
Appendix II: Army Range Requirements Model

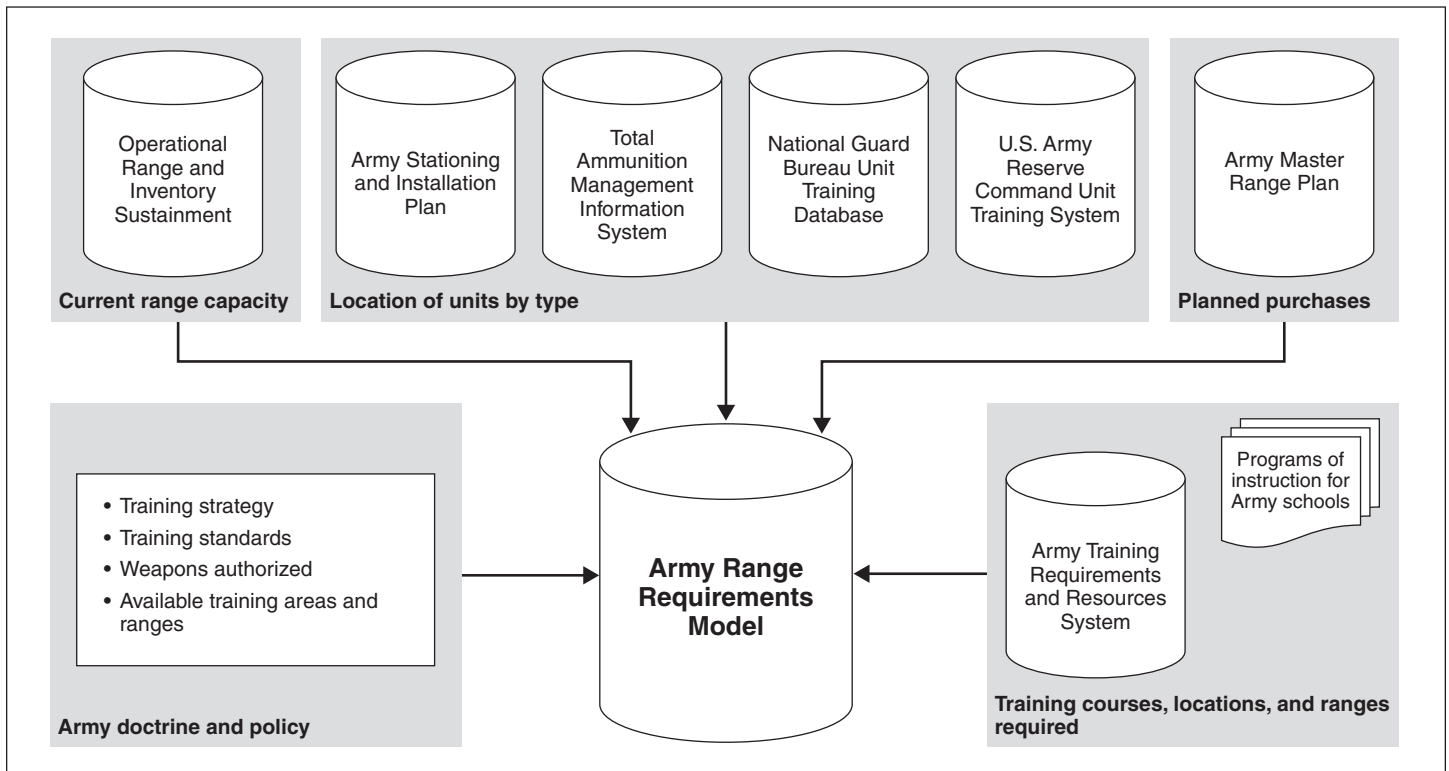
The Army Range Requirements Model provides a consistent and reasonable framework for Army headquarters, major commands, and installations to use to calculate training land requirements—just one step in the Army’s overall process for determining land needs and acquiring land for training. The model calculates the amount of land and the number of days needed to complete training tasks by using the Army training doctrine and policy in conjunction with input data from seven of the Army’s administrative and operational databases. The Army has several quality assurance safeguards to ensure that the model is reliable and updated regularly to help ensure that input data are accurate. The process to update the model includes multilevel reviews by the Army Management Office for Training Support Systems Division, subject matter experts, and authorized users of the model, such as range and training managers, that check for discrepancies between prior and updated calculations and current conditions at individual installations. With respect to the input data used by the model, Army officials are aware of weaknesses associated with some of the Army’s administrative and operational databases that provide these data and routinely take steps to mitigate their effect on the model’s calculations. For example, users have the opportunity to review the model’s calculations and data for accuracy and discrepancies and to address any issues. If any inaccuracies or discrepancies in the data sources are identified, users can extract the model data, request the data source program managers to make the necessary modifications and corrections, recalculate the training land needs, and send the recalculations to the model’s program office for validation and correction. As a result, we believe the effects of the minor weaknesses in the Army’s administrative and operational databases on the model’s calculations of the overall training land needs are minimal.

