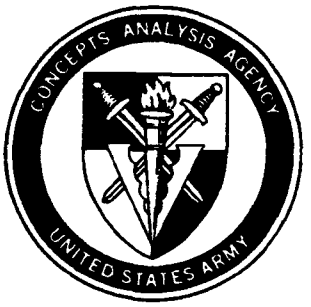
The US Army's Center for Strategy and Force Evaluation

STUDY REPORT
CAA-SR-94-4

RESERVE COMPONENT TRAINING INSTALLATION/FACILITY YEARLY REQUIREMENTS STUDY (RCTIFYRS)

APRIL 1994



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13. ABSTRACT (Maximum 200 words)
RCTIFYRS developed and demonstrated a methodology for identifying and selecting training locations for use by the Army National Guard and Army Reserve on the basis of economic, environmental, and readiness issues. The study considered all federally and state-owned installations and all Fiscal Year 95 Reserve Component (RC) units located in the continental United States. The approach called for identifying the training needs of the RC units and then cataloging the training resources available at each of the installations evaluated. Units were then allocated to the closest facility which met their training needs. The RCTIFYRS methodology provides a better tool for justifying the retention of training installations than it does for identifying facilities for closure. RCTIFYRS can be used to spotlight individual training sites and assess them in terms of the units they can support for annual and individual duty training and the alternative training facilities that these units would be forced to use should the site be closed. RCTIFYRS does not consider any mitigating factors (e.g., training resources unique to a given facility) which may argue against a site's closure, nor does it attempt to evaluate the "quality" of the training at one site as opposed to another.

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REPLY TO ATTENTION OF:

CSCA-RSV(5-5d)

14 OCT 1994

MEMORANDUM FOR DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS, ATTN: DAMO-ZB, WASHINGTON, DC 20310-0400

SUBJECT: Reserve Component Training Installation/Facility Yearly Requirements Study (RCTIFYRS)

1. Reference memorandum, Office of the Assistant Deputy Chief of Staff for Operations and Plans, 15 May 1992, subject: Reserve Component Training Installation/Facility Yearly Requirements Study (RCTIFYRS) -- Study Directive.

2. The reference memorandum requested that the U.S. Army Concepts Analysis Agency (CAA) conduct a study to provide the Assistant Deputy Chief of Staff for Operations and Plans with an analytical methodology and a set of tools for identifying and selecting training locations for the Army National Guard and Army Reserve based on environmental, economic and readiness requirements.

3. This final report documents the results of our efforts. The RCTIFYRS methodology provides the Army with an analytical framework for evaluating installations and facilities on the basis of their contributions to Reserve Component readiness. This is a vitally important capability, in light of the ever increasing reliance that the Army is placing on its Reserve Components, and should prove to be invaluable in preparing and supporting the Army's recommendations to the Defense Base Closure and Realignment Commission of 1995.

4. This Agency expresses appreciation to all commands and agencies which have contributed to this study. Questions and/or inquiries should be directed to the Chief, Value Added Analysis Division, U.S Army Concepts Analysis Agency, 8120 Woodmont Avenue, Bethesda, MD 20814-2797, DSN 295-1546.

E. B. VANDIVER III
Director

CAA	**RESERVE COMPONENT TRAINING INSTALLATION FACILITY YEARLY REQUIREMENTS STUDY (RCTIFYRS)**	**STUDY SUMMARY CAA-SR-94-4**

THE REASON FOR PERFORMING THE STUDY was to develop and demonstrate a methodology and means for identifying and selecting training locations for the Army National Guard and Army Reserve based on economic, environmental, and readiness issues.

THE STUDY SPONSOR was the Assistant Deputy Chief of Staff for Operations and Plans (DAMO-ZB), Headquarters, Department of the Army.

THE STUDY OBJECTIVES were to:

(1) Identify and catalog all of the training facilities considered by the study. This activity is to include the verification of current capabilities and any changes in the training facilities' availability due to probable future events (e.g., Base Closure and Realignment Commission actions, force structure changes, etc.).

(2) Provide an assessment of Reserve Component (RC) training requirements versus facility capabilities to determine the efficient allocation of resources.

(3) Identify any economic, environmental, or readiness constraints which affect the availability or desirability of the facilities identified in the study.

(4) Develop capabilities to display the results in a fashion that would be useful and understandable to multiservice, Congressional, and executive bodies.

THE SCOPE OF THE STUDY included all federally and state owned installations suitable for use as major training areas and all fiscal year (FY) 95 RC units located in the continental United States. Reserve Component units were to be evaluated with respect to both their 14-day annual training (AT) period and their inactive duty training (IDT) requirements.

THE MAIN ASSUMPTIONS of this study are:

(1) Land requirements, by type of unit and mission, for annual training will be in accordance with Training Circular (TC) 25-1, Training Land.

(2) Annual training will not be restricted to the May through August timeframe traditionally favored by the Reserve Component.

(3) Nonroutine training opportunities (i.e., National Training Center and Joint Readiness Training Center rotations and overseas exercises) will not be considered.

(4) The existence of mobilization stations, regional training sites (RTS) equipment concentration sites (ECS), or other facilities improvements will not, initially, be included in the decision criteria.

(5) Political considerations (i.e., any factors not directly related to unit readiness) will not be included in the decision criteria.

(6) Unit locations and branch designations will be taken from the Structure and Manpower Allocation System (SAMAS). Modifications to unit standard requirement codes (SRCs) and locations will not be considered.

(7) All distances (from unit locations to training areas) will be measured from the centers of their respective zip codes using a flat earth, straightline calculation.

THE BASIC APPROACH called for identifying the training needs of the RC units and then cataloging the training resources available at each of the installations evaluated. Units were then allocated to the closest facility which met their training needs. The allocation was done using a first fit-largest bin packing procedure.

THE PRINCIPAL FINDINGS of the study are:

(1) The RCTIFYRS methodology provides a better tool for justifying the retention of training installations than it does for identifying facilities for closure. RCTIFYRS can be used to spotlight individual training sites and assess them in terms of the units they can support for AT and IDT, the alternative training facilities that these units would be forced to use should the site be closed, and the impact. RCTIFYRS does not consider mitigating factors (e.g., training resources unique to a given facility) which may argue against a site's closure, nor does it attempt to evaluate the "quality" of the training at one site as opposed to another.

(2) RCTIFYRS is only as accurate and current as the data that it uses. A comparison of Appendix D and Appendix E will highlight the differences between the data that was used in the study and the "ground truth" developed by surveying each of the 85 AT facilities. Similarly, using the November 1993 (instead of the 1992) version of the SAMAS increases the number of RC units under consideration from 2,550 to 2,751.

(3) An analysis of AT needs showed that sufficient capacity exists to meet all of the training needs of the FY 95 RC force over a 14-week period. However, this constitutes the minimum possible time horizon and results in a large number of units traveling excessive distances to reach their designated AT sites. The "quality" of the solution (i.e., the number of units able to travel less than a day to reach their training site) increases as the number of 2-week AT time periods under consideration increases. Ten 2-week AT time periods was used as the base line for the AT evaluation portion of this study.

(4) An analysis of IDT needs showed that RC units have reasonable (i.e., within half of a day's travel) access to all facilities/ranges that they may require, except tank/Bradley Table VIII and demolition ranges.

(5) An analysis of active duty training requirements, based upon the standards contained in TC 25-1, indicated that Ft Bragg, Ft Carson, Ft Hood, and Ft Riley (among others) should be fully committed to tenant unit training requirements and should therefore be unable to support the reserves.

(6) The construction of multiple launch rocket system (MLRS) firing ranges (or the upgrade of existing artillery ranges) at Camp Grayling and Ft Bragg would result in significant travel savings for two of the RC's four MLRS battalions.

