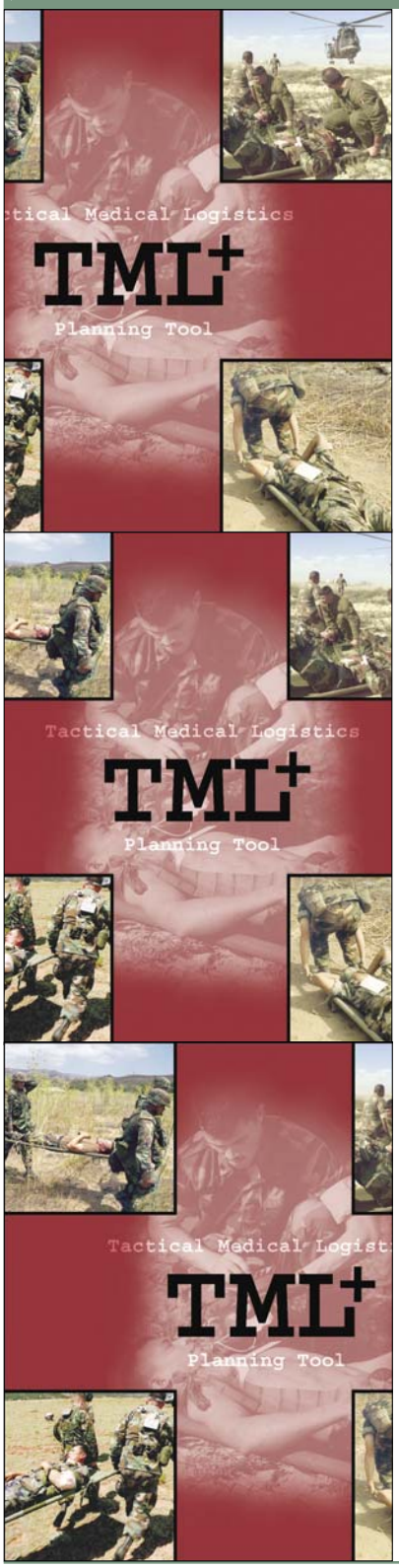
To use Index Help:

1. Press F1 on your keyboard or click the Help menu and select Index.
2. Click an item to display the information.

To search for a topic:

1. Press F1 on your keyboard or click the Help menu and select Search.
2. Type in the text to search for and click OK.





Five TML+ Configurations

TML+ comes with five canned configurations of treatment facilities. You must choose one to start TML+. You can modify your initial configuration once the program is open. For descriptions of each level of care, turn to page 5-1.

The five configurations are:

- First Responder (1RSP) to Battalion Aid Station (BAS) to Casualty Receiving and Treatment Ship (CRTS)
- 1RSP to BAS to Surgical Company (SC) to CRTS
- 1RSP to BAS to FRSS to CRTS
- 1RSP to BAS/Shock Trauma Platoon (STP) to CRTS
- 1RSP to STP/FRSS to CRTS

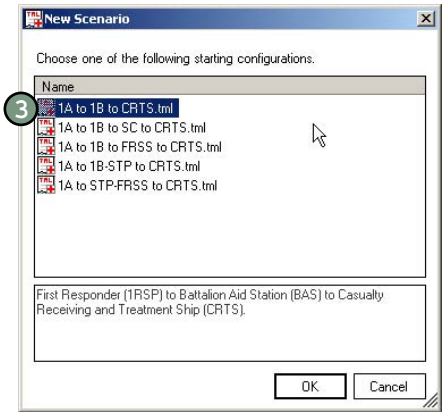
Each configuration has the following default settings:

- 10 WIAs stochastically generated per 24 hours
- 72 hours in length
- Northeast Asia (NEA) theater

Creating a New Scenario

To select a new scenario:

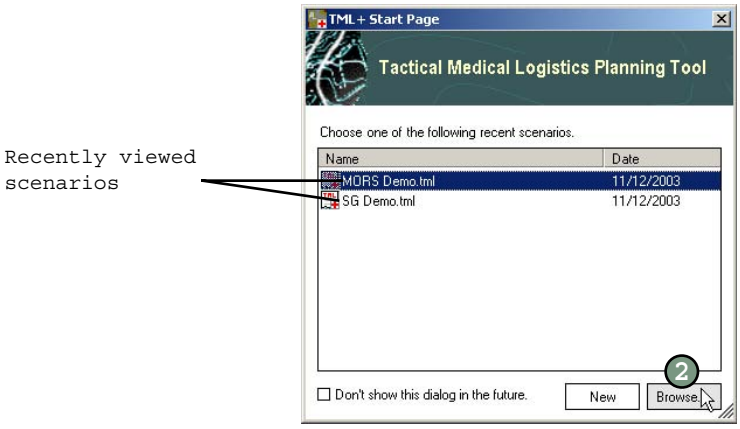
1. Start TML+ (see page 2-3). The TML+ Start Page dialog box opens.
2. Click the New button. A dialog box opens.
3. Double-click the icon corresponding to the configuration of your choice. Remember to name your new scenario (see page 3-4).



Selecting an Existing Scenario

To select an existing scenario:

1. Start TML+ (see page 2-3). The TML+ Start Page dialog box opens.
2. To choose an existing scenario, first click the Browse button, then double-click the scenario of your choice. (Note that recently viewed scenarios are displayed in the Start Page box.)



The Properties box has TML+ generated and user-defined (optional and required) fields that describe your scenario.

TML+ Generated Fields

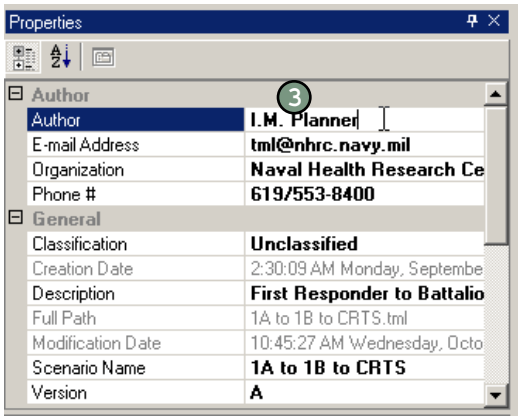
The automated fields are Creation Date, Full Path, and Modification Date. The creation date is the date you created the scenario. The full path shows where the file is stored. The modification date is the date you last modified the scenario.

User-Defined Optional Descriptive Fields

The optional fields are Author, Email Address, Organization, Phone #, Classification, Description, and Version.

To enter descriptive information on your scenario:

1. Click the scenario icon—the first icon in the Scenario Explorer.
2. In the Properties box, click in the right column of the desired field. For example, to add your name as the Author, click Author.
3. If a cursor becomes visible, type in the information. If an arrow becomes visible, click the arrow to view a drop-down menu and click the item of your choice.



User-Defined Required Fields

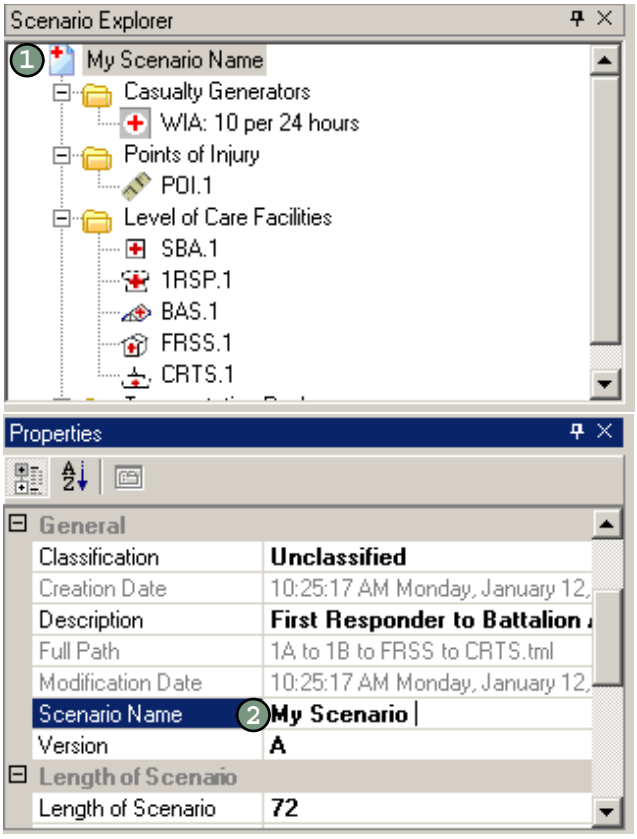
The required fields are Scenario Name, Length of Scenario, Units, Reports Filename, Output Detailed Audit, Overwrite, Deterministic, Number of Replications, Random Number Seed, and Theater. Instructions for these fields are covered in the following sections.

Entering the Name of the Scenario

To enter the name of the scenario:

① Click the scenario icon—the first icon in the Scenario Explorer.

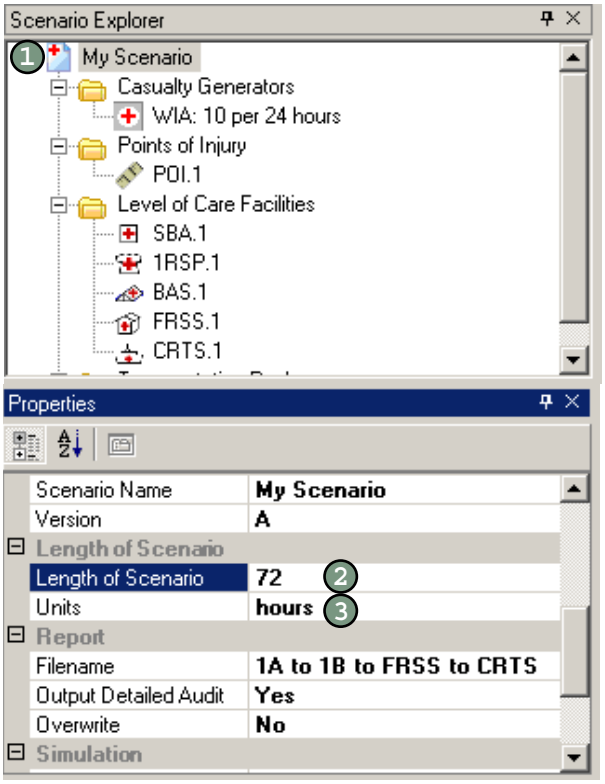
② In the Properties box, click in the right column of the field marked Scenario Name. Type in the name of your choice.



Entering the Length of the Scenario

To enter the length of the scenario:

1. Click the scenario icon—the first icon in the Scenario Explorer.
2. In the Properties box, click in the right column of the field marked Length of Scenario. Type in the number of hours or days for your scenario.
3. Click in the right column of the field marked Units. Click the arrow that appears to view the drop-down menu. Select hours or days.



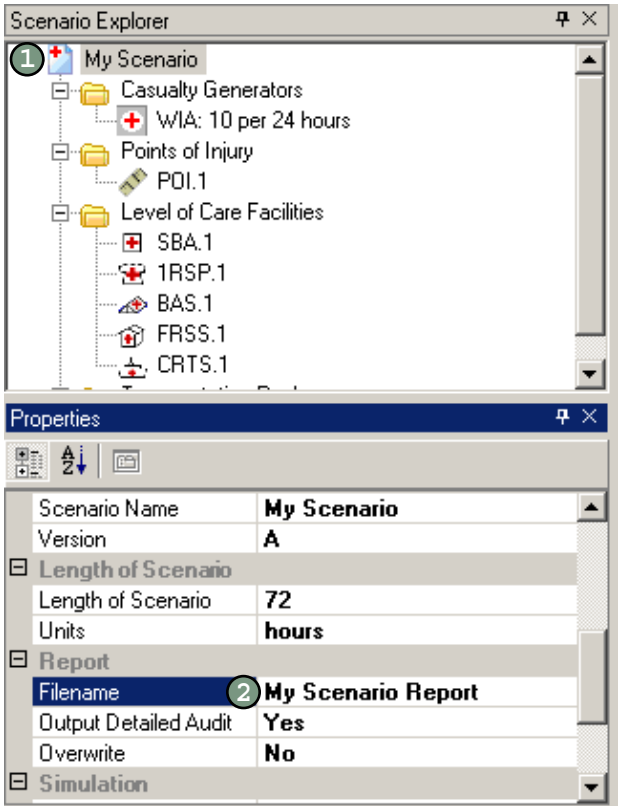
Renaming the Reports Database File

When TML+ runs a scenario, it generates a reports database file named "TML reports" by default. You have the option to rename this file.

To rename the reports database filename:

① Click the scenario icon—the first icon in the Scenario Explorer.

② In the Properties box, click in the right column of the field marked Filename. Type in the desired name of the file.

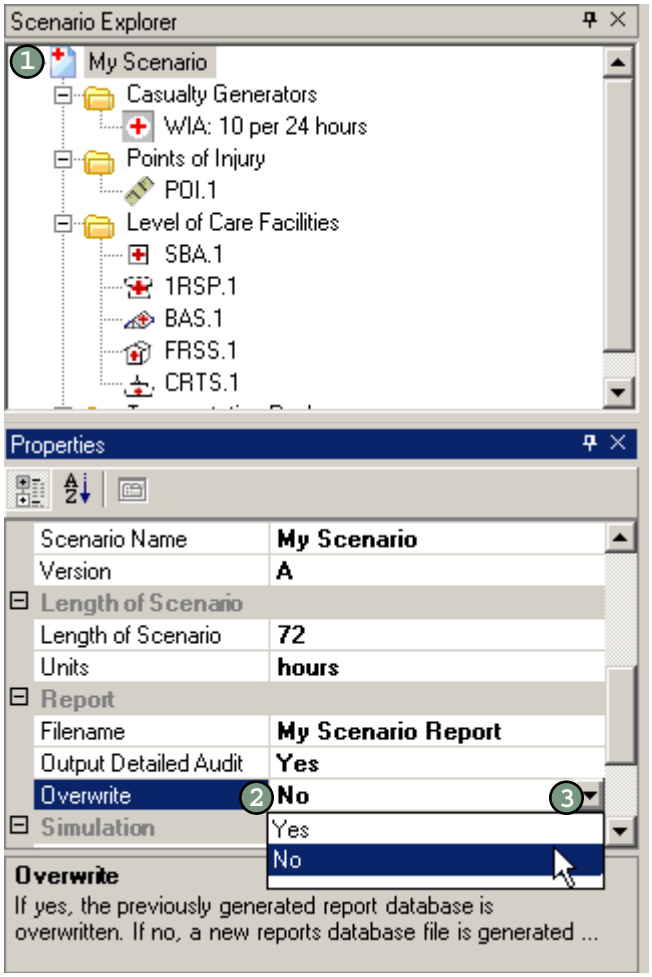


Overwriting the Reports Database File....

The overwrite command allows you to overwrite the reports database file each time you run the same scenario. By default, the overwrite command is set to No, which means that each time you run TML+ it overwrites the information from the previous run.

To overwrite the reports database file:

1. Click the scenario icon—the first icon in the Scenario Explorer.
2. In the Properties box, click in the right column of the field marked Overwrite under the Reports heading.
3. Click the black arrow and select Yes to overwrite the database file. Select No.

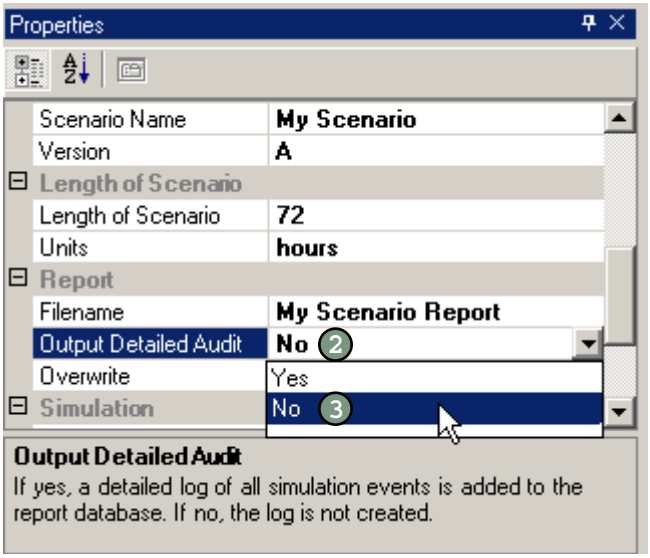


Turning Off the Detailed Audit Report

By default, TML+ generates a detailed audit report that lists each operation executed by TML+. This is a very lengthy report used for debugging purposes. To have TML+ create the detailed audit file:

1. Click the scenario icon—the first icon in the Scenario Explorer window.
2. In the Properties box, click in the right column of the field marked Output Detailed Audit under the Reports heading.
3. Click the black arrow and select No.

NOTE: *Turning off the detailed audit report does not affect the generation of other TML+ reports.*



Selecting the Type of Simulation

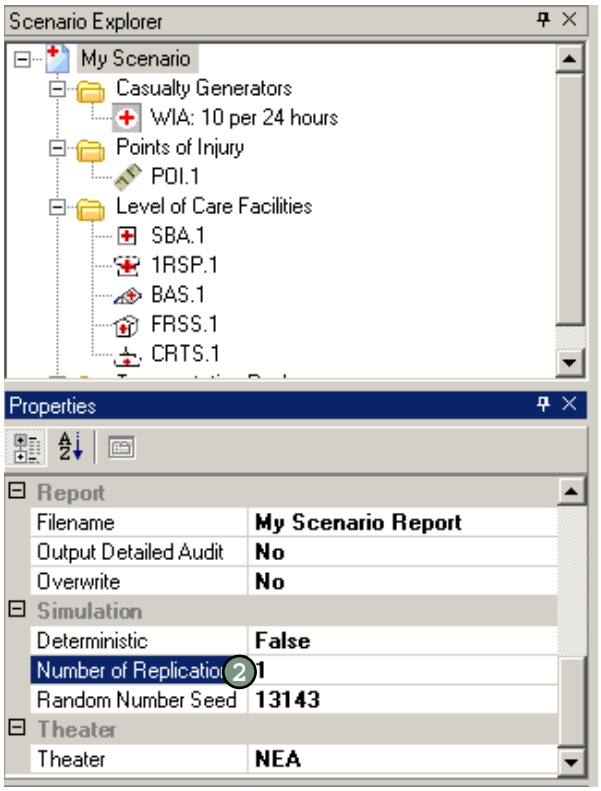
TML+ is designed to run stochastically. This process generates more realistic output that better reflects the chance events of a real-life scenario when compared with deterministic models. A deterministic feature is built into TML+ for debugging purposes only. **It is highly recommended that you leave the Deterministic field in the Properties box set at False.**

Entering the Number of Replications

You can generate multiple runs of a scenario. You can also look at the output for each run or an aggregate of the information of all the runs.

To enter the number of replications for your scenario:

1. Click the scenario icon—the first icon in the Scenario Explorer.
2. In the Properties box, click in the right column of the field marked Number of Replications. Type in the number of times you want TML+ to run the scenario.