Army Range Requirements Model Uses Multiple Inputs to Determine Training Land Requirements

Using Army’s training doctrine and policy as its basis, the Army Range Requirements Model uses data from seven administrative and operational databases that provide information on training range inventories, unit locations, planned purchases, and training courses to calculate the optimum or maximum amount of land needed to train to doctrinal standards and policy. Not reflected in the model are training lands that are not used due to environmental and cultural considerations, condition of facilities, and other factors, all of which the Army addresses through separate analyses at the end of the model’s calculation process. As such, the model’s calculations are not the entire analysis required for validation of training land needs and are not intended to be so. Figure 2 describes the model’s multiple inputs—the training doctrine and policy are depicted on

the left and the administrative and operational databases are depicted as cylinders.

Figure 2: Army Range Requirements Model's Multiple Inputs



Source: GAO analysis of Army Range Requirements Model architecture.

Model Requirements Based on Army Doctrine and Policy

The range requirements model uses Army doctrine and policy—specifically training strategy, training standards, weapons authorized for training, and available training areas and ranges—as its basis for generating training land requirements.

- Army Training Circular 25-1 provides training land requirements per unit, which includes the amount of maneuver training land necessary to meet

training requirements specific to unit size and echelon.¹ The model uses this data to determine the amount of land needed for maneuver training at each of its installations.

- Army Training Circular 25-8 provides data on how each type of training range is to be configured, such as the number of maneuver lanes, objectives, and firing points required for each standard range.² The model uses this information to determine whether an installation's training ranges are configured properly to meet training requirements and to calculate the amount of land needed for maneuver training at each Army installation.
- Army Pamphlet 350-38 provides training standards for the types of weapons and weapon systems to be used during training exercises and defines the required number of rounds to be fired for each weapon or weapon system to meet training requirements.³ The model uses this data to determine the types of ranges and training land needed for different training events. Upon release of new training standards, the Army reviews them for clarity before entering them into the model. The latest version of this policy was published in July 2008 and is currently being revised for fiscal year 2009. After the updates are complete, they will be incorporated into the model.
- Army Pamphlet 415-28 provides specific guidance on how property is to be tracked across the Army, specifying the use of category codes for each type of property including training land and ranges.⁴ These category codes allow the Army to determine what types of training land and ranges are available across all its installations. The model uses the categorization codes to identify and define a specific range or type of maneuver training land when generating training requirements. The Army ensures that any updates to these codes are reflected in the model by incorporating them as soon they are published. The pamphlet was last updated in April 2006.

¹Army Training Circular 25-1, *Training Land*, U.S. Army Chief of Staff (Washington, D.C., Mar. 15, 2004).

²Army Training Circular 25-8, *Training Ranges*, U.S. Army Chief of Staff (Washington, D.C., Apr. 5, 2004).

³Army Pamphlet 350-38, *Standards in Training Commissions*, U.S. Army Chief of Staff (Washington, D.C., July 24, 2004).

⁴Army Pamphlet 415-28, *Real Property Category Codes*, U.S. Army Chief of Staff (Washington, D.C., Apr. 11, 2006).

According to Army officials, the above Army doctrine and policies do not reflect the increases in unit training and the use of training ranges as a result of ongoing contingency operations. As more units, including National Guard units, are mobilized for contingency operations, they require more training than would have happened at a greater frequency than in peacetime. Because the range requirements model is based on doctrine that reflects peacetime assumptions, its calculations do not reflect the current increased training. For instance, in peacetime, most ranges are used 242 days a year (which is the timeframe used by the range requirements model to calculate training land needs). With increased training due to contingency operations and mobilization of troops, many ranges are being used almost year-round.

Model Uses Data from Seven Administrative and Operational Databases

The Army Range Requirements Model uses data from seven administrative and operational databases and relies on these data sources to provide the initial quality assurance over these data:

- **Operational Range and Inventory Sustainment** to track the Army's range inventory. This inventory provides geospatial data on each range, lists the type of munitions used at each range, and describes range conditions. Data in this inventory are required to be updated every 5 years. Army officials said that they would like to have the inventory updated more often, but, since the range inventory is relatively stable and does not change significantly, they believe that the system's data have a minimal effect on the reliability of model's calculations. Still, Army headquarters has asked that the inventory be updated more frequently and has provided funding in order to do so. The data are reviewed by both the U.S. Army Environmental Command, the Army office responsible for oversight of the inventory, and by installations, who are the primary users of the data.
- **Army Stationing and Installation Plan** to track the number of military personnel on an installation. This plan, which is a database, contains data on civilian and military personnel stationed at individual Army installations. For example, the database shows the number of units stationed on a specific installation during a given fiscal year. These data undergo a quarterly multistep validation, verification, and update process. The Army Assistant Chief of Staff for Installation Management, the office responsible for oversight of the database, performs a data integration process to normalize information provided to the system by other Army data sources. Updated data are sent to users, such as Army Installation Management Command and other Army commands, for review and validation. The database's management office controls data entered, limits access to the data to authorized users only, validates all data edits, and