THE STUDY EFFORT was directed by LTC Rodger A. Pudwill, Value Added Analysis Division, US Army Concepts Analysis Agency (CAA).

COMMENTS AND QUESTIONS may be sent to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-RSV, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797.

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CHAPTER 1

EXECUTIVE SUMMARY

1-1. BACKGROUND. The Defense Base Closure and Realignment Commission (BCRC) of 1991 took exception with the Army's submission of installations to be closed and/or realigned. This exception was based upon the Army's perceived lack of justification for maintaining major training areas (MTA) in support of Reserve Component (RC) training. This led to the US Army Concepts Analysis Agency (CAA) undertaking this study under the sponsorship of the Assistant Deputy Chief of Staff for Operations and Plans (DCSOPS) (DAMO-ZB). A copy of the study directive is available in Appendix B.

1-2. PURPOSE. The purpose of this study was to develop and demonstrate a methodology and means for identifying and selecting training locations for the Army National Guard and Army Reserve based on economic, environmental, and readiness issues.

1-3. OBJECTIVES

a. To identify and catalog all of the facilities available for use in RC training. This activity includes the verification of current capabilities and any changes in the availability of training facilities due to probable future events (e.g., BCRC and Army Base Realignment and Closure (BRAC) actions, force structure changes, etc.).

b. To provide an assessment of Reserve Component training requirements versus facility capabilities for the purpose of determining the efficient allocation of resources.

c. To identify any economic, environmental, or readiness constraints which affect the availability or desirability of the facilities identified in the study.

d. To develop capabilities to display the results in a fashion that would be useful and understandable to multiservice, Congressional, and executive bodies.

1-4. SCOPE OF THE STUDY

a. The baseline for this study consisted of the fiscal year (FY) 95 Reserve Component (i.e., Army National Guard and Army Reserve), the President's FY 1993 Budget, and the BCRC 1991 decisions.

b. The analysis examined major training areas and Reserve Component units with respect to both the unit's 14-day annual training (AT) period and its inactive duty training (IDT) requirements. Unit training requirements were initially to be based at the platoon and company level, in keeping with Forces Command's (FORSCOM's) BOLD SHIFT training initiative.

c. The study addressed the training needs of all table of organization and equipment (TOE) Reserve Component units stationed in the continental United States (CONUS) as part of the FY 95 base force structure and their existing weapon systems (i.e., any training requirements unique to weapons that have not yet been fielded were not to be considered). The original scope of the study, as specified in the study directive, included RC units located in Alaska and Hawaii. These units did not compete for resources with CONUS based units, and were deleted from the scope, with the sponsor's concurrence, prior to the start of the study.

d. The analysis considered all federal and state owned installations that are suitable for use as major training areas. The incremental capacity available at selected Active Component (AC) installations was also addressed.

e. Direct costs, both monetary and other, were to be calculated, quantified, and included in the analysis.

f. Indirect costs, both monetary and other, were to be highlighted through a narrative description, at a minimum, and quantified where possible.

g. The study was to be conducted in three phases.

(1) Phase I addressed the AT requirements of combat units only.

(2) Phase II incorporated combat support (CS) and combat service support units (CSS).

(3) Phase III addressed IDT requirements.

1-5. ASSUMPTIONS AND LIMITATIONS

a. Land requirements, by type of unit and mission, for annual training were in accordance with Training Circular (TC) 25-1, Training Land.

b. Annual training was not restricted to the May through August timeframe traditionally favored by the Reserve Component.

c. Nonroutine training opportunities (i.e., National Training Center and Joint Readiness Training Center rotations and overseas exercises) were not considered.

d. The existence of mobilization stations, regional training sites (RTS), equipment concentration sites (ECS), or other facility improvements was not included in the decision criteria. However, the costs of movements or improvements associated with any of these were to be examined in the economic analysis portion of the study.

e. Political considerations (i.e., any factors not directly related to unit readiness) were not included in the decision criteria.

f. Unit locations and branch designations were taken from the Structure and Manpower Allocation System (SAMAS). The modification of unit standard requirement codes (SRCs) and locations was not considered.

g. All distances (from unit locations to training areas) were measured from the centers of their respective zip codes, using a flat earth, straightline calculation.

1-6. DATA SOURCES

a. The Structure and Manpower Allocation System, November 1992 update. This was the primary source of information on Reserve Component units .

b. The Program Optimization and Budget Evaluation (PROBE) data base.

c. The Army Reserve Component Training Data System (ARCTDS), version 8.0. This was used as the source of facility and unit location maps.

d. The Defense Installations, Ranges, and Training Areas (DIRT) Information System, June 1991 update. This was the primary source of data on installations and training resources. The executive agent for DIRT was the Training and Performance Data Center, which was dissolved in September 1992. Responsibility for DIRT was subsequently transferred to the Defense Manpower Data Center, in Monterey, CA, with the US Army Training Support Center (Ft Eustis, VA) picking up the Army portion of the data base.

e. National Guard Bureau Pamphlet (NGB Pam) 25-1, Training Site General Information Summary, dated 1 February 1988. This was a secondary source of data on installations and training resources and was used to resolve inconsistencies in DIRT.

f. TC 25-1, Training Land, dated 30 September 1991. This was used as the source of unit maneuver requirements.

g. TC 25-8, Training Ranges, dated 25 February 1992. This was used to identify unit range requirements.

h. Department of the Army (DA) Pam 350-38, Standards in Weapons Training, dated 1 September 1988.

i. The Army Report to the Defense Base Realignment and Closure Commission, dated 1 April 1991.

1-7. APPROACH/METHODOLOGY. Figure 1-1 provides a visual representation of the problem (i.e., to allocate each of the 2,550 RC units on the left, to one of the training sites on the right). Figure 1-2 shows the approach taken to solve this problem.