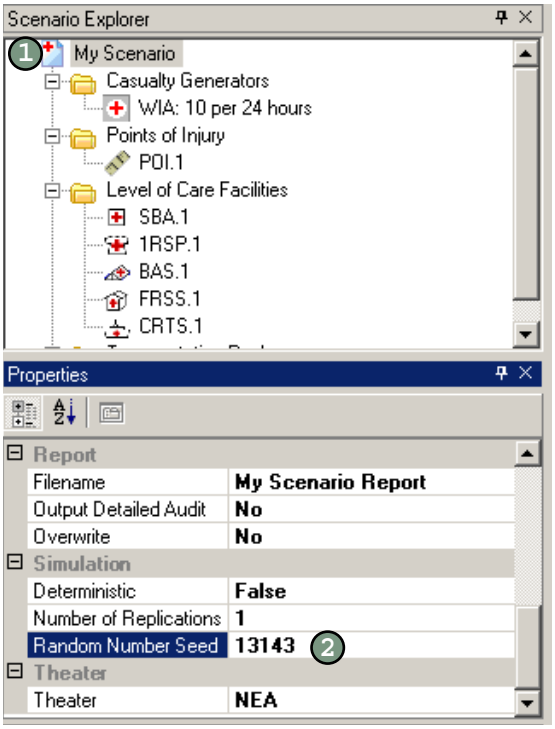
Modifying the Random Seed Number

As a stochastic model, TML+ uses random draws to simulate the scenario. This process requires a random seed number, the number used to initialize the random number generator. A large prime number works best. The default random seed number is 13143.

To modify the random seed number for your scenario:

① Click the scenario icon—the first icon in the Scenario Explorer window.

② In the Properties box, click in the right column of the field marked Random Seed Number and type in the number of your choice.

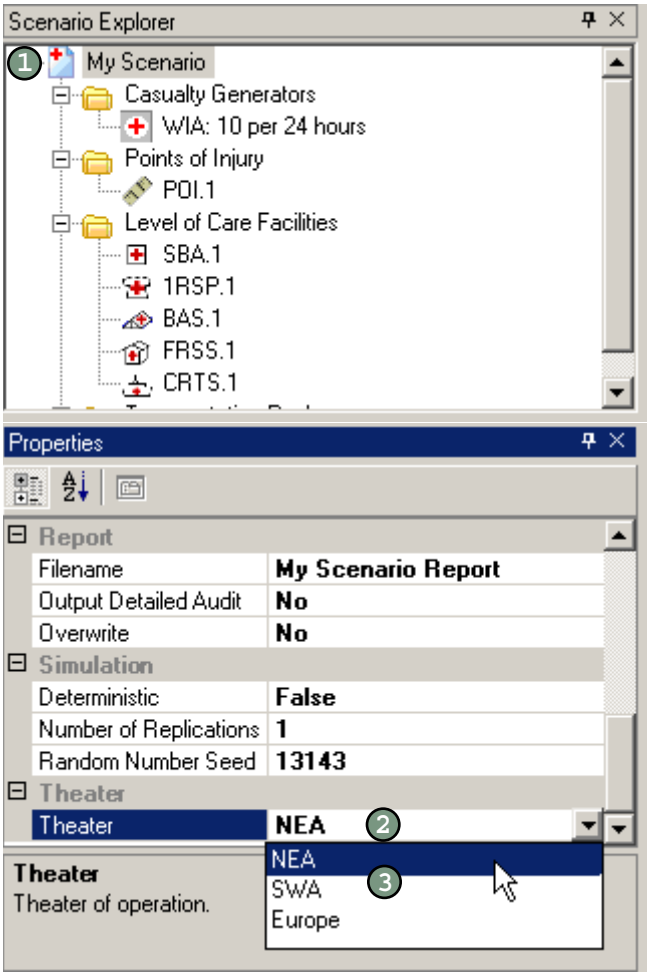


Selecting the Theater for the Scenario···

You can select from three theaters of operations: Southwest Asia (SWA), NEA, and Europe. By selecting a theater, you are identifying the PC code distribution that TML+ will use to generate the casualty stream.

To select the theater for the scenario:

1. Click the scenario icon—the first icon in the Scenario Explorer window.
2. In the Properties box, click in the right column of the field marked Theater.
3. Click the arrow that appears to view the drop-down menu and select the theater of your choice.



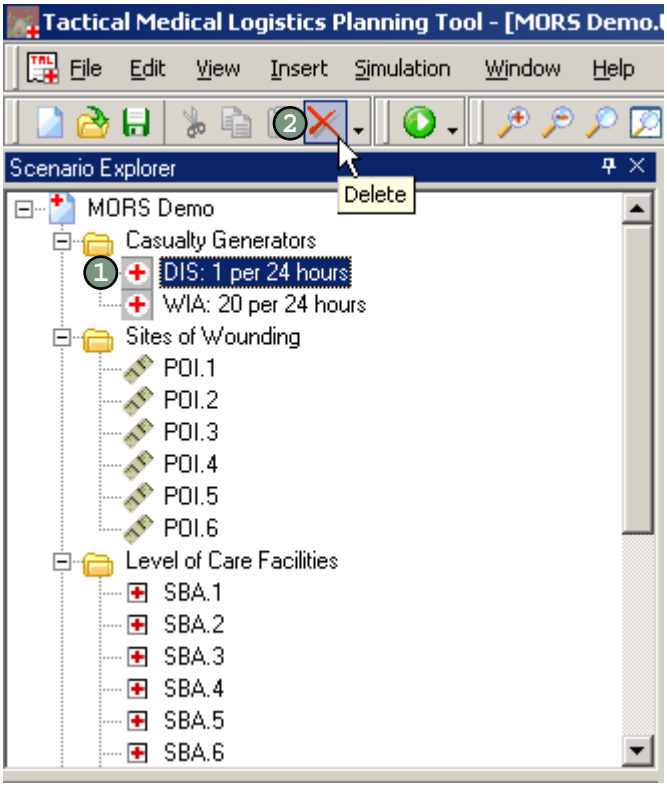
Deleting an Item in Your Scenario

To delete an item:

① Click the item in the Scenario Explorer, Common Data Explorer, or Network View. If you are deleting an item in the Network View, a bright green box around the item indicates it is selected.

② Press the Delete key on your keyboard or click the red X on the toolbar at the top of the screen.

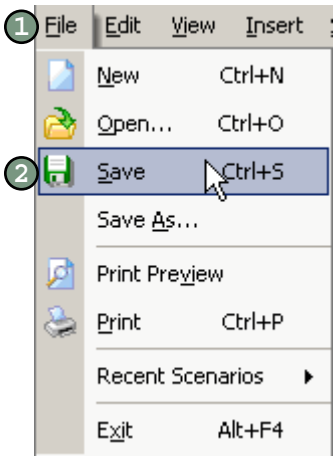
NOTE: *In the Common Data Explorer, you can only delete those items that you created. For information on how to create a customized LOC type or transportation type, turn to pages 5-12 and 6-8, respectively.*



Saving a Scenario

To save a scenario:

1. Click the File menu located in the top left-hand corner of the screen.
2. Select Save. If you are in a new scenario that has not yet been saved, a dialog box opens.
3. Navigate to where you would like to save your scenario.
4. Type in the file name and click Save.

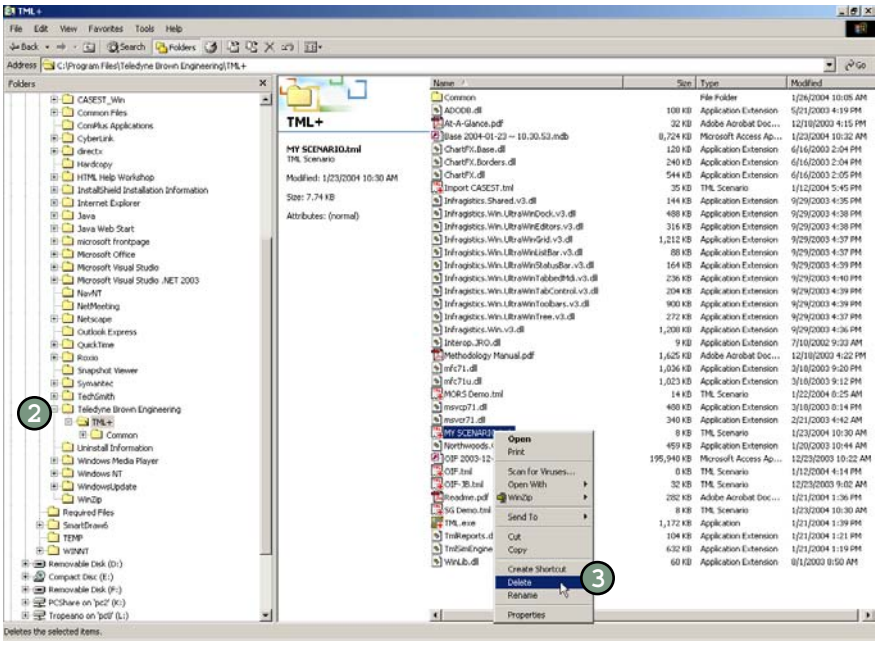


Deleting a Scenario

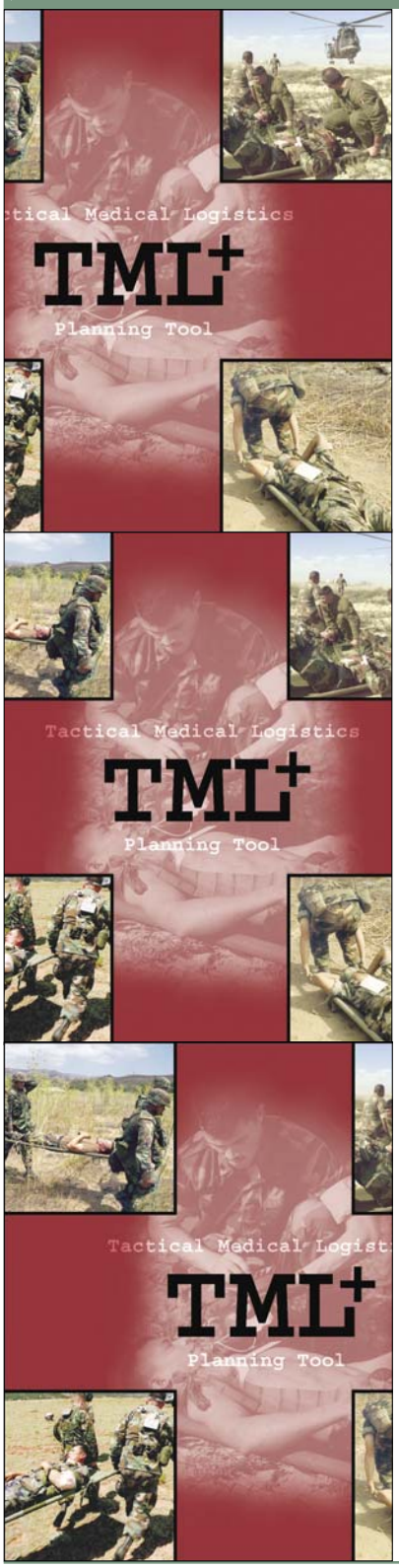
TML+ creates a separate .tml file for each scenario. You can delete the scenario using Windows Explorer.

To delete a scenario:

1. Open Windows Explorer.
2. Navigate to the folder that holds the TML scenario you want to delete.
3. Right-click the scenario icon and click Delete.



Chapter Four | Defining Casualty Generators



About Casualty Generation

TML+ offers you three ways to generate casualties. You can use the repeatable rate, table rate, or user-defined rate options explained later in this chapter.

Based on your input (e.g., 10 casualties per 24 hours), TML+ stochastically generates the specific PC code for each patient.

About PC Codes

TML+ has over 400 PC codes. Each PC code is linked to various information. Each PC code is:

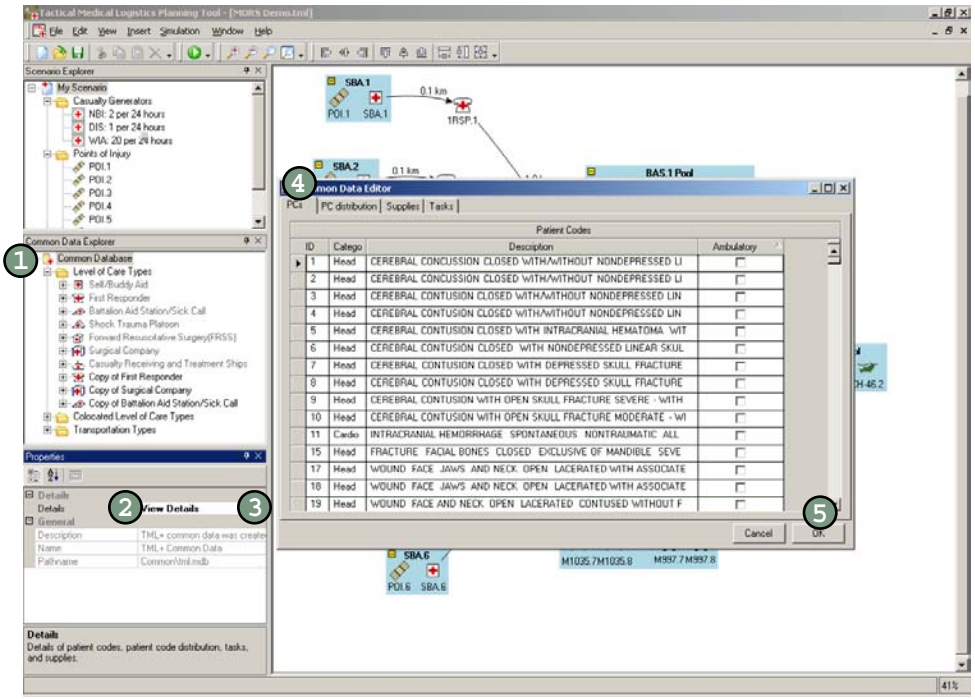
- assigned to one of three types: WIA, DIS, or NBI.
- assigned to a patient category that describes the kind of injury or disease (e.g., head, burns, gastrointestinal).
- is designated as ambulatory (the patient can walk) or litter (the patient cannot walk and requires a litter).
- linked to the medical tasks, supplies, and personnel necessary for treatment.

You can view the PCs by following the instructions on the next page in the section Viewing Underlying PC Data.

Viewing Underlying PC Data

To obtain the underlying PC data in TML+:

1. Click the Common Database icon in the Common Data Explorer.
2. Click in the field that reads View Details. An ellipsis button appears.
3. Click the ellipsis button.
4. For a list of PCs, click the tab labeled PCs. For a list of underlying PC distributions, click the tab labeled PC distribution.
5. Click OK to close.



Entering Killed in Action

ⓐ KIA are those troops who die on the battlefield. They receive no medical treatment.

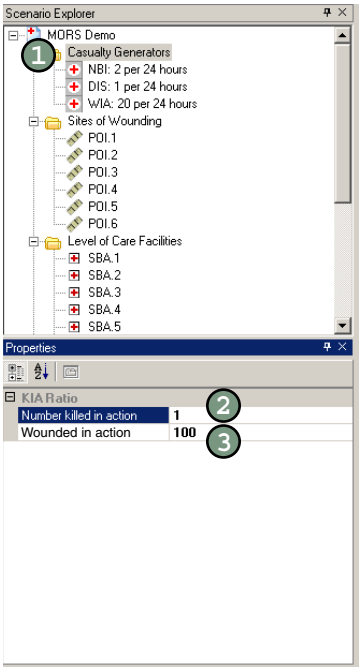
You enter killed in action (KIA) as a ratio. The numerator is the number of troops expected to be killed. The denominator is the number of troops with WIA injuries. For example, if the KIA ratio is 1 to 100 and your scenario has 500 WIAs, approximately 5 troops are stochastically generated as KIA.

To enter KIA:

① Click the Casualty Generators folder in the Scenario Explorer.

② In the Properties box, click in the right column of the field marked Number killed in action. Type in the number of troops expected to be killed per group of WIAs.

③ Click in the right column of the field marked Wounded in action. Type in the number of WIAs.



Creating a Casualty Generator by Rate

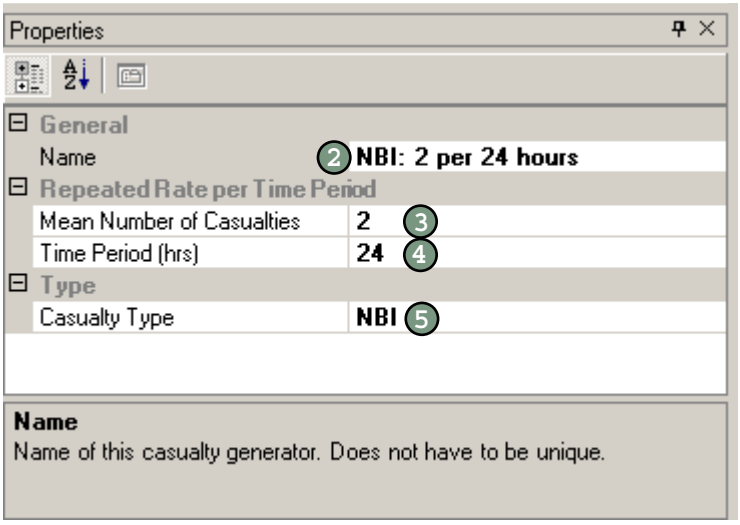
When using a casualty generator by rate, WIA, DIS, and NBI PCs are generated by separate casualty generators. For each type of patient stream, you must enter at least one casualty generator (e.g., to generate WIA, DIS, and NBI patients, enter three casualty generators).

✓ The rate option is best if you want to generate a steady casualty stream of one or more type (WIA, DIS, NBI) of casualty.

The rate you enter in this generator is repeated until the end of the scenario. For example, if you enter a rate of 10 WIAs every 24 hours for a 72-hour scenario, the rate is repeated 3 times and approximately 30 casualties are stochastically generated. For a 60-hour scenario, the rate is repeated 2.5 times, and approximately 25 casualties are stochastically generated.

To create a new casualty generator by rate:

1. In the Insert menu, click Casualty Generator, and click Rate.
2. In the Properties box, click in the right column of the field marked Name. Type in a name for the casualty generator.
3. Click in the right column of the field marked Mean Number of Casualties. Type in the number of casualties.
4. Click in the right column of the field marked Time Period. Enter the number of hours in which the mean number of casualties occur.
5. Click in the right column of the field marked Casualty Type. Click the arrow that appears. Select the type from the drop-down menu.



Creating a Casualty Generator by Table···

Casualty generator by table requires you to enter the number and type of casualties for one or more time periods. Like the casualty generator by rate, each generator generates one type of patient (WIA, DIS, NBI). Enter more than one generator to generate more than one type of patient (e.g., to generate WIA, DIS, and NBI patients, enter three casualty generators).

✓ The table option is best if you want to model a pulse or pause in the casualty stream.