integrates the validated data edits into the database. According to an Army official, the data are around 75 to 80 percent accurate even though they undergo a multistep review process on a regular basis. Still, we believe the effects of the database's 75 to 80 percent accurate rate on the model's calculations are minimal, because users of the range requirements model have the opportunity to review the database's data for accuracy and discrepancies and to address any issues with any inaccurate data used in model.

- **Total Ammunition Management Information System** to track the organization of units training at an installation. This system provides data needed to manage training ammunition requirements, authorizations, forecasts, and expenditures. Because these data are categorized by Army's hierarchical structure, they can be used to identify the organization of units per Army echelon. Data are manually validated each time the system is updated, which is usually twice a year.
- **National Guard Bureau Unit Training Database** to ensure that installations used by National Guard units are accounted for when calculating training land requirements. The database contains data on installations where National Guard units have trained and are scheduled to train, the type of training completed, as well as account for increased training due to contingency operations. Data are collected in a spreadsheet that is manually verified through two levels of review, both done within the National Guard Bureau Training Support Branch, the office with oversight of the database. The first review is by the person entering the data and the other by his or her supervisor. In addition, data are verified using a separate data system, the Range Facility Management Support System, which tracks historical usage of training land and ranges by National Guard units. National Guard officials said that historical training data are not used by the active Army to predict future training requirements, so the data from this database must be edited to fit the model's business rules. As such, the National Guard reviews the data and edits it to fit the model's business rules.
- **U.S. Army Reserve Command Unit Training System** to ensure that installations used by reserve units are accounted for when calculating training land requirements. The system provides reserve unit data, such as unit names and home stations, and serves as the central database for approved training activities within U.S. Army Reserve Command. The system provides data on annual training exercises involving more than one unit but does not include regular training for individual units. While Reserve Command training is underrepresented in the model, Army officials are aware and account for this lack of data by estimating regular

training for individual Reserve units. Data in this database are reviewed periodically to reflect updates and access to the data is limited to authorized users only. Most data are entered at the major command level and the major command has authority to grant access to users. In addition, the data undergoes a multilevel review process when entered into the system. The major command is responsible for an initial review of new data entered into the system, which are then reviewed for accuracy by subject matter experts. The final validation of any edits made to the data is performed by the Reserve Command Training Directorate, which maintains the system. Any issues resulting can be addressed when the model requirements are reviewed by Reserve users, who can identify discrepancies and notify the model program office about them. We believe this should sufficiently minimize any potential issues in training requirements calculated by the model.

- **Army Master Range Plan** to compare calculated land or range shortfalls with programmed modernization projects and range or land acquisitions. This comparison allows users to see when new training ranges or land will be ready for use to meet training requirements. The plan is the Army's database of record for approved range modernization and training land acquisition projects, including when modernization projects will begin and end, how much they will cost, what type of funding will be used for them, and where they will be located. Data in this database are verified and validated by installations, which develop prioritized lists of their range modernization and training land projects. These lists are first validated at the major command level followed by validation at the Army Office of the Deputy Chief of Staff, Training Support Systems Division, which has ultimate oversight over the database.
- **Army Training Requirements and Resources System** to assist in projecting range and training land requirements for various Army schools. This system is the Army's central repository for all school-related training courses and includes detailed information on requirements, programs, costs, and personnel. The Assistant Secretary of the Army for Manpower and Reserve Affairs has oversight over the system, which can be accessed only by authorized users. The system is a transactional database and any edits to the data in the system are recorded and can be traced back to the user who changed the data. An Army official said that, because the system can be accessed by a large number of users and has vast quantities of data, Army schools and other users are relied on to ensure that their class schedules are correct and up to date. Another official explained that, because training projections are estimated based on course schedules, they may not be correct for many installations, as courses are added or canceled throughout the year, including after the range requirements

model calculates training land needs. They added that this can potentially cause model calculations to be inaccurate. However, the model's quality assurance procedures allow users to note changes made to course schedules, and account for any inaccuracies in the model's calculations. We believe this should sufficiently mitigate any issues associated with the range requirements model use of the data from this system.