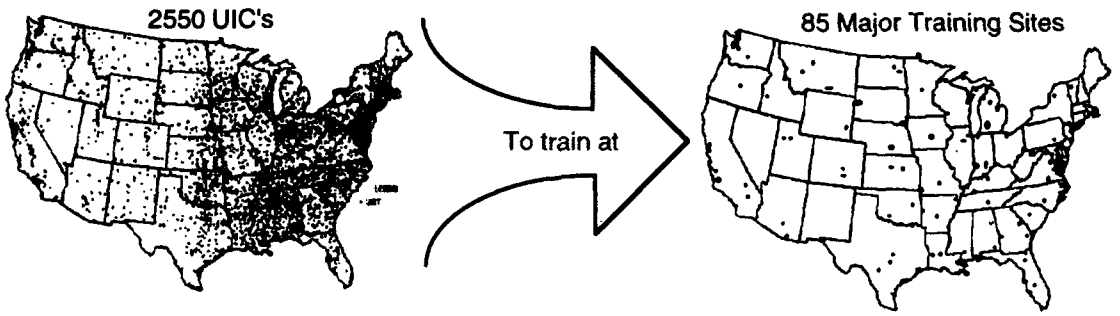

Figure 1-1. RCTIFYRS Allocation Problem

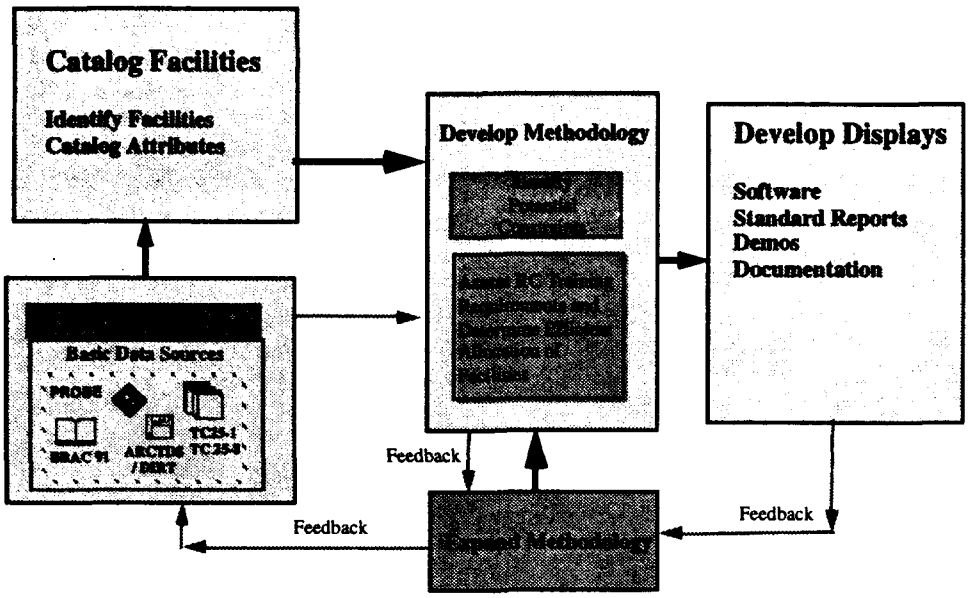

Figure 1-2. Approach

a. Data Collection Plan. The first step called for collecting data on installations (using the DIRT data base) and units (using SAMAS and TCs 25-1 and 25-8).

b. Catalog Facilities. The data collected was used to identify the training resource needs of the RC units. Once this was accomplished, the results were correlated with the installation data to produce a catalog of the training resources available at each of the facilities.

c. Develop Methodology. A methodology was then developed to allocate each of the units to a facility which met its training needs. The allocation was done using a first fit-largest bin packing procedure. A desirable side effect of this procedure is that combat units tend to be allocated to training sites before combat support units, which, in turn, tend to be allocated before combat service support units. The methodology proceeded as follows:

(1) Units were sorted on the basis of the number of training sites which could accommodate them, with units having the fewest number of training options at the top of the list.

(2) Starting at the top of the list developed above, each unit was assigned to the closest training site capable of meeting all of its training requirements. If that site was fully occupied, the unit was reallocated to the site at a later 2-week AT time period. If all of the available AT time periods at the nearest site were filled, the unit was allocated to the next closest site capable of meeting all of its training needs.

(3) As each unit was allocated to an AT location, it was removed from the list of units to be allocated, and the list of available training resources was decremented to reflect that unit's allocation.

(4) The procedures in (2) and (3) above were repeated until either all of the units were allocated to a training location for AT or all of the available training resources were depleted.

d. Expand Methodology. The methodology was expanded to determine whether or not the solution could be improved through the relaxation of some of the limitations and assumptions inherent in the study (sensitivity analysis).

1-8. ESSENTIAL ELEMENTS OF ANALYSIS (EEA). The essential elements of analysis and basic findings for each are as follows:

a. What are the training facility installations available for use in RC training and what are their capabilities and capacities? A complete list of the 85 installations used in the AT portion of this analysis, and the key training resources they contain, is available in Appendix D. Appendix E contains an update of the information contained in Appendix D. This update reflects the results of a data call completed after the conclusion of the study. The data call was initiated by the study sponsor for the purpose of eliminating the inaccuracies found in the DIRT data base, and validating the data so that the RCTIFYRS methodology can be used in support of future Army decisions involving RC training locations. Appendix F contains a list of the 271 installations used in the IDT portion of this analysis and the firing ranges they contain.

b. What are the RC training requirements for facilities and installations, and are there sufficient locations available to meet the need? The annual training needs of the Reserve Components, as specified in TC 25-1, can be met with existing resources over a timeframe of 14 weeks (i.e., seven 2-week AT time periods). However, seven AT periods represents the minimum amount of time needed to train these units and results in a large number of units traveling excessive distances to reach their designated AT site. Training sites can only accommodate a finite number of units during any given 2-week AT period. When a site runs out of room, a unit must either be sent to another site or rescheduled to the original site but at a later time period. Total training capacity, therefore, varies as a function of time with excess capacity becoming available as the number of 2-week periods considered increases beyond seven.

c. What are the constraints affecting the availability and desirability of RC training locations? The major factor governing the selection of installations for inclusion in the AT portion of the study was the amount of maneuver land they contained. The presence of firing ranges was found to be a secondary consideration. Maneuver land requirements were developed from the guidance provided in TC 25-1. Any sort of waiver to these requirements (e.g., a 20 percent reduction in the amount of maneuver space a unit needed or the adoption of an alternative training strategy) yielded a marked increase in the number of potential training sites available to the unit. This increase was most notable among the combat units, which have greater maneuver needs than combat support or combat service support units. The primary criterion governing the selection of potential IDT sites was the presence of firing ranges.

d. What is the appropriate methodology for determining RC training installation facility allocation? The preferred methodology involves formulating the problem as an integer program and then solving it to optimality. However, the use of an optimal procedure is impractical since the number of integer variables involved would exceed 2,000,000 while existing algorithms for solving integer programs are limited to approximately 2,000 integer variables. Any attempt to solve the integer formulation, with the equipment and algorithms currently available, would lead to processing times measurable in terms of months or years. The problem was therefore solved using approximation techniques. The actual methodology chosen employed a first fit-largest bin packing procedure (see paragraph 1-7c), which is guaranteed to yield an optimal or near optimal solution.

1-9. OTHER KEY FINDINGS

a. The RCTIFYRS methodology is better suited to justifying the retention of training installations than it is for identifying facilities for closure. RCTIFYRS can be used to spotlight individual training sites and assess them in terms of the units they can support for AT and IDT, the alternative training facilities that these units would be forced to use should the site be closed, and the impact. RCTIFYRS does not address any mitigating factors (e.g., training resources unique to a given facility) which may argue against its closure.

b. The RCTIFYRS process is only as accurate and current as the data that it uses. A comparison of Appendix D and Appendix E will highlight the differences between the data that was used in the study and the "ground truth" developed by surveying the 85 AT facilities at the conclusion of the study. Similarly, using the November 1993 (instead of the 1992) version of the SAMAS would increase the number of RC units under consideration from 2,550 to 2,751, yielding a different unit allocation scheme.

c. The incorporation of environmental data into the demonstration of the methodology was found to be impractical because of the incompleteness and unsuitability of the data in DIRT. The methodology was developed to take environmental restrictions into account; however, the actual consideration of such restrictions by the model awaits the gathering of the data needed to identify the exact nature of the restrictions themselves, and the magnitude of their impact.

d. The economic issues associated with the sending of a unit to one training site versus another were found to be dominated by the readiness issue of maximizing the training opportunities available to the unit commander (e.g., the costs associated with sending a unit an additional 300 miles, to a different location, is approximately $200.00; however, the training opportunity cost associated with this move is 2 lost days of training--1 additional day of travel going to the new AT site and 1 day returning from it).

e. An analysis of active duty training requirements, based upon TC 25-1, indicated that if Active Component units were to be given priority (over the RC) for access to local training resources, then Ft Bragg, Ft Carson, Ft Hood, and Ft Riley (among others) would be fully committed to tenant unit training and unable to support the Reserve Components.

f. An analysis of individual duty training needs showed that RC units have reasonable (i.e., within half of a day's travel) access to all facilities/ranges that they may require, except tank/Bradley Table VIII and demolition ranges.

g. The construction of multiple launch rocket system (MLRS) firing ranges (or the upgrade of existing artillery ranges) at Camp Grayling and Ft Bragg would result in significant travel savings for two of the RC's four MLRS battalions.

CHAPTER 2

RESERVE COMPONENT UNITS

2-1. GENERAL. This chapter discusses the derivation of the Reserve Component unit list used for this study and the identification of unit training requirements.