Unlike the rate option, the numbers you enter for each casualty type are generated only once. Therefore, you identify a rate for block of time. For example, if you enter 10 casualties for 24 hours and 15 for 48 hours, then approximately 10 casualties are stochastically generated for the first 24 hours and 15 casualties for hours 25 through 48.

To create a new casualty generator by table:

① In the Insert menu, point the mouse to Casualty Generator, and select Table.

② In the Properties box, click in the right column of the field marked Name. Type in a name for the casualty generator.

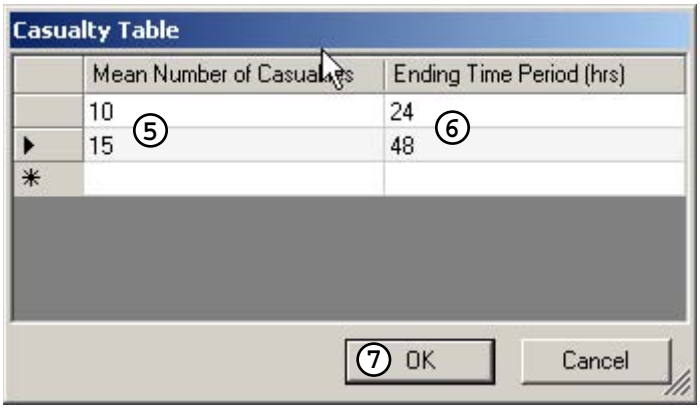
③ In the Properties box, click the right column of the field marked Casualty Type. Click the arrow that appears and select the type from the drop-down menu.

④ In the Properties box, click the word Collections and click the ellipsis button. A new window opens.

⑤ Click in the column marked Mean Number of Casualties. Type in the number of casualties expected to occur in the first time block.

⑥ Click in column marked Ending Time Period (hrs). Type in the hour on which you want the rate you entered in step 5 to stop.

⑦ Repeat steps 4 and 5 as many times as desired. Click OK.



Creating a User-Defined Casualty Generator

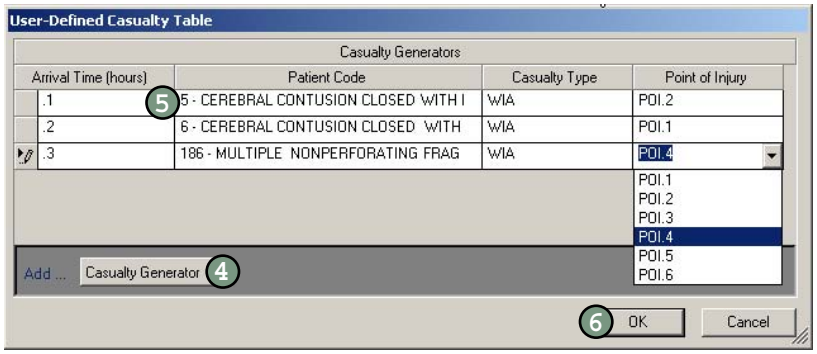
✓ The user-defined option is best if you want to use a patient stream from another software program.

The user-defined casualty generator allows you to override TML+'s stochastic patient stream generation. You enter the arrival time, PC code, and POI for each casualty.

***NOTE**: The TML+ database is structured according to PC codes. Any patient streams you paste into TML+ must use PC codes.*

To create a user-defined casualty generator:

1. Click the Insert menu, point the mouse to Casualty Generator, and select User-Defined.
2. In the Properties box, click in the right column of the field marked Name. Type in a name for the casualty generator.
3. In the Properties box, click in the right column of the field marked User-Defined Table and click the ellipsis button. A new window opens.
4. Click the Casualty Generator button to add a patient.
5. Click in the Arrival Time column and type in the time in hours. Click in the Patient Code, Casualty Type, and Point of Injury columns and select the desired information from the drop-down menus.
6. Repeat steps 4 and 5 as many times as desired. Click OK.



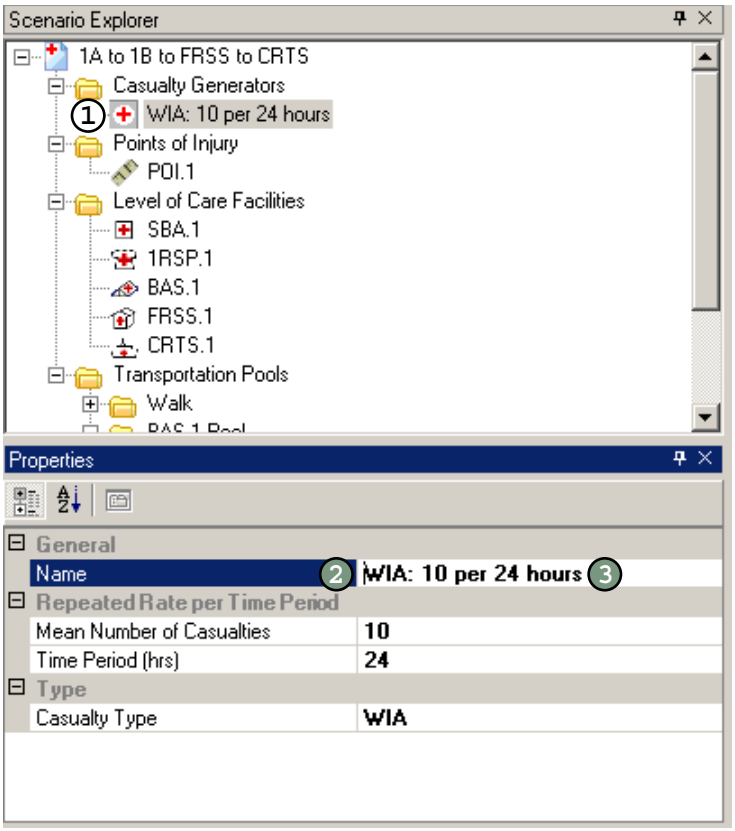
Modifying the Casualty Generator Name ····

To modify the name of a casualty generator:

① Click the casualty generator icon in the Scenario Explorer.

② In the Properties box, click in the right column of the field marked Name.

③ Type in the name of your choice.



Modifying the Mean Number of Casualties··

The mean number of casualties is the number of casualties expected to occur within a specific period of time. You can modify the mean number of casualties for generators by rate and by table.

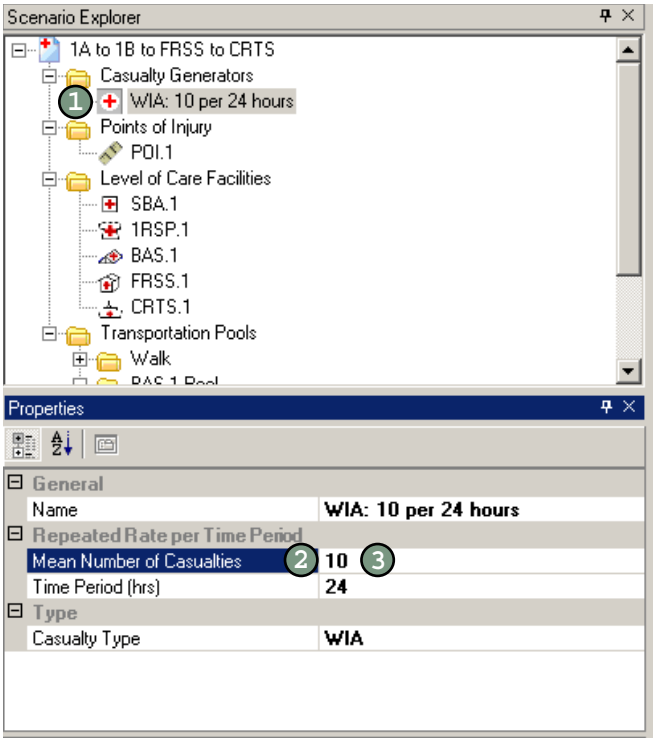
Casualty Generator by Rate

To modify the mean number of casualties in a casualty generator by rate:

① Click the casualty generator icon in the Scenario Explorer.

② In the Properties box, click in the right column of the field marked Mean Number of Casualties.

③ Type in the number of your choice.



Casualty Generator by Table

To modify the number of casualties in a casualty generator by table:

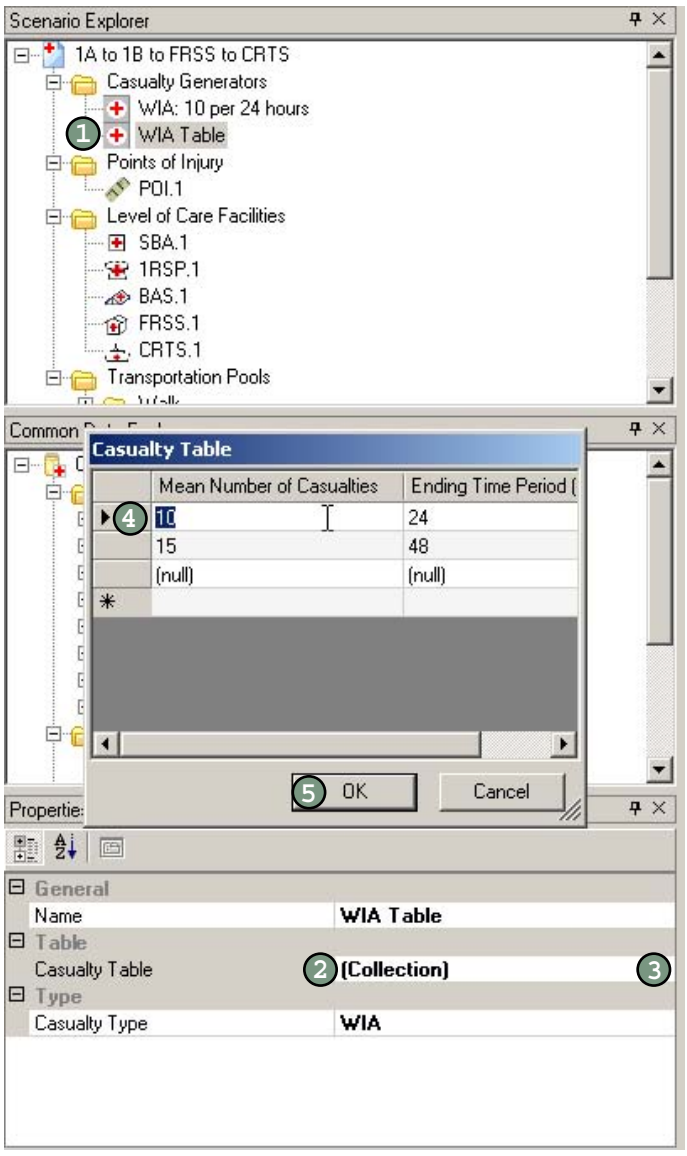
① Click the casualty generator icon in the Scenario Explorer.

② In the Properties box, click the word Collection. An ellipsis appears.

③ Click the ellipsis. The table opens.

④ Click in the column marked Mean Number of Casualties and type in the desired number for each time period.

⑤ Click OK.



Modifying the Generator's Time Period

You can modify the time period for casualty generators by rate and table.

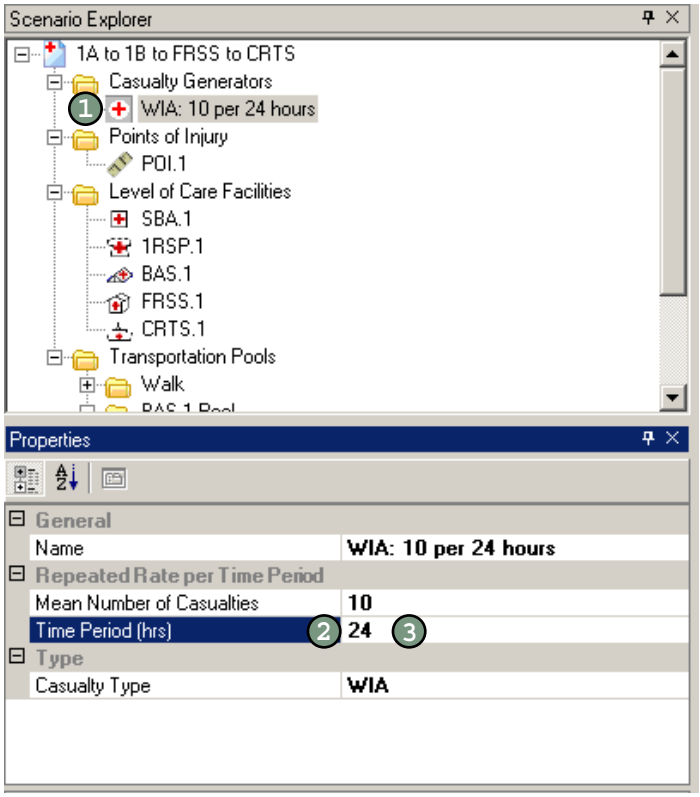
Casualty Generator by Rate

To modify the time period of a casualty generator by rate:

① Click the casualty generator icon in the Scenario Explorer.

② In the Properties box, click in the right column of the field marked Time Period (hrs).

③ Type in the number of hours.



Casualty Generator by Table

To modify the time period of a casualty generator by table:

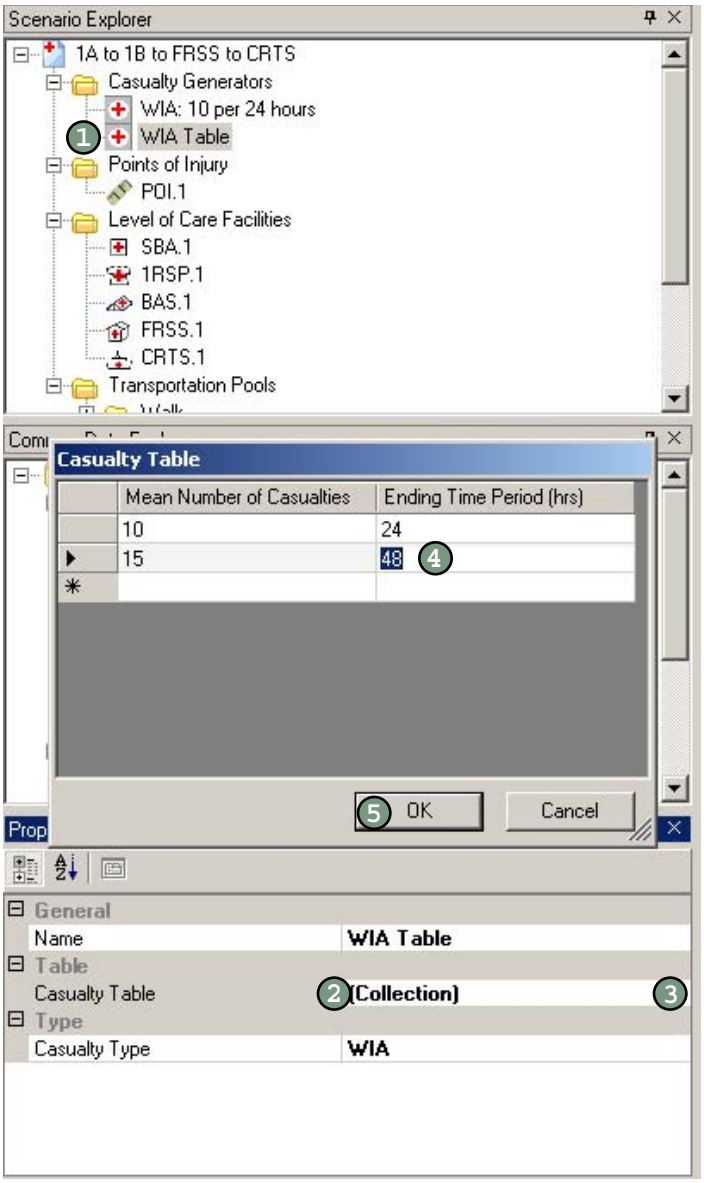
① Click the casualty generator icon in the Scenario Explorer.

② In the Properties box, click the word Collection. An ellipsis appears.

③ Click the ellipsis. The table opens.

④ Click in the column marked Ending Time Period and type in the hours for each time period.

⑤ Click OK.



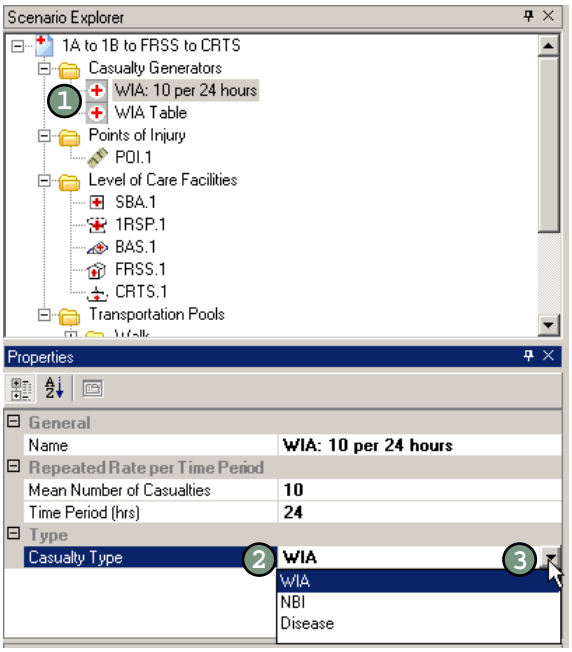
Modifying a Generator's Casualty Type

Each casualty generator by rate and by table generates one type of patient: WIA, DIS, or NBI.

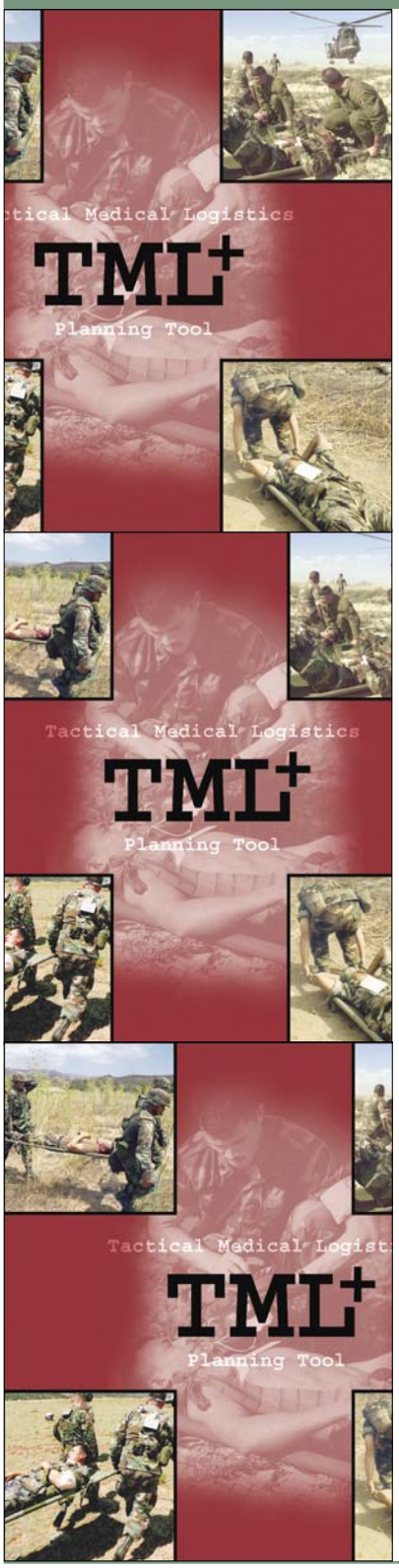
To modify the type of casualties assigned by the generator:

1. Click the casualty generator icon in the Scenario Explorer.
2. In the Properties box, click in the right column of the field marked Casualty Type.
3. Click the arrow that appears to view the drop-down menu and select the type.