Army Range Requirements Model Has Several Quality Assurance Safeguards

The Army Range Requirements Model has quality assurance safeguards to ensure that the requirements it produces are valid. These include limited access to the model, prohibiting users from permanently altering or deleting the data, and transparency. In addition, the process of updating the data used by the model also includes quality assurance procedures, including multilevel reviews of the data. For example, the range requirements model provides for authorized users at an individual installation to identify and verify the source data used by the model for their installation, which they routinely do. If the authorized users find errors or discrepancies they cannot update the data in the model themselves but rather provide the correct data to the range requirements model program manager which researches the issue and notifies the responsible data source manager of the correction. This installation quality check is in addition to the quality and reliability checks and procedures that exist within each of the data sources. We believe that any potential errors or discrepancies are sufficiently minimized before the data is used by the model to calculate its final training land requirements for an individual installation.

Model Quality Assurance Includes Limited Access, Inability to Permanently Alter Data, and Provides Transparency

The range requirements model can be used only by certain individuals who are granted access by the model's management office, such as installation range officers or training officers. These authorized users can review their installations' training requirements, which include detailed information on requirement calculations and associated data sources and provide a level of transparency to help ensure computation quality and accuracy. However, the users can not make any substantive changes to the model's data and calculations. This helps ensure that no data are accidentally deleted or permanently altered from the data sources. In those instances where authorized users may be concerned that the range requirements model does not take into account certain factors, such as environmental or cultural considerations, condition of facilities including ranges, and use of land by other services, instead of making edits directly to the model, they can extract data from the model and manipulate them to account for these factors. Any edits to the model's calculations are then forwarded to

the installation command and the model’s management office for validation. If validated, a record is kept of these changes at the installation level, though no modifications are made to the baseline data. This allows users to identify needed changes to their installation training requirement while not disrupting the overall system. In addition, this level of transparency is important, because the model’s management office relies on users to determine whether model requirements for their installations are adequate and correct.

Updates to Model Include Quality Assurance Procedures

In addition to the above quality assurance safeguards, updates to the model are part of a multistage process that provides an additional layer of quality assurance to data used by the model when generating training land requirements. Table 1 provides information on the steps used to update information in the model.

Table 1: Process for Updating Data in the Army Range Requirements Model

Step	Action taken
1. Upload new data	New data are manually uploaded from data sources into a temporary database.
2. Identify problems with updated data	An analysis is performed on the temporary database to identify data that do not fit model procedures and business rules. Subject matter experts then manually review the data to determine why it does not fit model procedures and business rules.
3. Compute new data in the model	Data are incorporated to a test version of the model and prospective training range requirements are computed.
4. Identify inconsistencies in new computations	Results of the test model are reviewed to check for inconsistencies. Subject matter experts determine whether they are valid or due to a flaw in the calculations.
5. Review computations	Results from the test model are circulated to select members of the model user community to ensure any inconsistencies not found in step 4 are identified.
6. Transfer updates	Data transferred from the test model to the actual model. During the transfer data are tested to ensure they are identical.

Source: DOD.

The entire update process is performed by the model’s management office and consists of several steps that can take from 2 to 10 weeks to complete depending on the complexity of the source data and the number of discrepancies found in such data. The first step involves collecting data from the seven data systems and manually uploading them into a temporary database. These data are uploaded manually because, as officials noted, most Army systems were developed at different times for a variety of purposes, so are not designed to communicate electronically. The second step of the update process identifies any problems with the newly uploaded data. This includes applying the model’s business rules to

the temporary database to see if the data can function in the model. Any data that appear to cause problems are then reviewed by subject matter experts in the model's management office to determine what is wrong with the data. In the third step, the data are uploaded to a test version of the model, which is used to calculate prospective training requirements. The fourth step involves reviewing the results of the test model for inconsistencies. For example, an installation for which training requirements for a particular type of range increase or decrease by more than 20 percent would be identified for further review. Subject matter experts would then review all the noted discrepancies to determine whether they are valid. The fifth step includes another layer of review of the test model results. After the subject matter experts are finished with their review, the test model results are then forwarded to select members of the model user community at the installation level. These users examine the test model results to determine whether any inconsistencies exist; these would have been inconsistencies not found in step four. The sixth and final step in the update process involves transferring the data in the test model to the actual model. During the transfer, the data are tested to make sure they are the same in both models. Once the data are uploaded to the actual model, they are used to determine official training requirements and are available to the entire user community.

The update process helps ensure that the data used to determine training land requirements are as accurate as possible. Although the model relies on the quality of the data provided by the source systems, the quality assurance procedures that are part of the update process can help mitigate any potential problems with the source data. For example, inaccuracies in any of the source systems, such as units or ranges incorrectly labeled, would likely be caught in the second step of the update process as the model's business rules would not be able to identify such units or ranges. Moreover, if errors cause large discrepancies in training requirements for certain installations, they would likely be noted and examined to determine what caused them. Further, users can review the test model calculations in step four, which allows them to determine whether requirements for their installations as well as for others appear to be inaccurate.