2-2. DERIVATION OF THE RCTIFYRS UNIT LIST. The RCTIFYRS FY 95 Reserve Component force list was derived from the November 1992 update of the Structure and Manpower Allocation System force file. This file provided a list of all of the units expected to be in the force in FY 95, along with their unit identification code (UIC), SRC, authorized strength, and location by city and state. The SAMAS file contained 9,440 actual and proposed units ranging in size from battalions, with close to 1,000 soldiers in them, to 2-man teams. This list was pared down to the 2,550 units used for this study through the following series of steps.

a. First, all active duty units were removed from the file. This reduced the list to 4,814.

b. Next, all table of distribution and allowances (TDA) units and units without an SRC were removed from the file. This step cut the list to 3,760 units.

c. After this, all units located outside the continental United States were deleted. This further reduced the list to 3,558 units. The reduction was relatively small because most of the overseas units are in the active duty force and had already been deleted in the first step.

d. Finally, the list was sorted by unit size (see Figure 2-1) and reviewed manually. A large number of teams and detachments (e.g., equipment repair teams, terrain detachments, surgical teams, military judge and court-martial defense teams, strategic intelligence detachments, interrogation/prisoner of war teams, movement control detachments, etc.), containing fewer than 10 people, were observed. It was noted that some of these units had no field training requirements and that the rest would probably not go to annual training alone, but rather as part of a larger unit or exercise. They were, therefore, all deleted. This yielded the final list of 2,550 RC units used in the study.

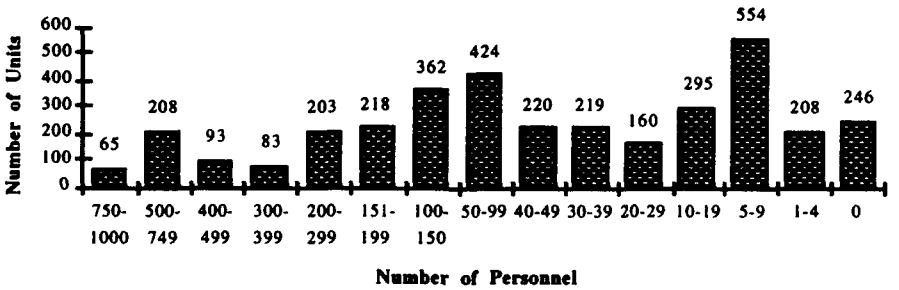

Figure 2-1. Reserve Component Units According to Strength

e. These procedures were repeated at the conclusion of the study, using the November 1993 update to the SAMAS. This resulted in an increase of 201 units (from 2,550 to 2,751) in the FY 95 RC force.

2-3. CADRE UNITS. The Army's proposed cadre divisions (34th and 40th Mechanized Infantry) accounted for 82 of the 2,550 RCTIFYRS units. These units were portrayed as full strength units in the RCTIFYRS unit list and were allocated training resources on the same basis as noncadre units. This is consistent with the way in which they were represented in the SAMAS, by their SRCs. It is important to note that should all, or some, of these cadre elements not train as the full strength units that they appear to be, then the training requirements generated by this study may be overstated.

2-4. UNIT LOCATIONS. Figure 2-2 offers a view of how the 2,550 units are distributed throughout the country. This figure was generated using the FY 92 unit list, residing in ARCTDS, and is intended to provide the reader with an illustrative, rather than a precise, portrayal of actual unit locations. Each point on the map corresponds with the location of either an individual unit or subunit (i.e., an infantry battalion could be represented by as many as five points on the map, if each of its subordinate companies were to be located in separate cities or towns) or the location of multiple units collocated in the same city (i.e., a major metropolitan area containing three separate battalions would be represented by only a single point on the map).

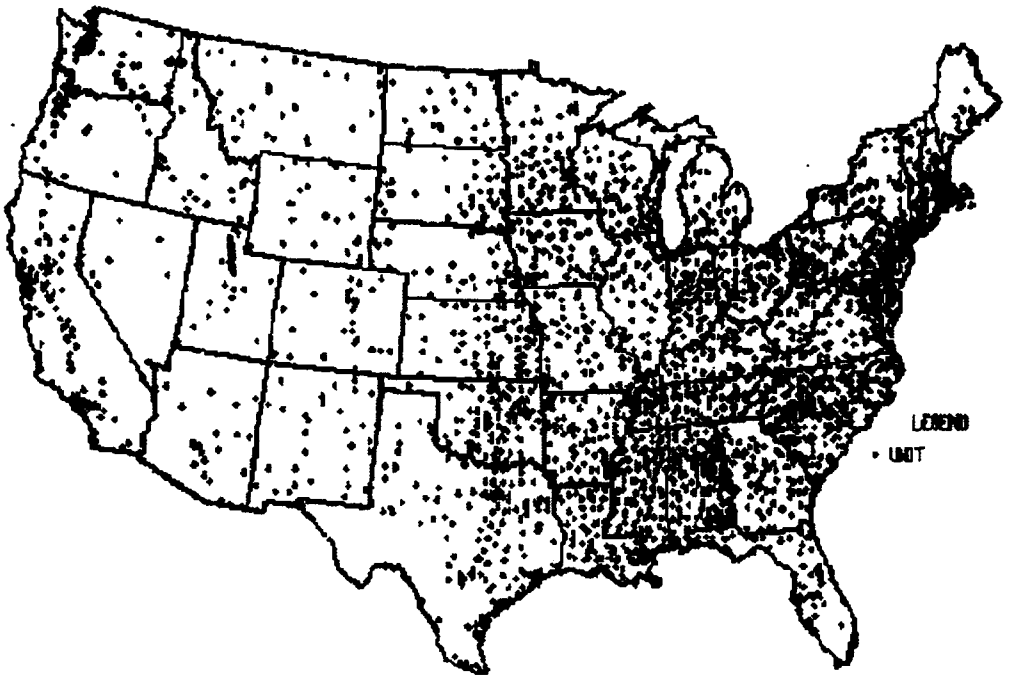

Figure 2-2. Reserve Component Units

2-5. SUMMARY OF RC UNITS BY BRANCH. The following is an alphabetical summary, by branch, of the Reserve Component units included in this study. Branch determinations were made by using the first two digits of each unit's SRC. Each branch/category shown below can therefore contain a mix of battalion, company, and detachment/team sized units.

a. Air Defense (AD): 24 units - gun/STINGER, CHAPARRAL and Hawk battalions; and one PATRIOT battalion.

b. Adjutant General (AG): 200 units - bands, replacement and postal companies; and personnel detachments.

c. Armor (AR): 114 units (includes SRC series 17, Armor; and SRC series 87, Heavy Divisions) - tank battalions, cavalry squadrons, and mechanized division/brigade headquarters and headquarters companies (HHC).

d. Aviation (AV): 117 units - attack and assault helicopter battalions, and air traffic control and aviation maintenance companies.

e. Chemical (CM): 64 units - divisional chemical, decontamination, and smoke generation companies.

f. Corps of Engineers (EN): 227 units (includes Engineer Restructuring Initiative units) - divisional and corps combat engineer battalions; assault, panel and girder bridging companies; pipeline and construction companies; and utilities detachments.

g. Field Artillery (FA): 105 units - MLRS, 8-inch, 155mm and 105mm battalions; and target acquisition and headquarters and headquarters batteries (HHB).

h. Finance Corps (FI): 82 units - finance detachments.

i. Infantry (IN): 63 units (includes SRC series 07, Infantry; and SRC series 77, Separate Light Infantry) - mechanized and light infantry battalions and long-range surveillance companies.

j. Judge Advocate (JA): 24 units - legal support detachments.

k. Medical (MD): 196 units - combat support, field and general hospitals; air and ground ambulance companies; and dental companies.

l. Military Intelligence (MI): 55 units - combat electronic warfare intelligence (CEWI) and linguist battalions.

m. Military Police (MP): 128 units - combat support and guard companies.