***NOTE**: The user-defined casualty generator assigns type to each patient. To modify the type of patient, click the casualty generator icon in the Scenario Explorer and follow steps 5 and 6 on page 4-6.*



Chapter Five | Inserting Levels of Care



About the Levels of Care

You can select various LOCs for your scenario. Below are descriptions of LOCs available in TML+. Shipboard levels of care and functional areas are under development.

TML+ allows you to customize various aspects of LOCs. Turn to page 5-12 for instructions on how to customize a medical treatment facility.

Self/Buddy Aid (SBA)

SBA is the treatment at the POI that each patient gives themselves or receives from another troop.

First Responder (1RSP)

1RSP is the company corpsman who first administers medical treatment to a casualty, performing first aid and emergency procedures.

Battalion Aid Station (BAS)

BAS is positioned as close as possible to forward line troops and offers clinical assessment. The treatment administered includes the use of intravenous fluids and antibiotics, preservation of the airway by surgical procedure, and application of more secure splints and/or bandages. BAS provides initial resuscitation and routine health services and carries the theater sick-call supplies. Supplies are configured to provide resupply to line corpsmen.

Shock Trauma Platoon (STP)

STP can serve as a beach evacuation station, reinforce a BAS, operate as an intermediary casualty collecting and clearing point between forward elements and the surgical company (SC), or

serve as the forward element of an SC (i.e., triage/evacuation platoon) preparing to relocate. STP includes triage and limited operating room (OR) and ward capabilities.

Forward Resuscitative Surgery (FRSS)

FRSS can serve as a forward element of the SC or as a stand-alone surgical element colocated with a BAS or STP. FRSS provides limited triage/preoperative trauma management and postoperative holding capability, and is equipped to provide life- and limb-saving surgical procedures. Includes triage, OR, and ward (with limited holding capability).

Surgical Company

(a) SC does not currently include dental capabilities.

SC objectives are to save life and limb, provide initial resuscitative treatment, and perform stabilization for evacuation for those casualties whose medical requirements exceed SC capabilities. SC has greater surgical and medical capabilities than BAS, including triage, OR, ward, x-ray, laboratory (lab), pharmacy, dental, and preventive medicine.

Casualty Receiving & Treatment Ship (CRTS)

(a) CRTS is currently modeled with the medical capabilities, personnel, and supplies of an SC.

CRTS is a general-purpose amphibious assault ship that receives, provides treatment for, and transfers casualties. The objectives of care are to save life and limb, provide initial resuscitative treatment, and perform stabilization for evacuation for casualties whose medical requirements exceed CRTS capabilities. The ship's capabilities include triage, lab, x-ray, OR, ward, pharmacy, dental, battle dressing station, portable medical locker, antidote locker, first-aid box, emergency response kit (ERK), junior ERK, and preventive medicine capability.

En Route Care System (ERCS)

(a) Only consumable supplies are calculated for MEDEVAC. Personnel requirements are not simulated.

ERCS has three phases: casualty evacuation (CASEVAC), tactical medical evacuation (MEDEVAC), and strategic evacuation. CASEVAC, phase one, renders care during patient transport from the POI to a casualty collection point or medical treatment facility, such as STP, FRSS, or SC. The casualty may not have received care or may have received care from a buddy, a field corpsman, or a medical officer at a BAS prior to CASEVAC. MEDEVAC, phase two, provides care during evacuation from a BAS, STP, FRSS, or SC to a theater hospital. Strategic evacuation, phase three, renders care during evacuation from the theater hospital to definitive care inside or outside the continental United States.

About the Functional Areas

Below is a description of functional areas within the LOCs.

Triage/SST

Triage/SST provides receipt, resuscitation, and sorting of casualties and treats casualties with battle injuries, nonbattle injuries (NBIs), and those who can return to duty within 72 hours. The triage/SST renders general surgical support and preoperative clinical functions.

Operating Room

OR provides resuscitative/stabilizing surgery to casualties unlikely to survive MEDEVAC.

Ward

SC ward provides monitoring and recuperative care to postoperative patients and those that can return to duty within 72 hours. FRSS ward has limited holding capabilities.

X-ray

(a) Only consumable supplies are calculated for x-ray, lab, and pharmacy. Tasks performed at these areas are not included in patient treatment time. Also, personnel requirements are not simulated at these functional areas.

X-ray provides x-ray section and processing capabilities.

Laboratory

Lab provides hematology, microbiology, blood chemistry, and urinalysis capabilities.

Pharmacy

Pharmacy provides the materiel required to establish and maintain pharmacy capabilities.

Preventive Medicine

(a) Preventive medicine is not currently modeled.

Preventive medicine performs technical functions for ensuring water potability, food inspection, sanitary waste disposal, vector control, and communicable disease monitoring and immunization. Preventive Medicine Maneuver was developed for the First Responder. For the Surgical Company, (1) Preventive Medicine Technician (PMT) for the PMT, PM Officer, and Environmental Health Officer (EHO); (2) Entomologist; and (3) Industrial Hygiene (IH) for the IH Officer and EHO.

Understanding Patient Treatment

TML+ simulates the treatment of patients through your treatment network. There are two primary aspects: the treatment itself and queuing. The patient arrives at the functional area and queues for treatment. When the required assets become available, the patient proceeds into the functional area to receive treatment.

Treatment is the series of medical tasks required to treat a specific PC. TML+ starts treating a patient when the personnel and equipment required to treat the specific PC are available.

Queuing occurs before and during treatment. When a patient arrives at a functional area, TML+ determines if the personnel and equipment are available to perform the first task. If the medical resources are assigned a busy status, the patient is placed into a waiting pool.

When the assets needed to perform the first task are available, the patient moves from the waiting pool into the functional area and treatment begins. For each task, TML+ performs the same test to determine the availability of the required personnel and equipment assets—a patient cannot proceed to the next task until the necessary assets are free. If the assets are busy, the patient is placed back into the waiting pool.

For more information on patient treatment and queuing, refer to the TML+ Methodology Manual.

Understanding Service Discipline

Service discipline is the method that TML+ uses to queue the patients for treatment. In other words, it is the set of rules used to determine who enters service first if several casualties are waiting. TML+ offers two types of service disciplines. You can choose to treat patients on a first-in-first-out (FIFO) basis, which treats the casualty who has been waiting the longest, or a Priority basis, where the casualty with the highest severity is selected to receive treatment first (see page 5-15).

If FIFO is selected, patients entering the waiting pool are rank ordered based on arrival time. If Priority is selected, patients are rank ordered on the severity of the PC and arrival time.

Inserting a New POI

ⓐ TML+ automatically bundles a POI with an SBA to simulate the care that casualties receive far forward. The two cannot be separated within the network.

A POI is a geographical site on the battlefield where injury occurs.

To insert a new POI:

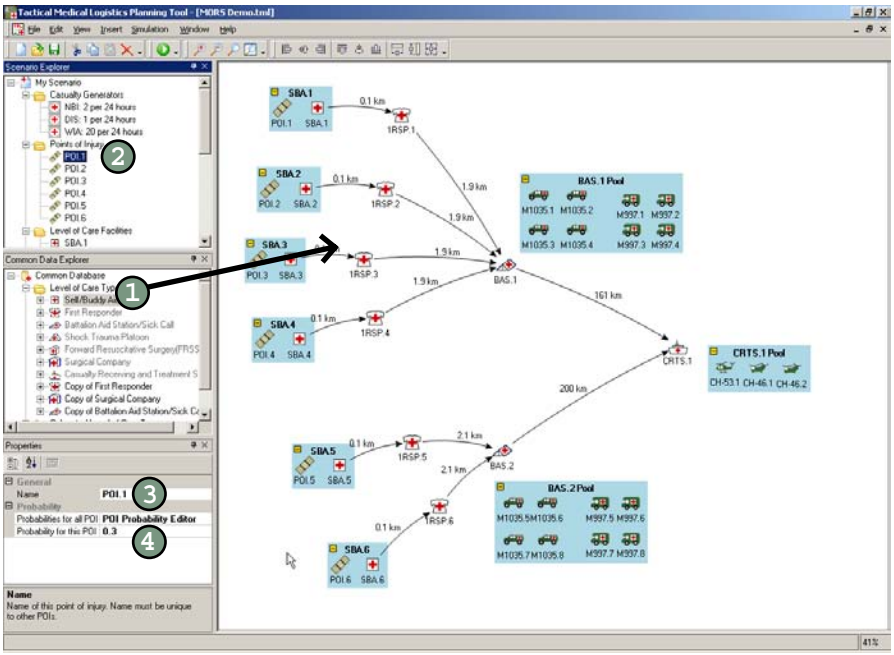
① Click and drag the SBA icon in the Common Data Explorer onto the Network View. A POI and SBA appear.

② Click on the POI icon in the Scenario Explorer.

③ In the Properties box, click in the right column of the field marked Name. Type in a name for the POI.

④ In the Properties box, click the right column of the field marked Probability for this POI. Type in the percentage (in decimal format) of the patient stream you expect to occur at this POI. This number must be between 0 and 1.

***NOTE**: The probabilities for all POIs must add up to 1. The casualties are randomly assigned to the POIs based on these probabilities.*



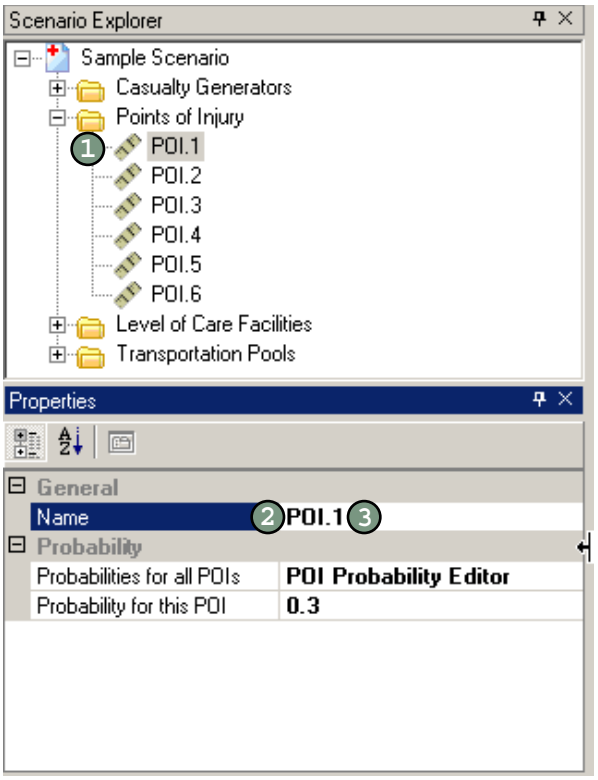
Modifying the Name of a POI

To modify the name of a POI:

① Click the icon of the POI icon in the Scenario Explorer.

② In the Properties box, click in the right column of the field marked Name.

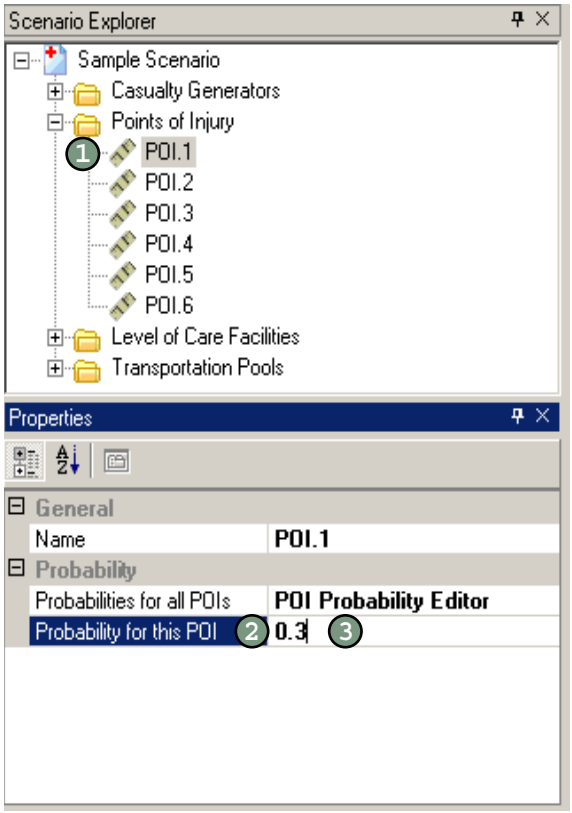
③ Type in the name of your choice.



Modifying the Probability for a POI

To modify the probability of a POI:

1. Click the icon of the POI icon in the Scenario Explorer.
2. In the Properties box, click in the right column of the field marked Probability for this POI.
3. Type in a number between 0 and 1. The probabilities of all POIs must equal 1.

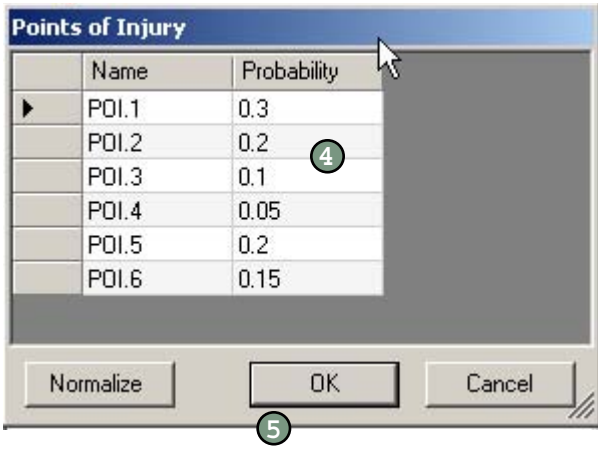


Editing All Probabilities for POIs

Once you create POIs, you can edit the probabilities for each in one place.

To edit the POI probabilities:

1. Click one of the POI icons in the Scenario Explorer.
2. In the Properties box, click the words POI Probability Editor. An ellipsis appears.
3. Click the ellipsis button. A table opens in a new window.
4. Enter the probabilities for each POI in the Probability column. Each number must be between 0 and 1 and all probabilities must add up to 1.
5. Click OK.



Normalizing POI Probabilities

✓ The Normalize function is useful if you have added POIs to an already defined scenario or if you have a large number of POIs.

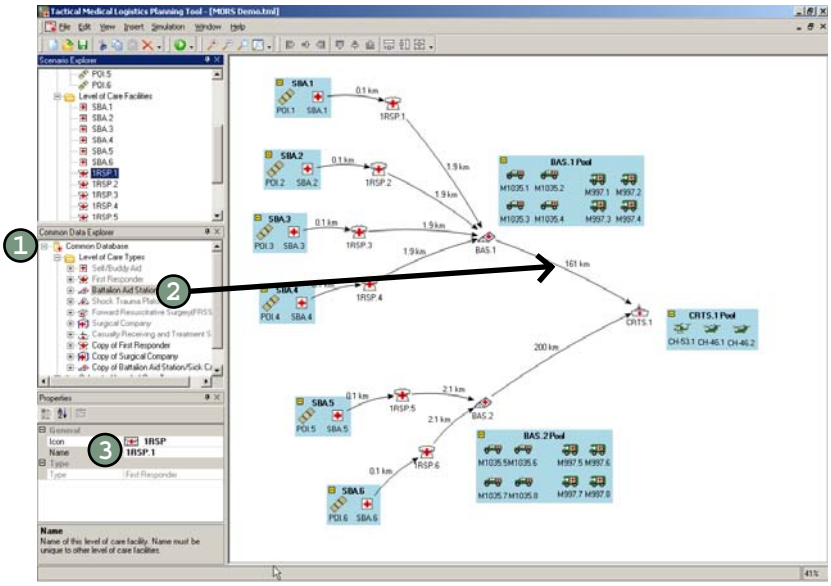
Normalizing POI probabilities makes the probabilities for all POIs sum to 1. To normalize POI probabilities, follow steps 1-3 above, click Normalize, then click OK.

Inserting a Predefined LOC

TML+ comes with a variety of predefined LOCs. These are listed in the Common Data Explorer under the Level of Care Types folder.

To insert a predefined LOC:

1. In the Common Data Explorer, click the plus sign (+) to the left of the Level of Care Types folder to see a list of the available LOCs.
2. Click and drag the icon of the desired LOC type onto the Network View. TML+ automatically names the LOC.
3. To change the LOC name, click in the right column of the field marked Name in the Properties box. Type in a name for the LOC.
4. Link this LOC to another by following the instructions on page 5-11.



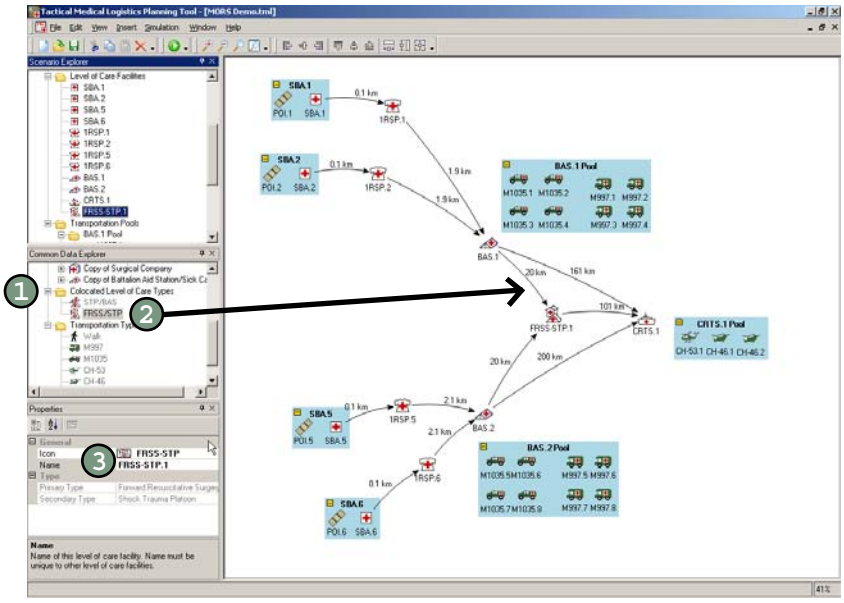
Inserting Colocated LOCs

When you colocate two levels of care, you are assigning them to the same geographic location. The LOCs share the burden of the casualty stream.