n. Ordnance (OD): 529 units (includes SRC series 09, Ordnance; SRC series 43, Maintenance; and SRC series 63, Support Command) - main and forward support battalions; ammunition companies; general support (GS) and direct support (DS) maintenance companies; and explosive ordnance disposal (EOD) detachments.

o. Quartermaster (QM): 203 units (includes SRC series 10, Quartermaster; SRC series 29, Composite Units and Activities; SRC series 42, Supply; and SRC series 54, Logistics Organizations and Operations) - service, supply, and petroleum companies; and water purification and distribution teams.

p. Signal Corps (SC): 61 units - mobile subscriber equipment (MSE) battalions; cable and wire companies; and data processing detachments.

q. Special Forces (SF): 19 units - Special Forces battalions and support companies.

r. Transportation (TC): 189 units - truck, boat and cargo transfer companies.

s. Other: 150 units (includes SRC series 33, Psychological Operations; SRC series 41, Civil Affairs; SRC series 45, Public Information; and SRC series 51 and 52, Rear Area Operations) - tactical support companies and public affairs and rear area operations detachments.

t. Total Number of Reserve Component Units Included in the RCTIFYRS Methodology: 2,550

2-6. SUMMARY OF RC UNITS BY SIZE. Table 2-1 provides a summary of the 2,550 RC units based upon each unit's size (i.e., battalion, company, or detachment/team). Size was determined by scanning the unit description (UNTDS) data elements contained in the SAMAS. The numbers of soldiers, indicated at the top of each column, are purely notional and should not be taken as a literal representation of authorized troop strengths. Branch designations correspond to those used in paragraph 2-5, with two exceptions: the Infantry and Special Forces branches were combined into a single entry, and the Finance Corps and Judge Advocate branches were incorporated into the "Other Branches" category. Unit size provides a useful measure of "goodness" in assessing the impact of modifications to the RCTIFYRS data and methodology.

Table 2-1. Summary of RC Units by Size

Branch	Battalions (250+ soldiers)	Companies (75-250)	Detachments (10-75 soldiers)	TOTAL
AD	21	3	0	24
AG	0	50	150	200
AR	54	44	16	114
AV	36	75	6	117
CM	0	47	17	64
EN	76	97	54	227
FA	67	37	1	105
IN	64	17	1	82
MD	66	75	55	196
MI	22	23	10	55
MP	0	77	51	128
OD	41	150	338	529
QM	0	122	81	203
SC	25	23	13	61
TC	0	138	51	189
Other	28	48	180	256
TOTAL	500	1026	1024	2550

2-7. GENERIC UNIT CATEGORY CODES. To this point, RC units have been characterized by branch, size, and location. This paragraph discusses the development and use of generic unit category codes. Generic unit categories were developed as a means of grouping units, based upon their training requirements, and assigning them to installations.

a. Rationale for Generic Category Codes. The 2,550 units considered in RCTIFYRS contain 387 different SRCs. Each of these SRCs identifies a unique set of equipment which is provided to the unit so that it can accomplish its assigned missions. However, since a unit's training requirements are mission-driven, units having different SRCs, but with similar missions, may have common training resource needs. For example, the two units identified by UICs WTQXAA and WYDJAA have SRCs 01385L100 and 01385L200, respectively. Both of these units are attack helicopter battalions and therefore require access to aerial gunnery ranges and maneuver space for their annual training. An examination of the SRCs associated with these two units shows that the primary difference between them is that unit WTQXAA is resourced with AH-1S helicopters, while unit WYDJAA is resourced with the newer AH-64. Therefore, while unit WYDJAA would be expected to be more capable and effective, from the viewpoint of"mission accomplishment," when training requirements are considered, the two units are virtually indistinguishable (as long as the aerial gunnery ranges are day/night capable and approved for both 20mm and 30mm ammunition). This reasoning was used to group the training resource needs of the 2,550 units evaluated in this study into 71 generic categories.

b. Description of Generic Category Codes. A generic category code is four characters long and consists of a two-letter mnemonic followed by a two-digit number. Associated with each code is a maneuver space requirement, in square kilometers (km^2), and a listing of every type of firing range that the unit requires for the conduct of its annual training. Any number, and type, of units can be combined under a single generic unit category code. Most of the codes, however, identify only a single "type" (i.e., with a common branch and mission) of unit. Generic category codes containing multiple types of units tend to be aggregations of units with little or no training resource needs (e.g., replacement companies, postal companies, and finance detachments all share a common generic category code). A complete list of generic categories, and their associated SRCs, is available in Appendix C.

c. Maneuver Area Requirements for Generic Category Codes. Unit maneuver area requirements were derived from TC 25-1. This document identifies mission-specific land requirements by Army Training and Evaluation Program (ARTEP) task. The RCTIFYRS study directive required that unit training requirements, developed for use in this study, be in keeping with the Army's BOLD SHIFT initiative. This initiative calls for maneuver requirements to be generated based upon the concept of units training primarily by platoon and company lanes. Unfortunately, no doctrine currently exists to detail how a Reserve Component battalion should implement this concept in the actual conduct of its annual training.

(1) The National Guard typically sends units to AT in brigade slices. This, however, is inconsistent with BOLD SHIFT's emphasis on platoon and company-level lane training. An AT package made up of individual battalions (and separate companies where appropriate) was chosen as the best compromise between the National Guard's desire to develop unit cohesion by training large units and the ability of the existing installations to support large-scale maneuver. This battalion-sized AT package tracks well with the available maneuver land at the various training sites. If a brigade slice of maneuver land is developed (e.g., two infantry battalions; one armor battalion; one artillery battalion; one engineer battalion, one forward support battalion; plus specialty companies and platoons such as scout, signal, intelligence, and air defense), it can quickly exceed the maneuver land available at all but one or two locations in CONUS (even if the requirement is developed by platoon and company lanes per BOLD SHIFT). The decision to allocate units to AT on a battalion/separate company basis was validated by the study sponsor at the Phase I in-process review (IPR) in January 1993.

(2) Refer to Figure 2-3, which is broken into two major sections. On the left is an extract from TC 25-1 providing the missions and the associated maneuver area required to train that mission for a mechanized infantry/armor battalion task force, a mechanized infantry company, and

a mechanized infantry rifle platoon. This provides the base data from which the maneuver area requirement for a nominal mechanized infantry battalion AT must be derived.

TC 25-1

Mech Inf/Ar Bn TF	
• Movement to Contact	248 km^2
• Offensive Operations	68 km^2
• Defensive Operations	138 km^2
• Retrograde	138 km^2
Mech IN Co	
• Movement to Contact	84 km^2
• Attack	50 km^2
• Raid	50 km^2
• Ambush	50 km^2
• Defend	24 km^2
• Retrograde	102 km^2
• Recon & Security	78 km^2
Mech In Rifle Plt	
• Movement to Contact	24 km^2
• Attack	18 km^2
• Raid	18 km^2
• Ambush	30 km^2
• Defend	30 km^2
• Retrograde	50 km^2
• Recon & Security	21 km^2

Training Strategy

Bn Lanes	
Max Area =	248 km^2
Avg Area =	148 km^2
Co Lanes - 4 Co/Bn	
1 Maneuver Lane (max) =	102 km^2
2 Maneuver Lanes (max + min) =	126 km^2
3 Maneuver Lanes (max + min + 2nd max) =	210 km^2
4 Maneuver Lanes =	260 km^2
Plt Lanes - 3 Plt/Co, 4 Co/Bn = 12 Plts	
3 Plt Lanes (max) =	150 km^2
6 Plt Lanes (3max + 3min) =	167 km^2
9 Plt Lanes (avg) =	246 km^2
1 Co Lane (max) + 5 Plt Lanes (3max + 2min) = 248 km^2	

Figure 2-3. Extract of TC 25-1

(a) The right-hand side of this figure provides alternative strategies which could be used to develop the maneuver land for a nominal mechanized infantry battalion. At the top, the area required for the most terrain-intensive battalion mission is listed, along with the average area required for training the battalion missions. Next, in the middle portion of the display, typical methods for implementing company lanes are listed. For a single company lane, the most terrain-intensive company mission was selected, as this would allow any of the seven company missions to be run on the same terrain. This provides a value of 102 km^2 as the required value. If two company lanes are to be run simultaneously, taking both the area required for the most terrain-intensive mission and the least terrain-intensive mission, provides a value of 126 km^2. Note that this value is equivalent to two lanes, each the size of the average company mission (63 km^2) and is also close to both the size of the average battalion mission (148 km^2) and a typical battalion mission (defense - 138 km^2). Continuing down the chart, the values for three and four individual company lanes are developed equivalently by selecting maneuver areas from the list of mechanized infantry company missions. The reader should note that these values are close to the maneuver requirement identified for the most terrain-intensive battalion mission.

(b) The bottom third of the chart develops the requirements for the conduct of platoon lanes in the same manner as described above. Finally, the last line of this section provides a maneuver area requirement for a combined exercise where both platoon and company lanes are

being performed simultaneously. As mentioned previously, the values generated approximate the values listed for the most terrain-intensive and typical battalion missions. Based on this repeated approximation of the maneuver areas required for the most terrain-intensive and typical battalion missions, these combined values were selected as the criteria for a generic unit to perform platoon and company lanes in accordance with BOLD SHIFT.

(3) Due to the lack of an established doctrine, it was decided that the maneuver requirement would be parameterized among four separate training strategies, the two developed above, the additional values obtained by taking a percentage of the maneuver requirement associated with the most terrain-intensive battalion mission, and the maneuver requirement needed for a hypothetical battalion AT. This hypothetical AT of a mechanized infantry battalion was conducted as follows: two of the four companies would be conducting range firing while the remaining two companies would execute maneuver tasks. Of the two companies executing maneuver, one company would train in a typically sized company lane (50 km^2) while the second company would execute platoon lanes, each of its three rifle platoons in a typically sized platoon lane (30 km^2 each), for a total battalion AT maneuver requirement of 140 km^2. These four strategies were developed for each of the 71 generic categories and used to determine the sensitivity of the methodology to the AT maneuver area requirements.

(4) The reader should be aware that the actual selection of maneuver boxes on a particular piece of terrain is dependent on the actual contours and vegetation contained in the area, and therefore the area actually required to train a specific mission is expected to be different for each installation. Gathering data on the individual maneuver boxes at all of the 85 installations is beyond the scope of this study, and the allocation of terrain in the gross manners described above is expected to have sufficient slack to allow selection of suitable terrain with the required spacing between adjacent maneuver lanes without overallocating the maneuver resource available. Wherever multiple maneuver land requirements were available, the most strenuous one was selected. In the case (most often with combat support and combat service support units) where no requirement was identified, one was inferred from the unit most closely resembling it.

d. Range Requirements for Generic Category Codes. Range requirements were based upon TC 25-8 and limited to major firing ranges (all units required small arms ranges for their individual weapons; including them in each of the generic categories would therefore have been redundant). In addition, current Army policy on Reserve Component training states that individual weapons qualification is an IDT task and not an AT event. As the primary use of the generic category codes is in the AT allocation methodology, attaching the additional data elements, required for the identification of individual weapons, to the generic categories would needlessly clutter the algorithm with unessential information.

e. Sample Generic Category Codes. Table 2-2 shows the generic categories developed to account for the training needs of infantry units (SRCs 07 and 77). The first column contains the generic category code itself. The next column identifies the maneuver space (in sq km) required by the units associated with the generic category. A "Y" in any of the subsequent columns indicates that the firing range is required by the units categorized under that particular code. The default range entry is a blank, which indicates that the unit, or units, described by the generic category do not require the use of a particular type of firing range for their annual training.

Table 2-2. Generic Categories for Infantry Units

		Ranges						
	Maneuver area	TNK	BFV	ARTY	MLRS	MORT	HELO	ADA
IN10	248		Y			Y		
IN11	248					Y		
IN12	400					Y		
IN20	99							
IN21	70							

Category code IN10 accounts for mechanized battalions equipped with the Bradley fighting vehicle (BFV) while IN11 is used for M113 battalions and IN12 for light battalions. Light infantry brigade and division HHCs are represented by category IN20 (mechanized brigade HHCs are grouped under AR20) and long-range surveillance companies by IN21.

CHAPTER 3

TRAINING FACILITIES

3-1. GENERAL. This chapter discusses the derivation of the various installation lists used for this study.

3-2. POTENTIAL TRAINING AREAS. This analysis considered all federal and state-owned facilities in the continental United States for use as Reserve Component training areas. The principal source of facility data was the Defense Installations, Ranges, and Training Areas Information System, which was last updated on 6 June 1991. DIRT provided a comprehensive listing of facilities, facility ownership, and facility locations. A map of the 6,184 federal and state-owned facilities, which formed the starting point for this analysis, is shown in Figure 3-1. These facilities can be categorized in terms of ownership as shown in Table 3-1.

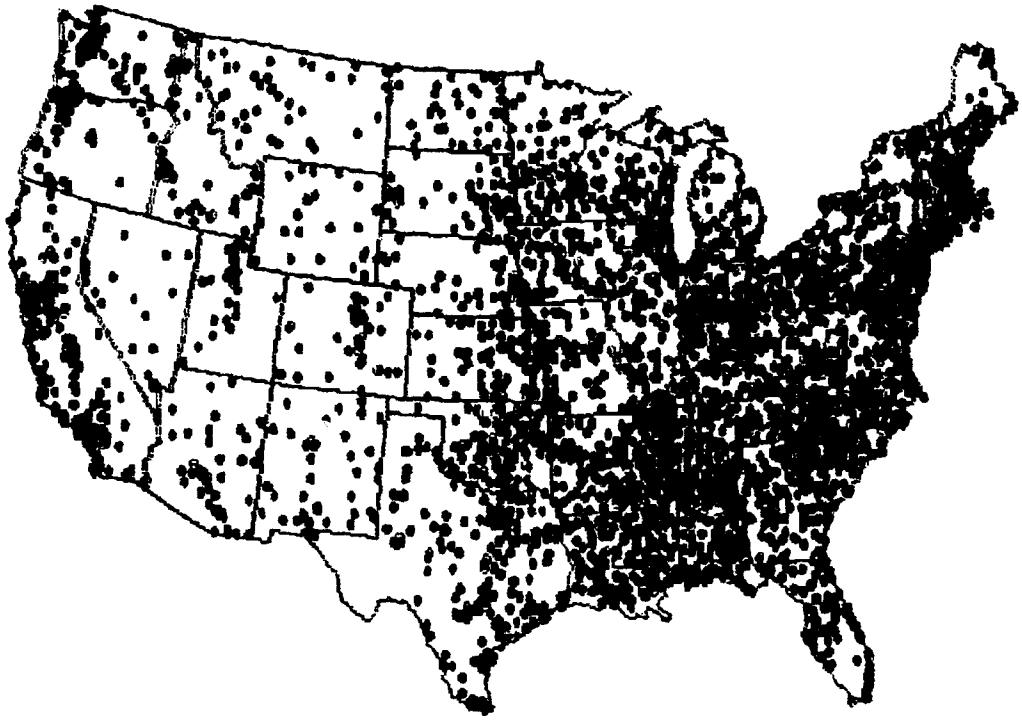

Figure 3-1. Federal and State Facilities

Table 3-1. Facility Ownership

Owner	Quantity
Army National Guard	3,075
Army Reserve	1,168
Navy/Naval Reserve	562
Air Force/Air Guard	509
State/Federal/Other	489
Active Army	243
USMC/Marine Reserve	91
Coast Guard	47