With colocated facilities, one LOC is designated as the primary facility and the other as secondary. All casualties go to the primary LOC first. Then, based on the PC code, wait time, and provider availability, certain patients proceed to the secondary LOC (see the TML+ Methodology Manual for more information).

To insert colocated levels of care:

1. In the Common Data Explorer, click the plus sign to the left of the Colocated Levels of Care Types folder to see a list of the available colocated LOCs.
2. Click and drag the icon of the desired colocated LOC type onto the Network View. TML+ automatically names the colocated LOC.
3. To change the colocated LOC name, click in the right column of the field marked Name in the Properties box. Type in a name for the colocated LOC.
4. Link this colocated LOC to another by following the instructions on page 5-11.



Linking LOCs

ⓐ You can only link an LOC to either the same LOC type (e.g. BAS to BAS) or to an LOC with more capability (e.g. BAS to SC). You cannot send casualties forward in the evacuation chain.

Once you place your LOCs onto the Network View (see page 5-9), you link them to show the route you anticipate your patients to travel. When you link two LOCs, you are creating a primary route. However, the choices you make for your patient evacuation routes are subject to patient treatment rules (see page 5-4 for more information).

In some cases, when you link an LOC, TML+ automatically draws a secondary route. The secondary route is an alternate route that patients travel if the primary route is busy or if the patient has a PC code not treated at the next LOC (the primary route). In other words, not all PCs are treated at all LOCs. **If you delete the route drawn automatically by TML+, those patients not treated at the next LOC in your network do not receive further treatment.**

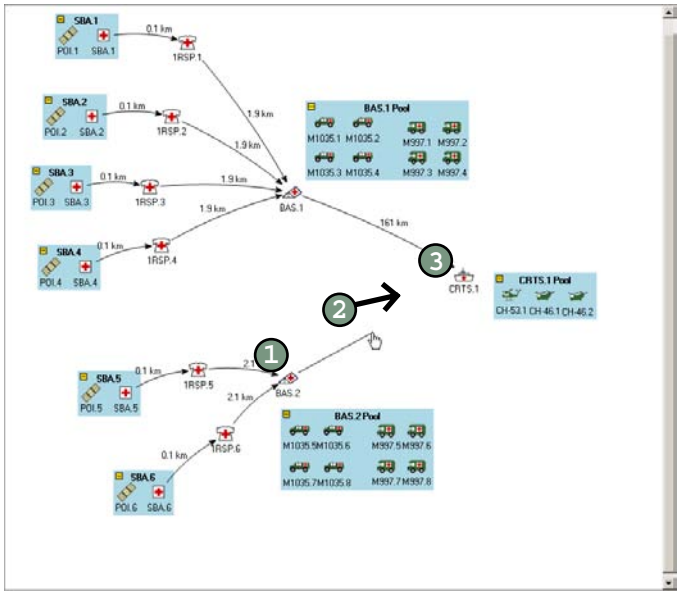
To link an LOC:

① Place the mouse over the LOC to connect. It changes from an arrow to a hand.

② Click and drag the mouse to the LOC to which patients can be evacuated.

③ Release the mouse. A line appears linking the two LOCs. TML+ enters a default value of 1 km for the distance.

④ Click the 1 km. A text field appears. Type in the distance between the linked LOCs.



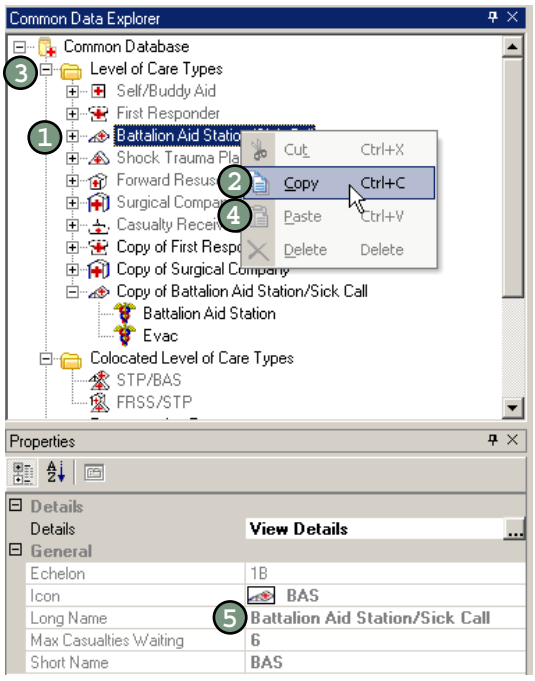
Creating a Customized LOC Type

A customized LOC type is a copy of an existing LOC type that you change to suit your needs. Currently, you can modify the quantity of the personnel, the individual equipment and consumable supply items within an AMAL, and the service discipline (the method used to queue patients). Future versions of TML+ will have expanded capability that include identifying the LOC medical capabilities (e.g., holding, resuscitation).

To create a customized LOC:

1. In the Common Data Explorer, right-click the LOC type you wish to customize. A menu appears.
2. Select Copy.
3. In the Common Data Explorer, right-click the Level of Care Types folder. A menu appears.
4. Select Paste. An icon appears at the bottom of the LOC types list.
5. In the Properties box, click in the field labeled Name. Type in a name for the new LOC type you created.

Follow the instructions in the next section to modify the LOC's personnel quantities and supply data. To add a customized LOC type to the scenario, follow the instructions on page 5-12.



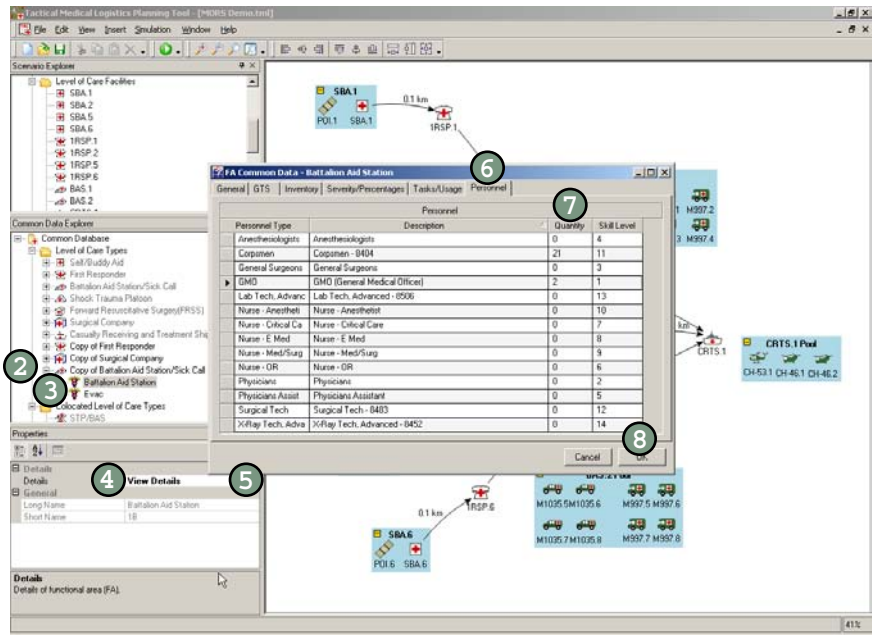
Modifying Personnel in an LOC Type

Each LOC comes with defined types and quantities of personnel.

To modify the personnel of an LOC type:

1. Create a customized LOC type for the LOC you want to change (see page 5-12).
2. In the Common Data Explorer, double-click the customized LOC.
3. Click the functional area to modify.
4. In the Properties box, click View Details. An ellipsis appears.
5. Click the ellipsis button. A new window opens.
6. Click the Personnel tab.
7. Click in the quantity column and enter the new quantities for each type of personnel.
8. Click OK.

To add your customized LOC type to the scenario, follow the instructions on page 5-9.



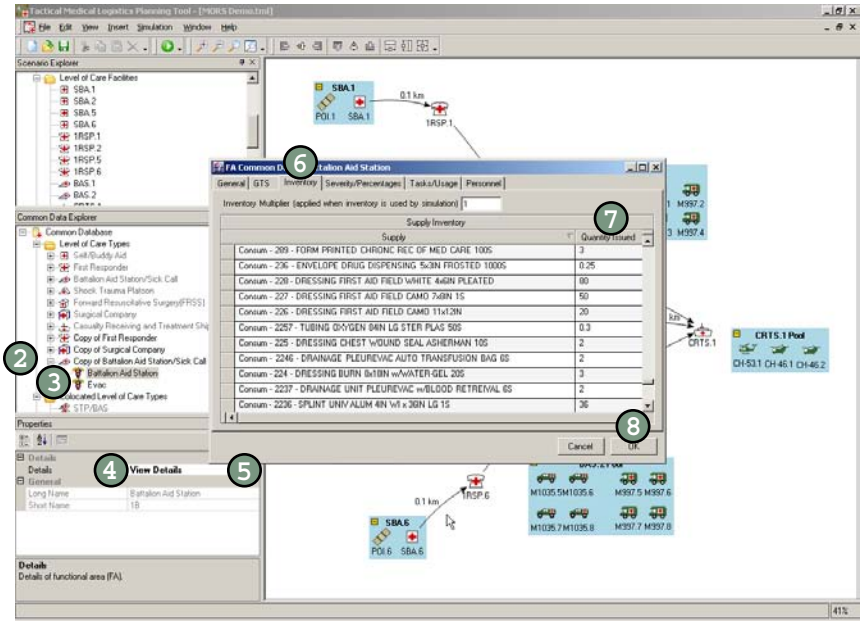
Modifying Supply Data in an LOC Type

Each functional area is associated with equipment and consumable items. You can modify the individual quantities of each item.

To modify the supply quantities of an LOC type:

1. Create a customized LOC of the LOC you want to change (see page 5-12).
2. In the Common Data Explorer, double-click the customized LOC (by default this is labeled “Copy of [name of LOC type]”). This expands the LOC to show its functional areas.
3. Click the functional area to modify.
4. In the Properties box, click View Details. An ellipsis appears.
5. Click the ellipsis button. A new window opens.
6. Click the Inventory tab.
7. Click in the Quantity Issued column and enter the new quantities for each supply item.
8. Click OK.

To add your customized LOC type to the scenario, follow the instructions on page 5-9.

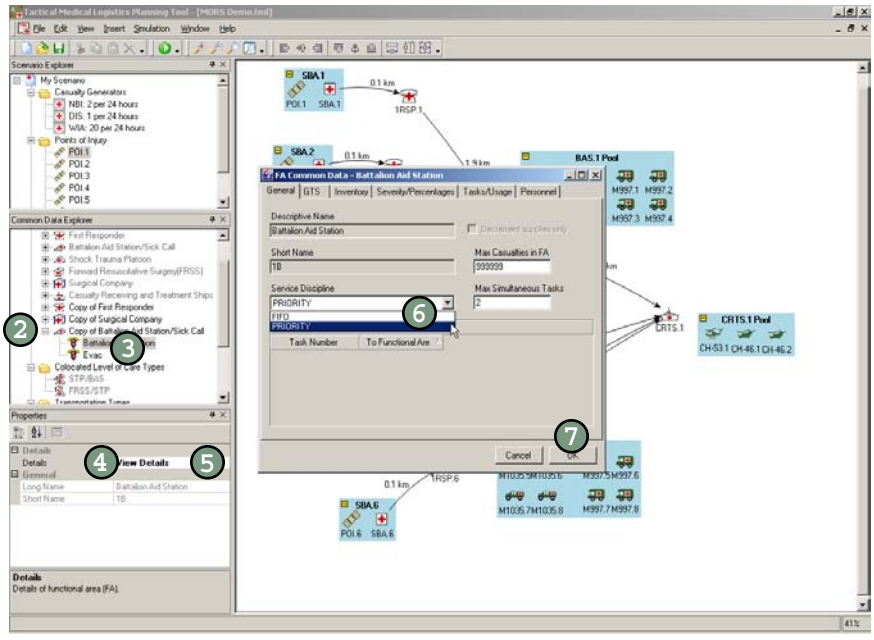


Modifying the Service Discipline

The service discipline is the method that TML+ uses to queue the patients for treatment. You have two choices: FIFO or Priority. FIFO treats patients on a first in-first out basis, treating the patient who has been waiting the longest. Priority treats the patients based on severity, treating the most serious PCs first. Priority is the default setting.

To modify the service discipline for an LOC type:

1. Create a customized LOC type for the LOC you wish to modify (see page 5-12).
2. In the Common Data Explorer, click the plus sign next to the customized LOC you just created. This expands the functional area list.
3. Click the functional area you want to change.
4. Click View Details. An ellipsis appears.
5. Click the ellipsis. A new dialog box opens defaulted to the General tab.
6. Click the down arrow under Service Discipline and select FIFO or Priority.
7. Click OK.

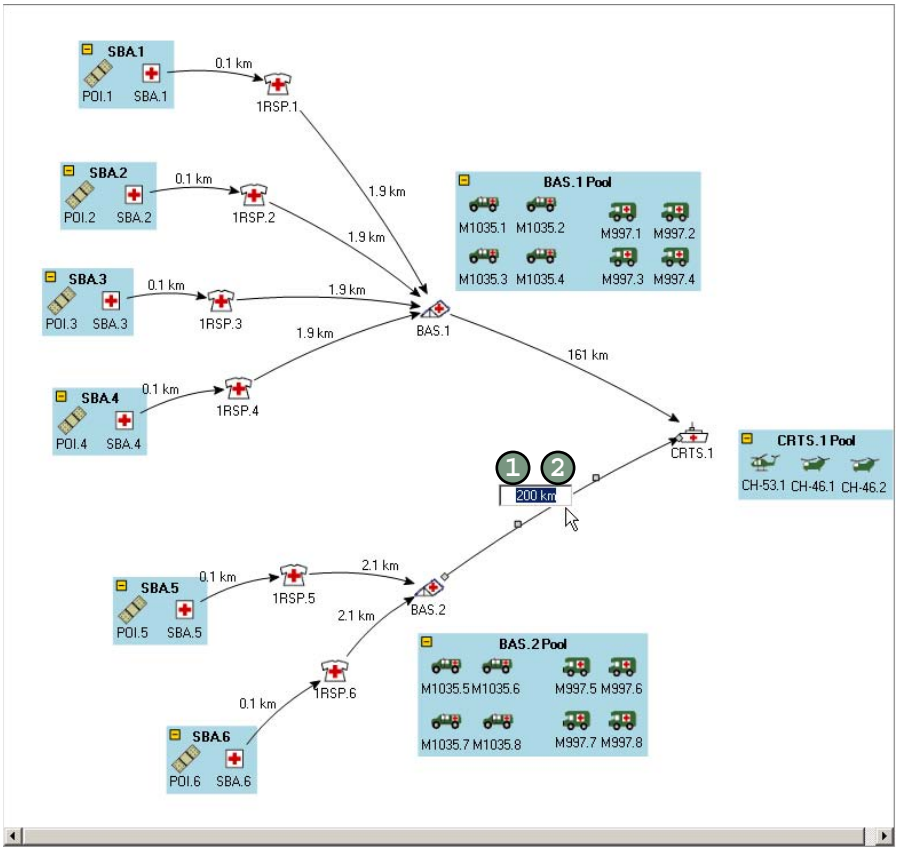


Modifying the Distance Between LOCs

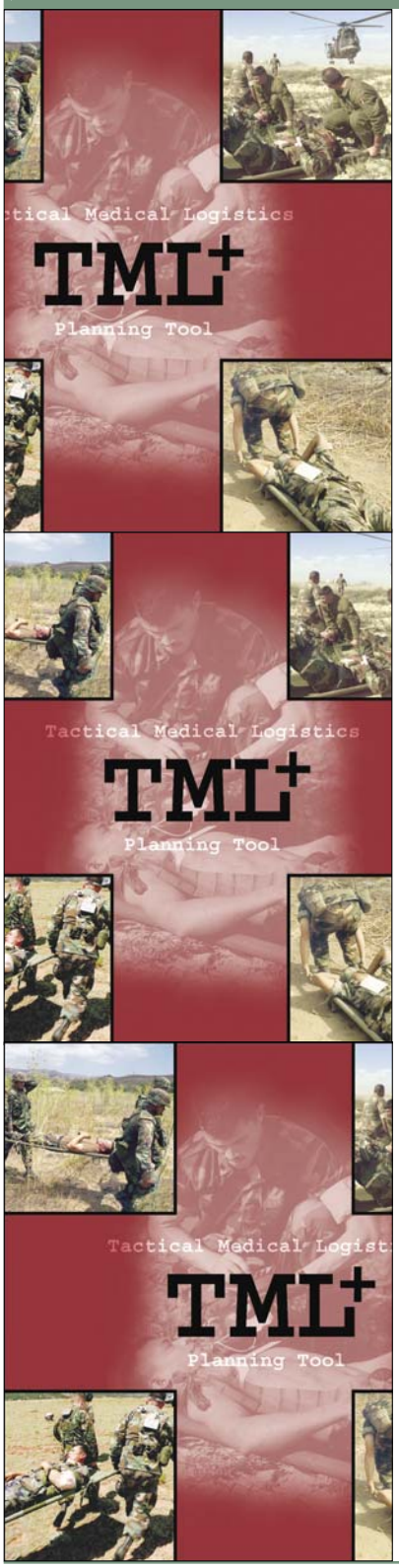
To modify the distances between two LOCs:

① In the Network View, click the number displayed between the two LOCs. A text field appears.

② Type in the new distance kilometers.



Chapter Six | Inserting Transportation Assets



About the Transportation Assets

You identify the transportation assets for each LOC that you add to your treatment network. Each asset has the following characteristics:

- **an empty speed**: the speed of the vehicle carrying no patients.
- **a loaded speed**: the speed of the vehicle when loaded with at least one patient.
- **maximum capacity**: the number of ambulatory patients a vehicle can carry. Two ambulatory seats equals one litter space.
- **patient ambulatory loading and unloading time**: the time it takes to load or unload a patient who can walk.
- **patient litter loading and unloading time**: the time it takes to load or unload a patient on a litter.
- **patient wait time**: the amount of time the vehicle remains grounded waiting for a full patient load.

You can modify these characteristics by following the instructions on page 6-8.

Types of Transportation Assets

Walk

The walk asset indicates a patient walking or being carried to the next LOC. The walk asset is to indicate that a vehicle is not being used. This is typically used to model the transportation from the POI to the First Responder.

Ambulances

(a) No transportation assets are modeled between colocated LOCs.

You can choose from two types of ambulances: M997 and M1035. The M997 has the following default settings: 8 maximum capacity (which equals 4 maximum litter carrying capacity), empty and loaded speed of 88 km/hr, ambulatory patient loading and unloading time of 2 minutes per patient, litter patient loading and unloading time of 3 minutes per patient, and a wait time of 10 minutes.

The M1035 has the following default settings: 3 maximum capacity (which equals 4 maximum litter carrying capacity), empty and loaded speed of 88 km/hr, ambulatory patient loading and unloading time of 2 minutes per patient, litter patient loading and unloading time of 3 minutes per patient, and a wait time of 10 minutes.

Helicopters

You can choose from two types of helicopters: CH-46 and CH-53. The CH-46 has the following default settings: 15 maximum capacity, empty and loaded speed of 268 km/hr, ambulatory patient loading and unloading time of 2 minutes per patient, litter patient loading and unloading time of 3 minutes per patient, and a wait time of 32 minutes.

The CH-53 has the following default settings: 55 maximum capacity, empty and loaded speed of 268 km/hr, ambulatory patient loading and unloading time of 2 minutes per patient, litter patient loading and unloading time of 50 minutes per patient, and a wait time of 32 minutes.

Modifying Assets

You can change the default settings for these assets by creating a customized transportation asset (see page 6-8).

How Assets Are Called

Each asset is assigned to a base LOC. The base is the LOC at which the asset is stationed. The asset leaves the base to pick up patients and returns to the base to drop the patients off for care.

All the assets assigned to the same level of care are put into a pool called the base pool. The fastest asset in the pool (based on empty speed) is drawn when an evacuation call is placed. If two assets have the same speed, the asset with the largest capacity is chosen.

Transportation Routing Rules

Transportation routes are the paths vehicles travel within the treatment network. There are two types of routes: primary and secondary. Both types of routes are indicated by solid lines (future version will show secondary routes as dotted lines). Each of these types of routes has a set of rules that determines the flow of patients.

Primary Routing Rules

Primary routing rules are the TML+ underlying data that define the overall flow of patients within the treatment network. Although you identify the primary LOCs a patient can visit, the flow of patients is restricted by these rules, which are based on the medical capabilities of the selected LOCs as defined by Navy and Marine Corps doctrine.

The primary routing rules in TML+ are:

1. Patients must move from POI to SBA.
2. Patients can only move back in the medical evacuation chain, i.e. from less capability to more capabilty.
3. Patients walk from SBA to next LOC defined in the scenario.
4. Transportation assets must be part of the scenario to answer an evacuation call.
5. Transportation assets do not stop at more than one LOC in one trip.
6. Transportation assets do not go between different sites of the same LOC type (e.g., BAS1 to BAS2).

Primary routing rules are top-level rules that are always used the same way, independent of time and the specifics of how the patient stream proceeds. For example, whether there are 50 patients in the first 10 minutes or 3 patients in 3 hours, they will always move from POI to SBA.

Secondary Routing Rules

Secondary routing rules are those rules that are activated based on the individual patient stream and the context of the scenario. As the patient stream places demands on resources, secondary routing rules direct the patient flow based on the availability of assets. The secondary routes are determined by three steps.

First, TML+ checks to determine if the patient's PC is treated at the next LOC. If no, the patient is queued for evacuation for the next available LOC that does treat the patient's PC.

If the PC is treated at the next LOC, TML+ performs the second step, checking if the LOC has a busy status. If the LOC is busy, the patient is queued for evacuation. A busy status means the patient capacity of the LOC is full and a certain number of patients (as designated by NHRC according to doctrine) are waiting. For example, if both beds in FRSS pre-op are busy and two patients are waiting, FRSS is designated as busy and patients are routed to the next LOC.

If the LOC is free, TML+ performs the third step. TML+ stochastically determines by a random draw whether the patient is treated at that LOC. Because not all PCs are treated at every functional area, this random draw is based on the percentage of patients with a specific PC that are treated at a specific functional area.

For example, if a patient with a surgical PC arrives at BAS, the primary routing rules determine the patient be evacuated from BAS to FRSS. However, if FRSS has a busy status at the time the patient arrives, the patient will queue to be evacuated to CRTS. If FRSS is free, TML+ executes a random draw to determine if FRSS treats the patient or is evacuated to CRTS because only a percentage of those patients with that surgical PC are treated at FRSS.

Contact NHRC at tml@nhrc.navy.mil if you would like more information on the capacities or the underlying percentages of treatment for PCs at the various functional areas.

How Patients Are Queued for Transport····

Once a patient is determined to be evacuated, TML+ checks the availability of transportation assets. The assets are prioritized by empty speed and capacity, with the fastest and largest being called first. In addition, the asset goes to the LOC with the highest priority casualty waiting to be evacuated.

If the asset is available, the patient is assigned a claimed status and the capacity of the asset is decremented based on the PC's designation as a litter or ambulatory. When the transportation asset reaches full capacity, it is assigned a busy status. This status prevents the asset from being called for another evacuation run until its present assignment is completed.

Inserting a Transportation Asset

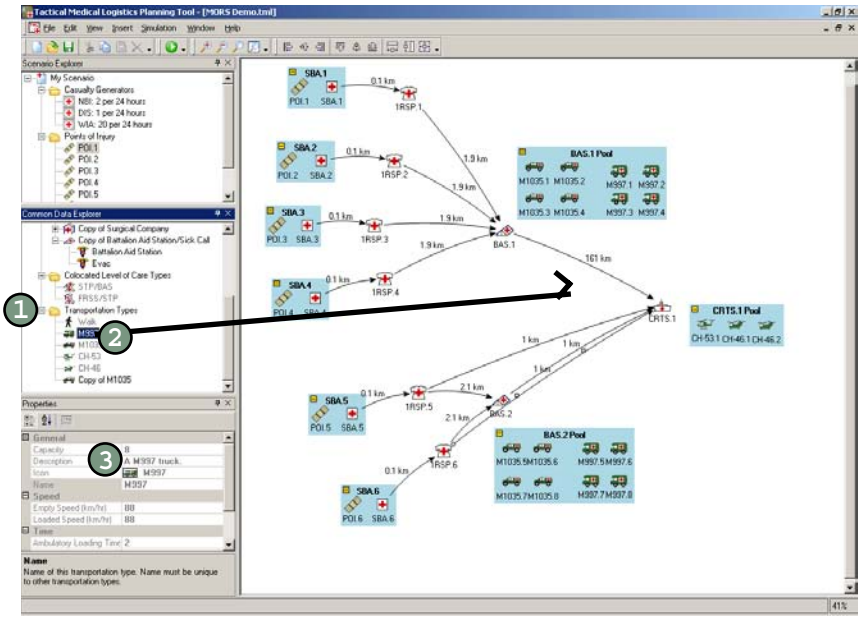
TML+ comes with a variety of predefined transportation types. These are listed in the Common Data Explorer under the Transportation Types folder.

To insert a transportation asset into your scenario:

① In the Common Data Explorer, click the plus sign to the left of the Transportation Types folder to see a list of the available transportation assets.

② Click and drag the icon of the desired transportation asset onto the LOC (or its existing transportation pool) in the Network View where you want the asset to be based. TML+ automatically names the asset.

③ To change the Transportation name, click in the right column of the field marked Name in the Properties box. Type in a name for the asset.



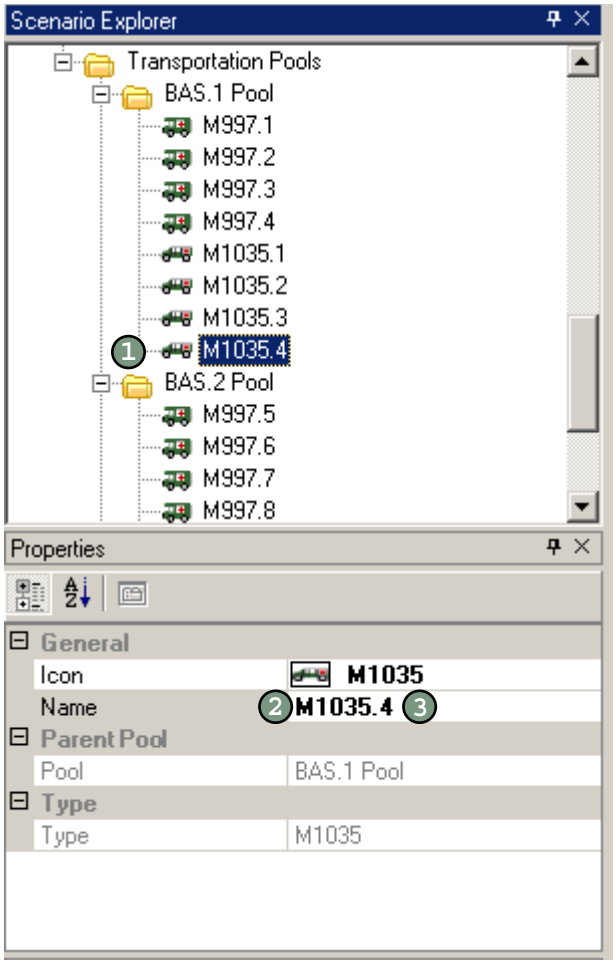
Modifying the Transport Name

To modify the name of a transportation asset in your scenario:

① Click the icon of the asset in the Scenario Explorer.

② In the Properties box, click in the right column of the field marked Name.

③ Type in the name of your choice.



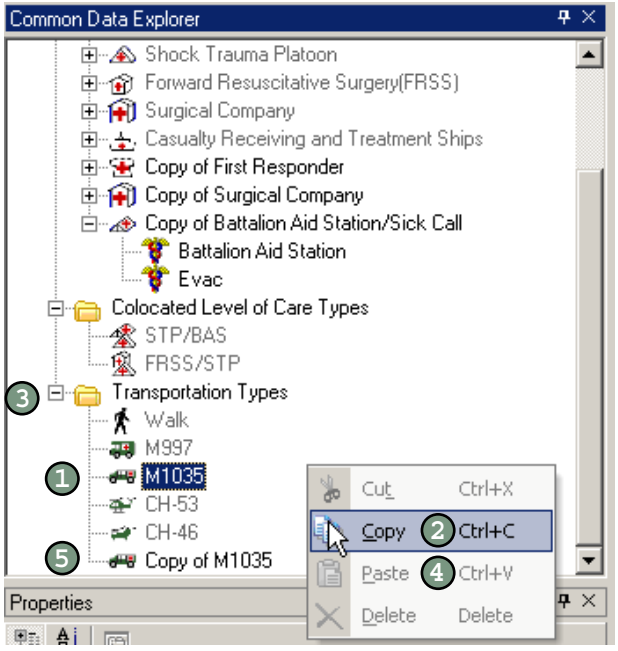
Creating a Customized Transport

A customized transportation asset is a copy of an existing transportation type that you change to suit your needs. Currently, you can change the speed, capacity, loading and unloading times for both litter and ambulatory patients, and the wait time of the asset.

To create a customized transportation asset:

1. In the Common Data Explorer, right-click the icon of the transportation asset you wish to customize. A menu appears.
2. Select Copy.
3. In the Common Data Explorer, right-click the Transportation Types folder. A menu appears.
4. Select Paste. An icon appears at the bottom of the Transportation Types list.
5. Click the new icon.
6. In the Properties box, click the field labeled Name. Type a name for the new transportation asset you created.

Follow the instructions in the next sections to modify the asset's characteristics. To add your customized asset to the scenario, follow the instructions on page 6-6.

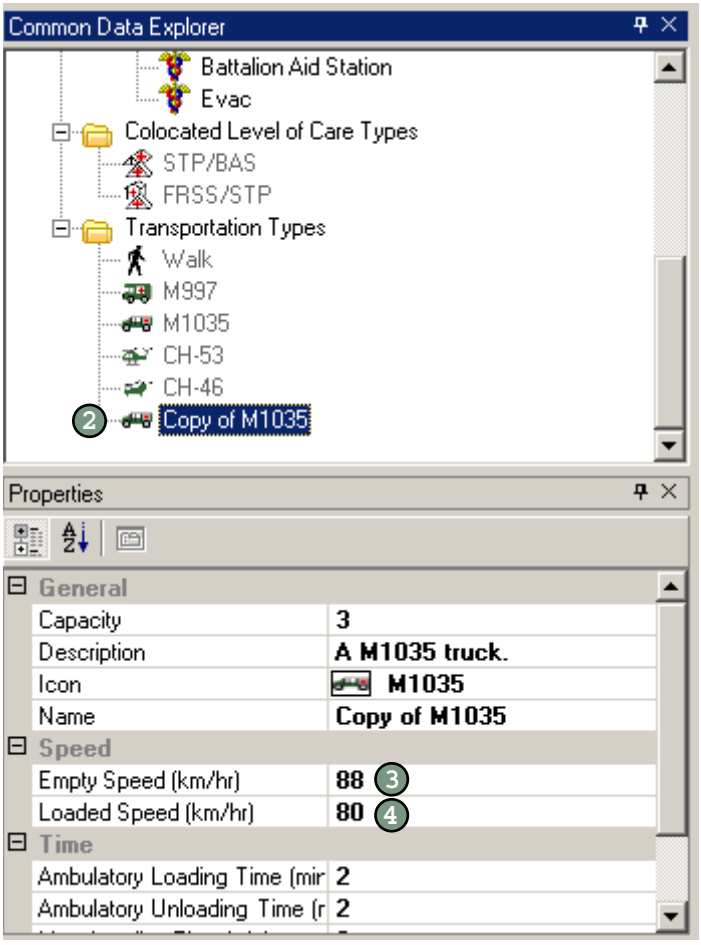


Modifying Speed of a Transport

You can only modify the speed by creating a customized transportation asset (see page 6-8). You can change both the speed of the asset when empty (no patients) and when loaded (with patients).

To modify the speed:

1. Create a customized transportation asset (see page 6-8).
2. In the Common Data Explorer, click the icon of the customized asset you wish to modify.
3. In the Properties box, click the right column of the field marked Empty. Type in a speed for the asset when it is empty (no patients).
4. In the Properties box, click the right column of the field marked Loaded. Type in a speed for the asset when it is loaded with patients.

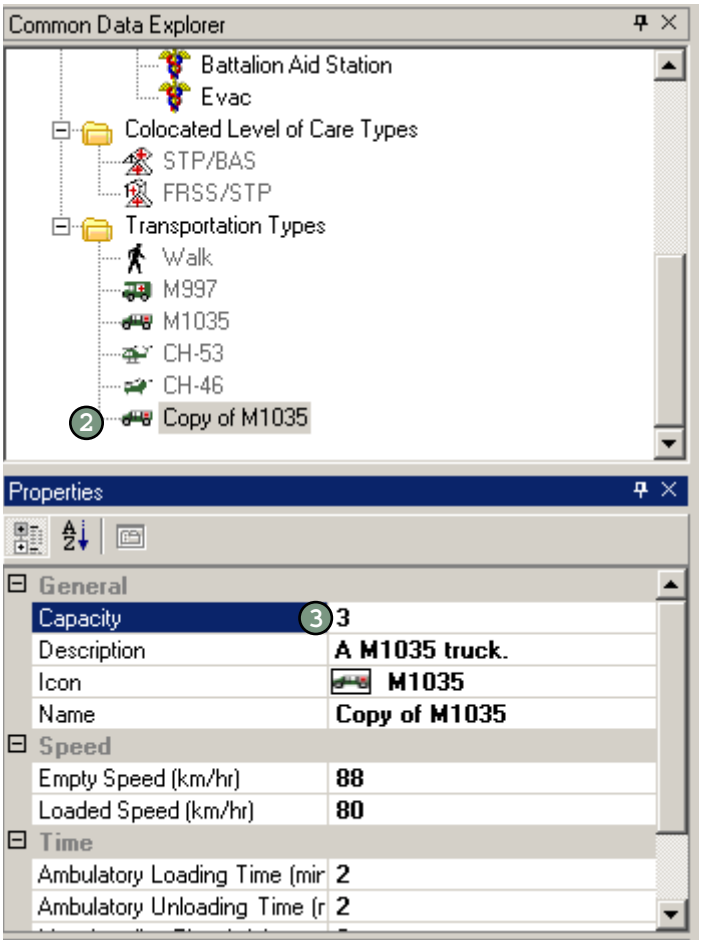


Modifying Capacity of a Transport

You can only modify the capacity by creating a customized transportation asset (see page 6-8). The capacity of a transportation asset is the maximum number of ambulatory patients a vehicle can carry. Remember, two ambulatory seats equal one litter space.

To modify the capacity:

1. Create a customized asset (see page 6-8).
2. In the Common Data Explorer, click the icon of the customized asset you wish to modify.
3. In the Properties box, click the right column of the field marked Capacity. Type in the maximum quantity of ambulatory patients the vehicle can carry. (Remember two ambulatory seats equals one litter space.)

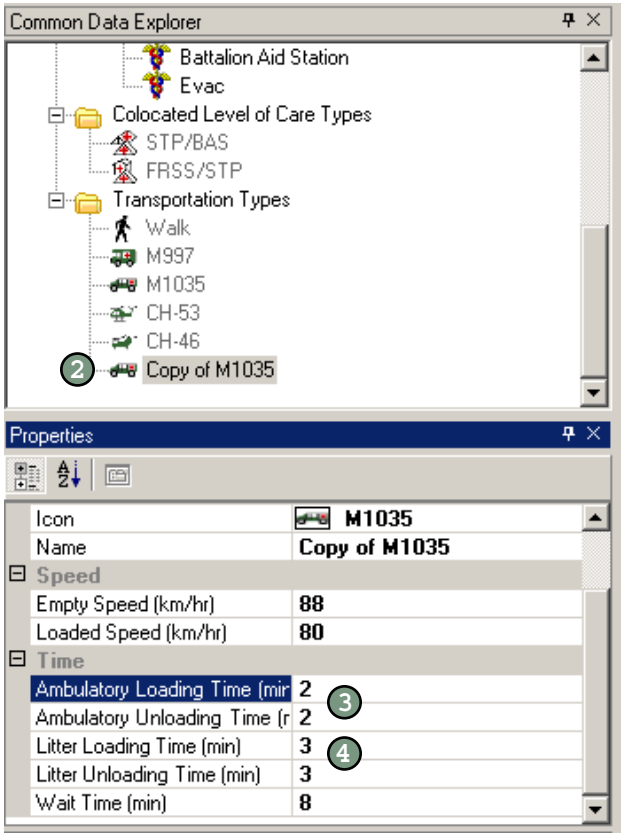


Modifying Loading and Unloading Times

You can only modify the litter and ambulatory loading/unloading times by creating a customized transportation asset (see page 6-8). The loading and unloading times indicate the amount of time necessary to load or unload each patient. You can modify the loading and unloading times for both ambulatory and litter patients.

To modify the loading and unloading times:

1. Create a customized asset (see page 6-8).
2. In the Common Data Explorer, click the icon of the customized asset you wish to modify.
3. In the Properties box, click the right column of the field marked Ambulatory Loading Time. Type in the number of minutes it takes to load each ambulatory patient. Repeat for Ambulatory Unloading Time.
4. In the Properties box, click the right column of the field marked Litter Loading Time. Type in the number of minutes it takes to load each patient on a litter. Repeat for Litter Unloading Time.