3-3. DERIVATION OF THE RCTIFYRS INSTALLATION LISTS. RCTIFYRS was charged to consider both AT and IDT support to the Reserve Components. These areas were considered separately, and multiple lists of installations were therefore required. Installations and facilities can be looked at in terms of four broad categories: those that can support AT, those that can support IDT, those that can support both, and those that can support neither. The initial list of facilities included armories, depots, family housing areas, federal buildings, radio relay sites, state parks, Veterans' Administration hospitals, and other sites deemed not to be suitable for Reserve Component training. Two criteria were used in the identification of installations for inclusion in this study: the availability of maneuver land and the availability of training ranges.

a. RCTIFYRS AT Installation List. The principal criterion used in the selection of installations for inclusion in the AT site list was the availability of maneuver land. A review of RC unit training requirements revealed that all RC units required some degree of maneuver land (even if it was little more than enough space to set up a command post) but that only a small percentage of them (344 of the 2,550) had requirements for anything other than small arms ranges. The presence of firing ranges was therefore considered to be secondary to a unit's need to maneuver during AT. The list of installations used in the AT portion of the analysis was developed through the following series of steps:

(1) First, all facilities without any maneuver land were deleted. This reduced the number of sites under consideration from 6,184 to 1,217.

(2) Next, all sites that did not contain at least 4 sq km (1,000 acres) of maneuver space were deleted. The choice of 4 sq km was based upon a desire to provide the methodology with a "reasonable" base of potential training areas from which to operate. This step reduced the list to 80 installations.

(3) At this point, the list was reviewed manually. Questionable entries (e.g., Rocky Mountain Arsenal, Tooele Army Depot, etc.) were deleted, and obvious omissions (e.g., Ft Hood, Camp Ripley, Ft McCoy, etc.) were investigated and, if warranted, added in. Additions were

based upon the data contained in NGB Pam 25-1, Training Site General Information Summary, dated 1 February 1988. At the conclusion of this step, the RCTIFYRS AT site list contained 85 potential training sites. The location of these sites is shown on the map in Figure 3-2.

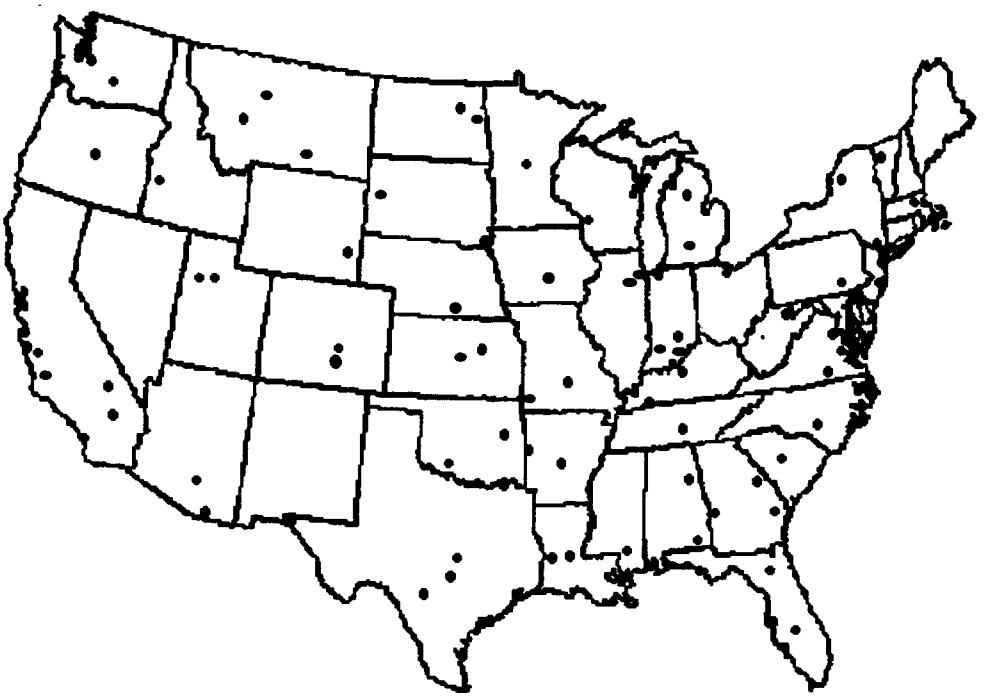

Figure 3-2. Training Facilities Considered in the AT Analysis

(4) The final step consisted of searching the DIRT data base and determining which, if any, of the major firing ranges, required by TC 25-8, each installation contained. A complete list, showing each of the installations and the resources it contains, is available in Appendix D. Table 3-2 displays the ownership of the 85 AT facilities. Ten of these sites are not under Army control/ownership.

Table 3-2. Ownership of AT Facilities

Owner	Quantity
Army National Guard	42
Active Army	32
USMC	4
Air Force	4
Air Guard	1
Navy	1
Army Reserve	1

(5) At the conclusion of the study, a data call was initiated at the sponsor's behest. During the conduct of the study, a significant number of differences was found to exist between the installation resource data contained in DIRT and what was reported by people "on the ground." Corrections were incorporated into the RCTIFYRS data as the errors were found. However, it was felt that the number and the severity of the errors identified was such that, if the methodology were to be useful in supporting the decisionmaking process at the Department of the Army level, the data would have to be validated. Each of the 85 installations was contacted directly and requested to verify/update the data that was being used. Appendix E contains the results.

b. RCTIFYRS IDT Installation Lists. The principal criterion used in the selection of facilities for inclusion in the IDT site list was the availability of training ranges. It was expected that IDT training would be conducted primarily on a small unit basis with each IDT period tending to concentrate on a specific training task or a series of highly related tasks. The emphasis of the IDT analysis was therefore placed on a unit's access to training resources rather than to the competition for resources considered in the AT analysis. The intent of this analysis was to evaluate a unit's proximity to each of the firing and maneuver resources it needs to fully train. Any of the training resources requiring multiple travel days to reach were considered to be impractical for the unit to use as an IDT site. A separate list of potential IDT sites was generated for each major category of firing/training range that a unit may require. A consolidated list of all of the IDT installations, shown in Figures 3-3 through 3-9, is available in Appendix F.

(1) Small Arms Ranges. Figure 3-3 shows the location of the 252 facilities identified in the DIRT data base as possessing M-16/small arms qualification ranges. DIRT actually lists 333 small arms ranges. These run the gamut from indoor firing ranges, located in the basement of armories, to outdoor ranges situated at major training areas. However, only those sites containing ranges where weapons can be fired for qualification, rather than just familiarization, were selected for inclusion in the study.