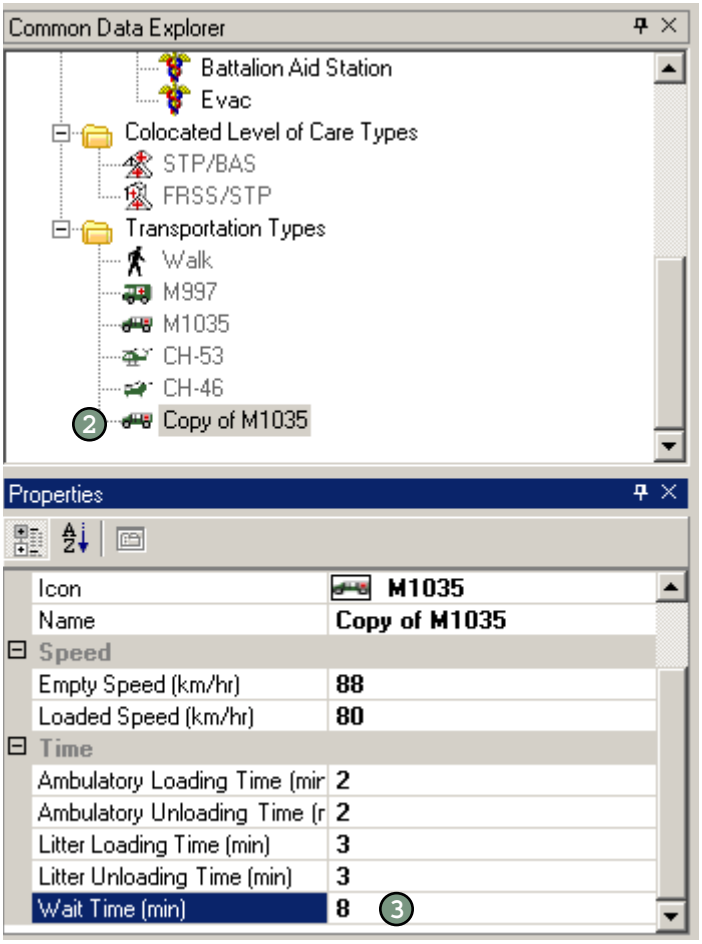
Modifying Wait Time

You can only modify the wait time by creating a customized transportation asset (see page 6-8). The wait time is the number of minutes the asset waits for a full patient load before leaving the level of care. Wait time starts when the asset finishes loading the last patient waiting for transport. If another patient arrives, the wait time clock resets.

① Create a customized asset (see page 6-8).

② In the Common Data Explorer, click the icon of the customized asset you wish to modify.

③ In the Properties box, click the right column of the field marked Wait Time. Type in the number of minutes the asset will wait for patients before leaving the level of care.



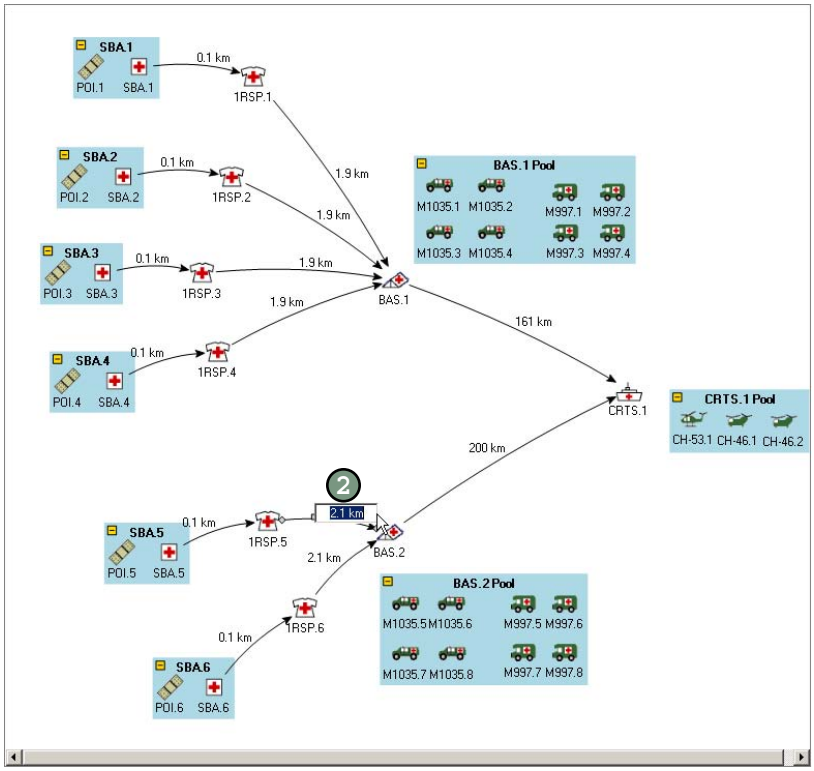
Modifying Distance Traveled by an Asset ··

The distance an asset travels between LOCs is indicated by the number above the line connecting two LOCs in the Network View.

To modify the distance an asset travels between LOCs:

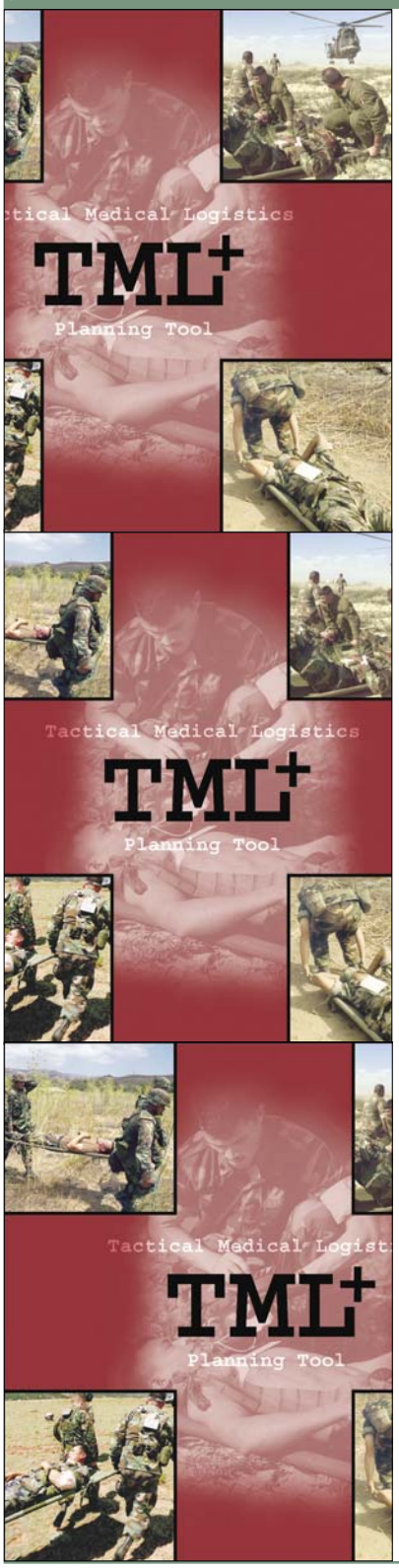
① In the Network View, click the number above the line connecting the LOCs.

② Type in the number of km.



Chapter Seven

Generating and Using Reports



About TML+ Reports

There are four groups of TML+ reports: casualty estimation, care providing, transportation, and general information.

The casualty estimation reports pertain to the number and types of casualties that occur in the scenario.

The care providing reports pertain to the treatment that occurs within the LOCs and functional areas, such as how many patients are treated, how long treatment takes, and how long patients wait to receive treatment.

The transportation reports pertain to patient evacuation, such as how many patients are evacuated per trip, how long patients have to wait for evacuation, and how many times each asset is used.

The general information reports provide a summary of your scenario inputs.

You can also access a list of the assumptions built into TML+.

About the Reports Navigator

When you run your scenario, TML+ generates an extensive output database. The Reports Navigator is the dynamic interface that you use to access this database file. The Report Navigator is equipped with drop-down menus that give you control in both what data you see and how they are displayed.

Turn to page 8-1 for an explanation of each report and why it is useful.

The Reports Navigator comes with drop-down menus that let you control what data you see and how they are displayed.

Replication Menu

If you run more than one replication of a scenario, the Replication menu lets you select the data for an individual replication or for all replications. When you select All from the drop-down menu, you see the mean, the standard deviation, the minimum, and the maximum for each data field.

Group Menu

The Group menu lets you select the primary area of data you are interested in. You can select casualty estimation, care providing, transportation, or general information (see page 7-1 for a general description of each report group).

Subgroup Menu

The Subgroup menu lets you select the specific report you want to see. The choices in this menu change depending upon which Group you select. In other words, the options in the Subgroup menu are different for the Care Providing group than for the Transportation group. Chapter 8 provides a description of each report (each group/subgroup combination).

Report Type Menu

The Report Type menu lets you select the format of the data. The options in this menu change according to the selections in the Group and Subgroup menus. Various reports can be displayed in table, pie chart, step chart, and/or Gantt chart formats.

LOC and FA Menus

The LOC and functional area menus appear when appropriate, depending upon the choices you make in the Group and Subgroup menus. You use these menus to view the data pertaining to the different LOCs and functional areas in your scenario.

Generating Reports

Once you have built your scenario, you run the simulation to generate the reports. The reports open in the Report Navigator, a new window that sits atop the Network View.

To generate the reports on your scenario:

1. Click the button in the toolbar at the top of the screen.
2. Follow the instructions in the following sections to use Reports Navigator.

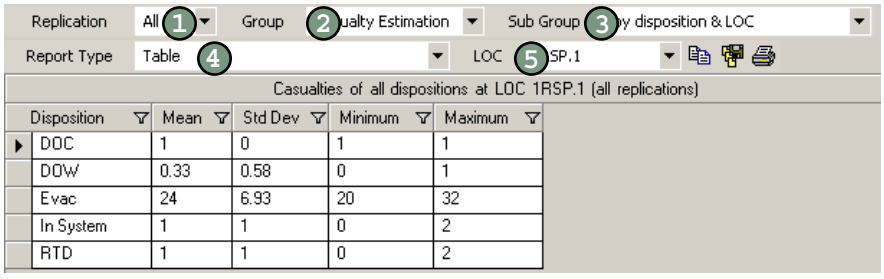
WARNING: If you have a complex scenario, the reports may take substantial time to generate. One way to speed up the run time is to turn off the audit report (see page 3-8).

Selecting a Report

To select a report:

1. Click the Replication menu and select the desired replication.
2. Click the Group menu and select the area of data.
3. Click the Subgroup menu and select the specific report.
4. Click the Report Type menu and select how you would like the data to be displayed.
5. If present, click the LOC and/or FA menu and select the facility.

Turn to page 8-1 for a description of each report and why it is useful.



Disposition	Mean	Std Dev	Minimum	Maximum
DOC	1	0	1	1
DOW	0.33	0.58	0	1
Evac	24	6.93	20	32
In System	1	1	0	2
RTD	1	1	0	2

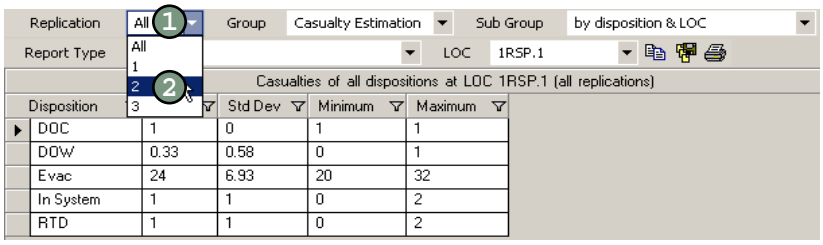
Modifying the Replication

If you run more than one replication of a scenario, the Replication menu lets you select the data for an individual replication or for all replications. When you select All from the drop-down menu, you see the mean, the standard deviation, the minimum, and the maximum for each data field.

To modify the replication you are viewing:

① Click the Replication menu.

② Select the replication you wish to view.



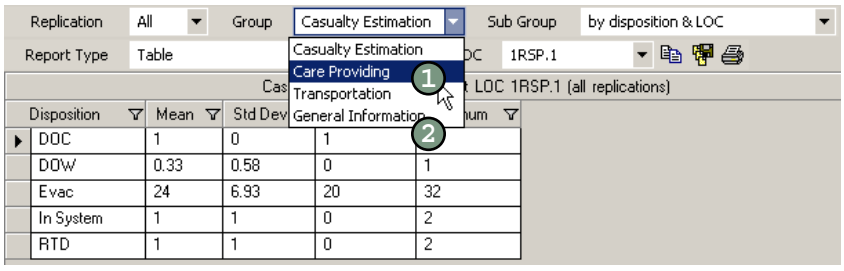
Modifying the Group

The Group menu lets you select the primary area of data you are interested in. You can select casualty estimation, care providing, transportation, or general information (see page 7-1 for a general description of each report group).

To modify the group of data you are viewing:

① Click the Group menu.

② Select the area of data you wish to view.



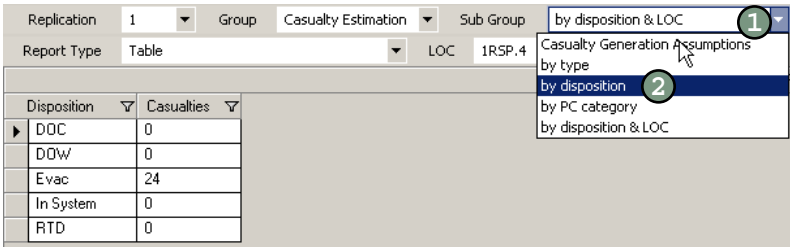
Modifying the Subgroup

The Subgroup menu lets you select the specific report you want to see. The choices in this menu change depending upon which Group you select. In other words, the options in the Subgroup menu are different for the Care Providing group than for the Transportation group. Chapter 8 provides a description of each report (each group/subgroup combination).

To modify the subgroup you are viewing:

① Click the Subgroup menu.

② Select the specific report you wish to view.



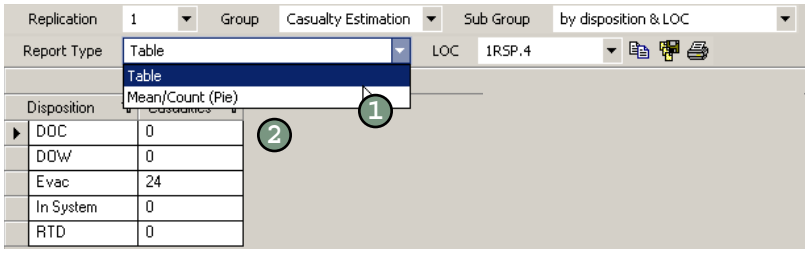
Modifying the Report Type

The Report Type menu lets you select the format of the data. The options in this menu change according to the selections in the Group and Subgroup menus. Various reports can be displayed in table, pie chart, step chart, and/or Gantt chart formats.

To modify the subgroup you are viewing:

① Click the Subgroup menu.

② Select the specific report you wish to view.



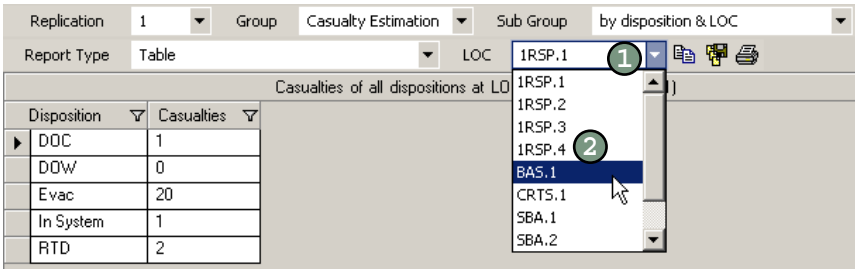
Modifying the LOC or FA

The LOC and FA menus appear when appropriate, depending upon the choices you make in the Group and Subgroup menus. You use these menus to view the data pertaining to the different LOCs and functional areas in your scenario.

To modify the LOC or FA you are viewing:

① Click the LOC or FA menu.

② Select the LOC or FA you wish to view.



Sorting Your Reports

You can sort your reports by each individual column (i.e., one column at a time). To sort by more than one field, follow the instructions in the next section on filtering.

To sort by a column in the report:

- Click the heading once for ascending order.
- Click the heading twice for descending order.

Click on the heading to sort.

Title	Value
Average delay for transport trips (minutes)	0.98
Average number of casualties transported per trip	1.08
Total number of trips by selected transportation asset(s)	40
Percent of trips with no transport delay	82.14
Total trip time of selected transportation assets (minutes)	460.43

When you filter a report, you are selecting to display a subset of the data in a report. Filtering is different from sorting because it hides the information you do not want to focus on. Filtering is also different from sorting because you can filter more than one column at a time.

The filtering function is located at the top of each column as denoted by the button.

NOTE: *Once you select a filter, the filter icon turns blue so that you can identify which columns have filters.*

Using Standard Filtering Options

You can filter all columns on blanks, nonblanks, and any entry in the column. If you filter on blanks, only those rows with empty fields in the column on which you filtered are displayed. If you filter on nonblanks, only those rows with an entry (text or numeric) in the column on which you filtered are displayed.

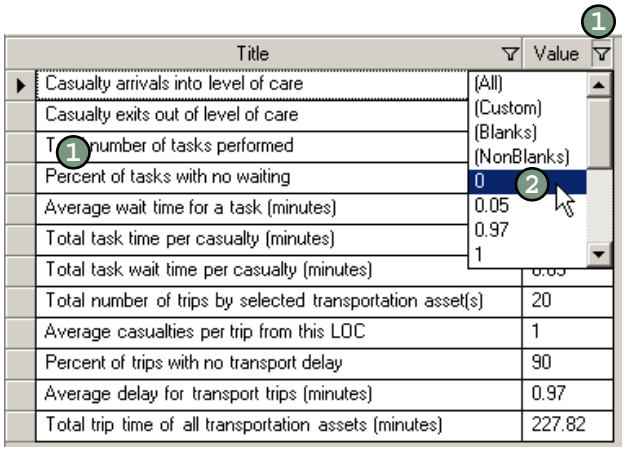
In addition, you can filter the column on any entry in that column. For example, say you have the following entries in a column: 3, 4, 8, 8, 8. If you want to see only the data with a value of 8, you can select 8 from the filter and view only the three records with a value of 8 in that column.

To filter your report:

① Click the button.

② Select the object to filter on.

③ Repeat steps 1 and 2 for all the columns you want to filter.

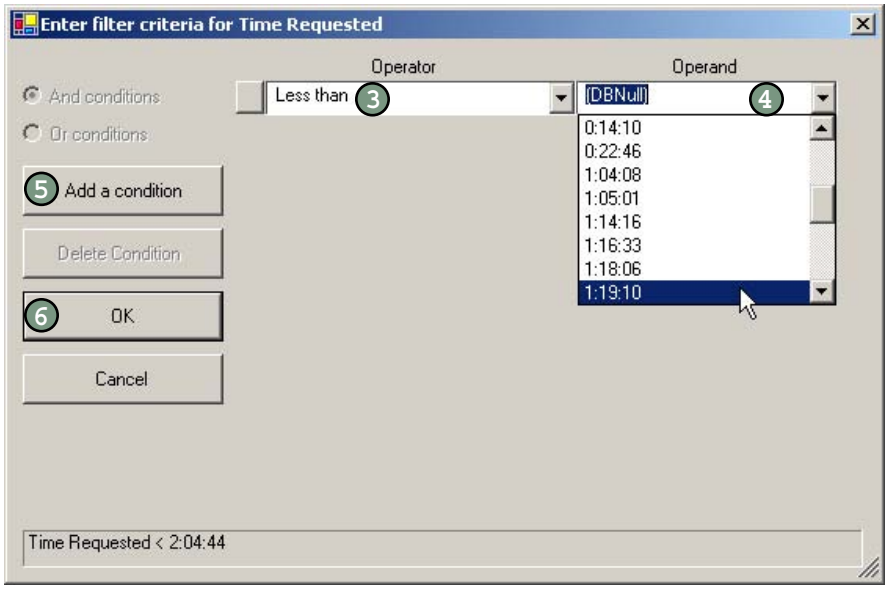


Customizing Your Filter

If you do not want to use the standard filtering choices (blanks, nonblanks, and entries in the column), you can customize your filter. The customizing feature allows you to filter on one or more conditions rather than one specific entry. For example, say you have the following entries in a column: 3, 4, 5, 5, 8. You can use the customization feature to display only those columns with a quantity greater than 4.

To customize your filter:

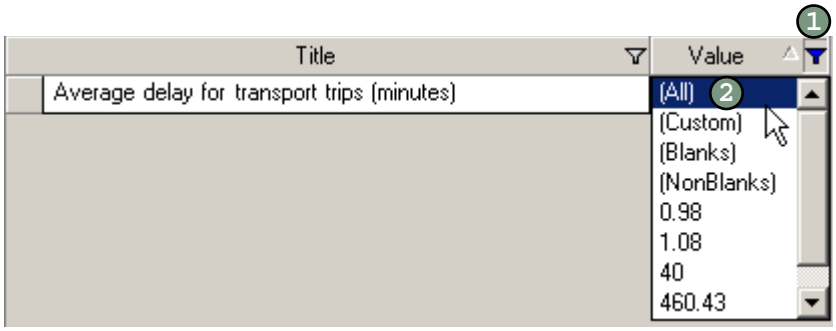
1. Click the button.
2. Select Custom. A new dialog box opens.
3. Click the drop-down menu and select the Operator.
4. Click the drop-down menu and select the Operand.
5. To add another condition, click the Add a condition button and follow steps 3 and 4.
6. Click OK.



Clearing a Filter

To clear the filtering options on a column:

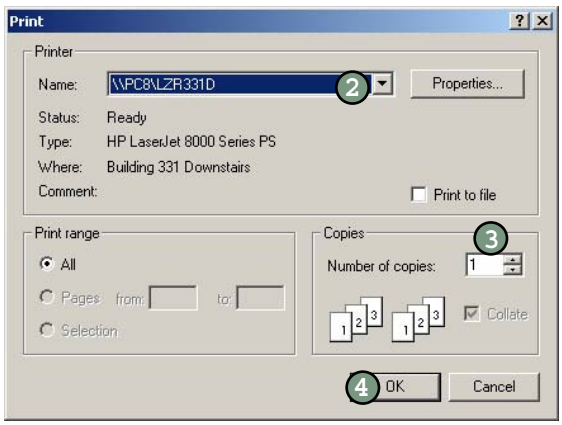
1. Click the button.
2. Select All.
3. Repeat for each column you wish to clear.



Printing a Report

To print your report:

1. Click the button on the toolbar.
2. Select the printer from the drop-down menu.
3. Select the number of copies.
4. Click OK.

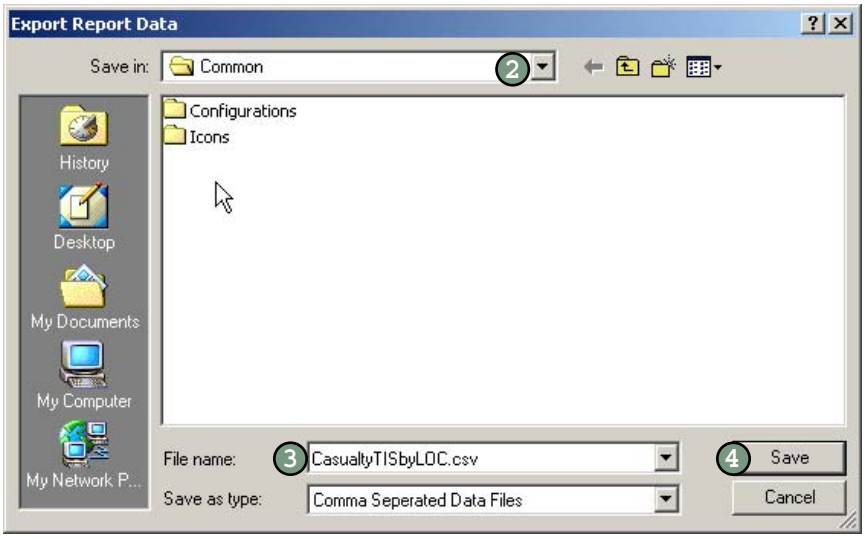


Exporting a Report

You have the option to export your data to a comma separated file (.csv), which can be opened in Excel.

To export the selected report:

1. Click the button on the toolbar. A dialog box opens.
2. Navigate to where you would like to save the file. Make a note of this location.
3. Type in a name for your file.
4. Click Save.



Report	Formats	What it says	Why it is useful
General Information			
Scenario properties	Table	Shows all the user inputs for the scenario.	Quick at-a-glance of the scenario
Audit report	Table	Displays each process completed by TML+ (a very extensive report).	Used by NHRC for testing purposes
All assumptions	Table	Lists all the underlying assumptions for TML+.	
Casualty Generation			
Patients by type	Table, pie chart	Shows the numbers of WIA, KIA, NBI, and DIS.	Provides visibility of the distribution of the types of casualties in the patient stream.
Patients by disposition	Table, pie chart	Shows the total numbers of died of wounds (DOW), died of complications (DOC), returned to duty (RTD), still in system, and evacuated across all LOCs.	Provides visibility of the distribution of patient dispositions across the treatment network. Can be used to determine if the treatment network is treating patients quickly and efficiently (as indicated by the died of complications and still in system statistics). This report can be used in conjunction with the Patients by disposition at each LOC report to pinpoint specifically which LOCs are problematic.
Patients by patient condition category	Table, pie chart	Shows the numbers of patients with each type of JRCAB patient condition category (e.g., head, gastrointestinal, respiratory).	Provides visibility on the distribution of the types of diseases and injuries generated within a certain theater. Can be used to determine the particular personnel skills required for a scenario.
Patients by disposition at each LOC	Table, pie chart	Shows the numbers of DOW, DOC, RTD, still in system, and evacuated.	Provides visibility of the distribution of patient dispositions at the LOC. Can be used to determine if a LOC is treating patients quickly and efficiently (as indicated by the died of complications and still in system statistics).
Assumptions	Table	Lists all the underlying assumptions for the Casualty Generation reports.	

Report	Formats	What it says	Why it is useful
Care Providing			
Casualty time in system by LOC	Table	Shows patient information, such as how many arrive at and exit the LOC, average wait time for a task and for evacuation, total treatment time at the selected LOC.	Can be used to determine if enough personnel are present to provide treatment at the selected LOC. Can be used in conjunction with the Casualty time in system by functional area report to determine which functional areas within the LOC are problematic.
Casualty time in system by functional area	Table	Shows patient information, such as how many arrive at and exit the LOC, average wait time for a task and for evacuation, total treatment time, at the selected functional area.	Can be used to determine if enough personnel are present to provide treatment at the selected functional area.
Casualty accumulation by LOC	Step chart	Shows the number of casualties either receiving or waiting for treatment at a particular time at the selected LOC.	Provides visibility on when congestion occurs within the LOC. Can be used to determine how to relieve congestion with additional personnel or transportation assets. Can be used in conjunction with the Casualty accumulation by functional area report to determine which functional areas within the LOC are problematic.
Casualty accumulation by functional area	Step chart	Shows the number of casualties either receiving or waiting for treatment at a particular time at the selected functional area.	Provides visibility on when congestion occurs within the functional area. Can be used to determine how to relieve congestion with additional personnel or transportation assets.
Casualty flow	Table	Shows the final disposition, arrival time, treatment time, and time since wounding for each casualty at each LOC in the system.	Provides visibility on how long each patient is in treatment. Can be used to determine if casualties are being treated efficiently through the treatment network. Can be used in conjunction with the Casualty flow by LOC to determine which LOC is problematic.
Casualty flow by LOC	Table	Shows the final disposition, arrival time, treatment time, and time since wounding for each casualty for the selected LOC.	Provides visibility on how long each patient is in treatment. Can be used to determine if casualties are being treated efficiently at the selected LOC.

Report	Formats	What it says	Why it is useful
Care Providing (cont.)			
Consumable usage by functional area	Table	Shows the starting/ending quantities, the quantity used, the time the quantity was exhausted (if applicable), and the casualty being treated when the consumables were exhausted at the selected functional area.	Can be used to determine which consumables are in high demand and which are oversupplied or undersupplied.
Equipment utilization by functional area	Table, Gantt chart	Shows the percentage of time of the scenario that each equipment item was used at the selected functional area.	A high-level report that can be used to determine whether certain equipment assets are underused and therefore if the number of assets designated for the scenario should be reduced. This report is best used as a decision tool only if the utilization percentages are very low. This is because although an equipment asset may be used a percentage of the total scenario time, the time it is used could be due to a spike in casualties during which more equipment assets were needed to address the needs of the patients.
Personnel utilization by functional area	Table, Gantt chart	Shows the percent of time of the scenario that each staff person was used at the selected functional area.	A high-level report that can be used to determine whether certain personnel are under used and therefore if the number of assets designated for the scenario should be reduced. This report is best used as a decision tool only if the utilization percentages are very low. This is because although each staff person may be used a percent of the total scenario time, the time each person is used could be due to a spike in casualties during which more staff were needed to address the needs of the patients.
Tasks performed by functional area	Table	Shows for each casualty the individual tasks performed, the supplies used by that task, the time the casualty arrived at the task, the time the task was started, and the time the task was finished at the selected functional area	Can be used to determine the skill set required to successfully treat the patient stream and to determine whether the personnel assets meet the requirements of the scenario.
Assumptions	Table	Lists all the underlying assumptions for the Care Providing reports.	

Report	Formats	What it says	Why it is useful
Transportation			
Transportation usage by pool	Table	Shows the number of trips made by all the assets, the average number of casualties per trip, the percentage of trips without any delay, average delay for those trips with a delay, the total trip time for all assets at the selected functional area.	Can be used to determine if enough transportation assets are available to handle the evacuation needs of the scenario by looking at the delay in evacuating patients across all transportation assets.
Transportation details by LOC	Table	Shows for each individual transportation asset the time requested, the casualty IDs for those on the asset, the time the asset left its home base, the time it arrived and departed from the LOC, the time it arrived at the home base, and the time the unloading of patients was complete at the selected LOC.	Can be used to determine if enough transportation assets are available to handle the evacuation needs of the scenario by looking at the delay in evacuating patients for each asset. In addition, it can be used to determine which assets are carrying the majority of the evacuation load and whether these assets can be more efficiently distributed to the LOCs in the treatment network.
Transportation utilization	Table, Gantt chart	Shows for each individual transportation asset the percentage of time of the scenario that asset was used across all LOCs.	Can be used to determine whether certain transportation assets are under used and therefore if the number of assets designated for the scenario should be reduced. This report is best used as a decision tool only if the utilization percentages are very low. This is because although a transportation asset may be used a percentage of the total scenario time, the time it is used could be due to a spike in casualties during which more assets were needed to address the needs of the patients.
Assumptions	Table	Lists all the underlying assumptions for the Transportation reports.	

TML+
At-A-Glance

1

Start TML+.

① Click Start in the lower left corner of your screen.

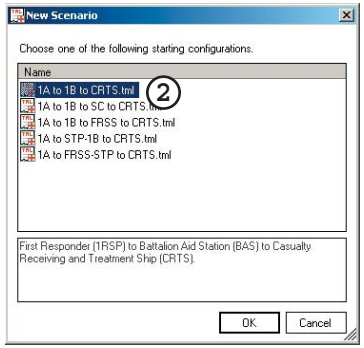
② Pass your mouse over Programs, then TML+, then click the TML+ icon.

2

Select a configuration.

① In the TML+ Start Page dialog box, click New.

② Double-click the icon with the desired configuration.



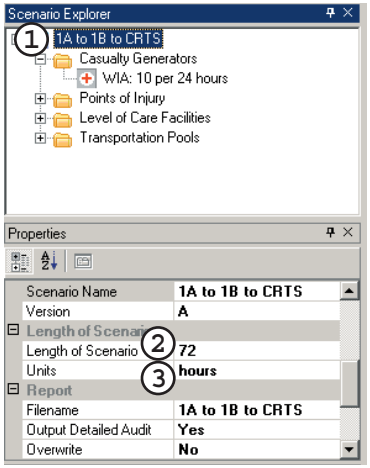
3

Enter scenario length.

① In the Scenario Explorer, click the scenario icon.

② In the Properties box, type in hours or days in the Length of Scenario field.

③ In the Properties box, click the arrow in the Units field to select hours or days.

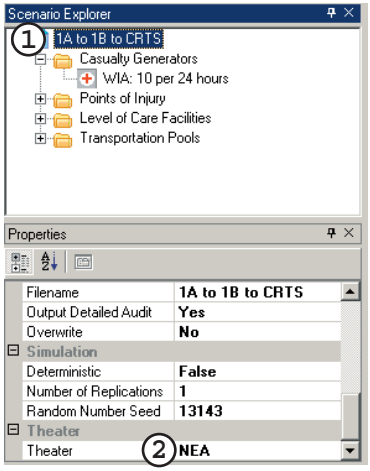


4

Select theater.

① In the Scenario Explorer, click the scenario icon.

② In the Properties box, click in the arrow in the Theater field and select the theater.



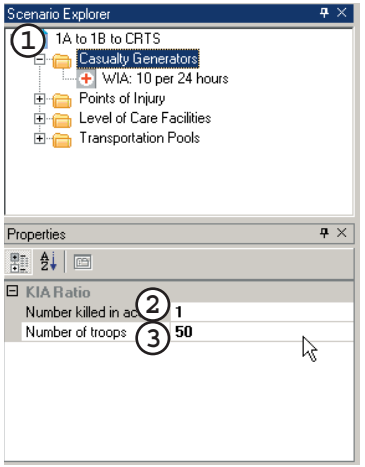
5

Enter killed in action.

① In the Scenario Explorer, click the Casualty Generators folder.

② In the Properties box, type in a number in the Number killed in action field.

③ In the Properties box, type a number in the Number of troops field.

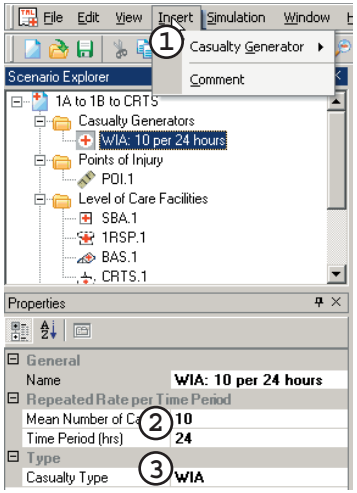


TML+
At-A-Glance

6

Add casualty generators.

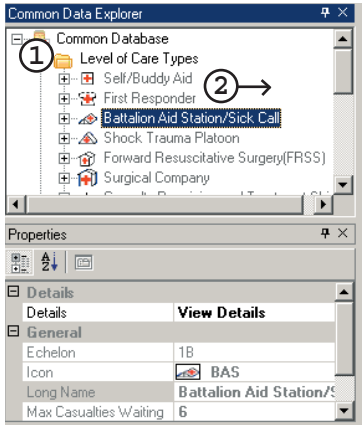
1. Under Insert, click Casualty Generator, then Rate.
2. In the Properties box, type in the Mean Number of Casualties and Time Period.
3. In the Properties box, click the down arrow in the Casualty Type field and select type.



7

Add LOCs.

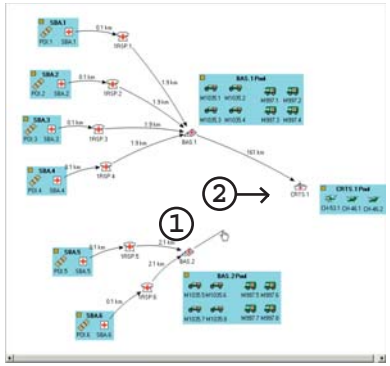
1. In the Common Data Explorer, double-click the Level of Care Types folder.
2. Click and drag the icon of the desired LOC type onto the Network View and release the mouse.



8

Connect LOCs.

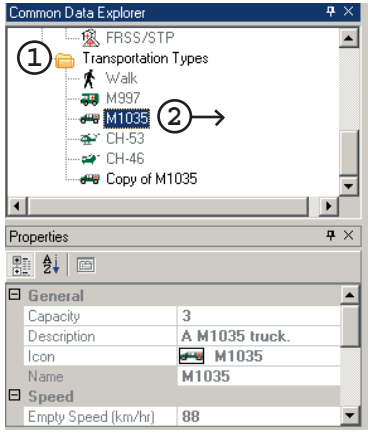
1. Place the mouse over the LOC to connect. It changes from an arrow to a hand.
2. Click and drag the mouse to the LOC to which patients can be evacuated and release the mouse.
3. Click the 1 km. Type in the distance.



9

Add transportation.

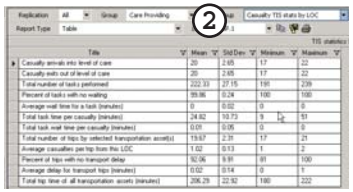
1. In the Common Data Explorer, double-click the Transportation Types folder.
2. Click and drag the icon of the desired transportation asset onto the LOC in the Network View and release the mouse.



10

Run the scenario.

1. Click the button in the toolbar to run the scenario.
2. Use the drop-down menus in the Report screen to view different outputs.



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The Tactical Medical Logistics Planning Tool (TML+) is a software program designed for Navy and Marine Corps medical planners as a tool that (1) models the patient flow from the point of injury through more definitive care, and (2) supports operations research and systems analysis studies, operational risk assessment, and field medical services planning. The manual is divided into seven chapters. Chapter 1 provides background information, explains the development of TML+, and discusses why TML+ is important. Chapter 2 provides an overview of TML+ as well as in-depth instructions for basic program operations. Chapter 3 explains how to select a scenario while Chapter 4 describes how to set up your casualty streams. Chapter 5 outlines how to identify the levels of care you expect to provide treatment for your patients. Chapter 6 explains how to insert the transportation assets for your network of care facilities. Chapter 7 explains how to generate reports and interpret them most effectively. In addition, an at-a-glance set of directions for running TML+ is located at the back of this guide.

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