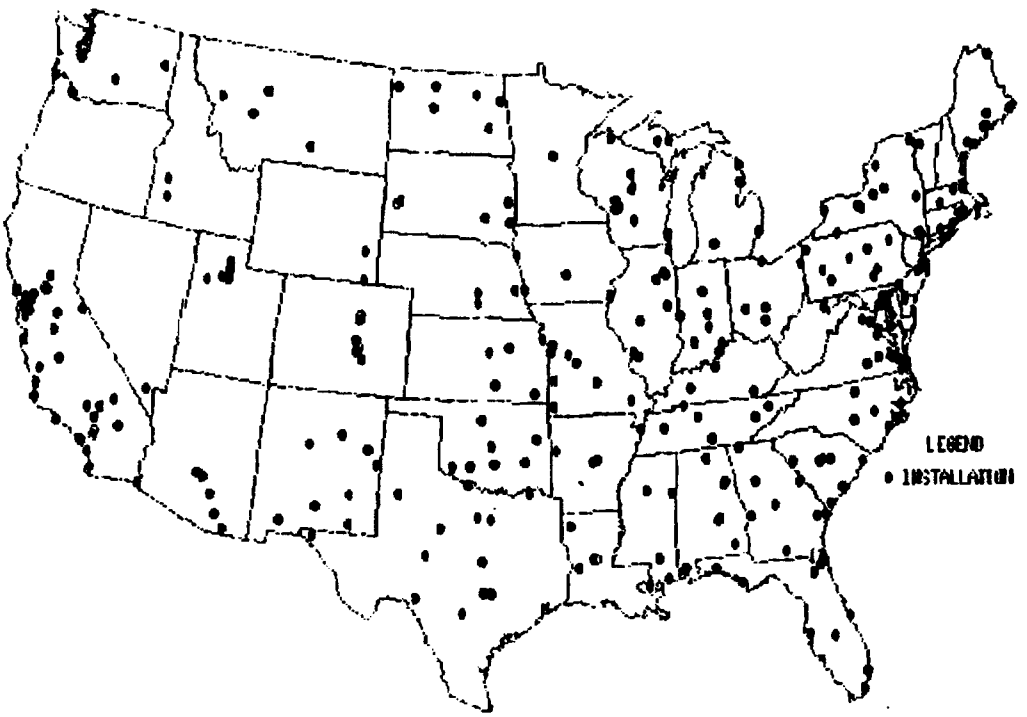

Figure 3-3. Small Arms Ranges

(2) Artillery Ranges/Impact Areas. Figure 3-4 shows the 71 installations which are identified in the DIRT data base as containing ranges and/or artillery impact areas. The data base draws a distinction between an artillery range and an artillery impact area. DIRT shows some facilities as having one but not the other (e.g., Ft Bliss has an artillery range but no impact area, while Ft Ord has an impact area but no ranges). Artillery ranges are listed in terms of the types of weapons and munitions that they can support, while impact areas are not. The 48 AT installations, identified as capable of supporting artillery training, were chosen on the basis of the types of artillery munitions they supported (to preclude the chance of allocating an 8-inch artillery unit to an installation that can only accommodate 105mm howitzers) while the 71 IDT sites in Figure 3-4 were selected on the basis of having either a firing range or an impact area on site. The identification of installations having the capability to support artillery firing will become more difficult as the advanced artillery location systems are fielded. For example, the DIRT data base required that installations with artillery ranges report the number of firing points they contain. However, artillery units equipped with the position and azimuth determining system (PADS) no longer train from specified firing points. Modifications to the way that the Army does business may be one of the causes of the confusion and errors in DIRT. The difficulty appears to occur when a strict interpretation of the question is made at the installation, and no reconciliation of the data is done prior to entering it into the system.

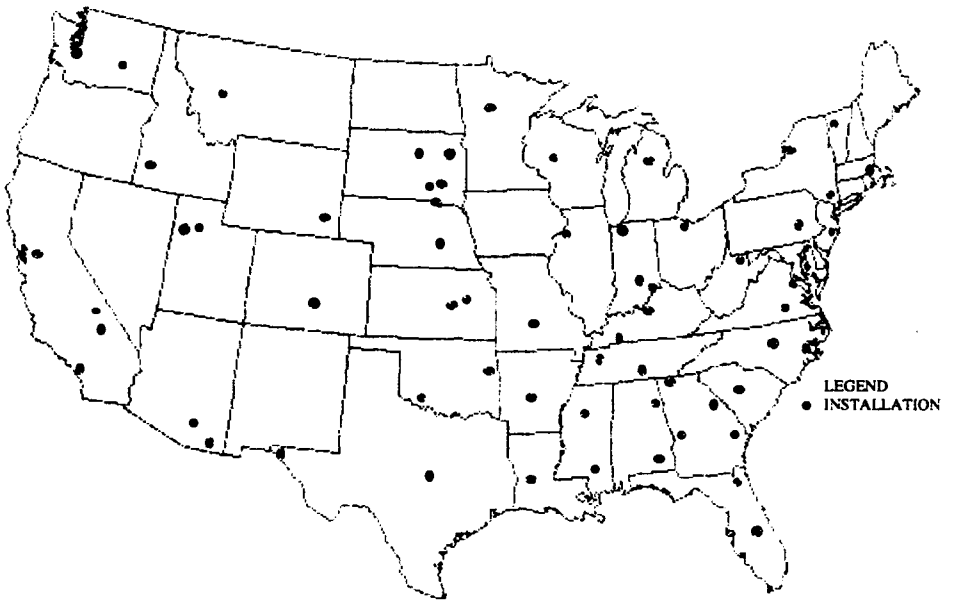

Figure 3-4. Artillery Ranges/Impact Areas

(3) Tank Main Gun Firing Ranges. Figure 3-5 shows the 60 installations (18 of which contain subcaliber devices) identified by DIRT as capable of supporting tank main gun firing. Only one of the installations (Ft Knox, Kentucky, home of the Armor Center and School) was listed as having firing ranges capable of supporting the M1A1 tank's 120mm gun. This may be a reflection of the fact that only 5 of the 42 RC tank battalions were equipped with M1A1s, or it may be an indication that either the data collectors recycled their questions or the installations recycled their answers. As a practical matter, this study considered any tank range that could support a 105mm tank main gun to be capable of supporting a 120mm gun as well.

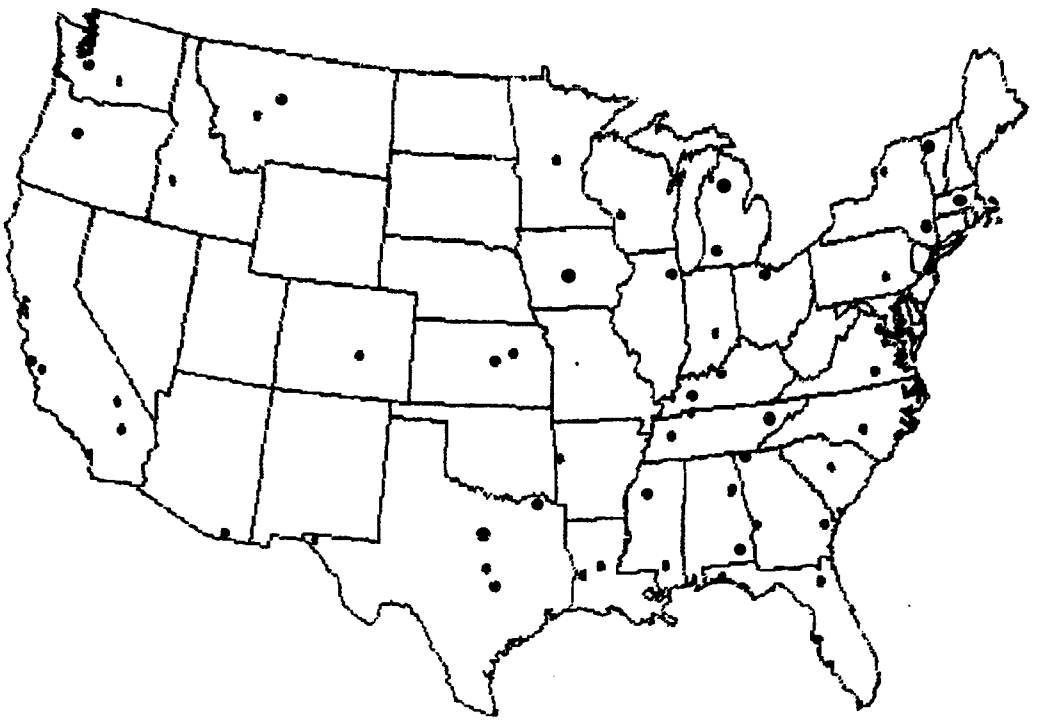

Figure 3-5. Tank Main Gun Firing Ranges

(4) Bradley Firing Ranges. Figure 3-6 shows the location of the 29 installations, identified in DIRT, as capable of supporting Bradley (i.e., 25mm chain gun) firing.

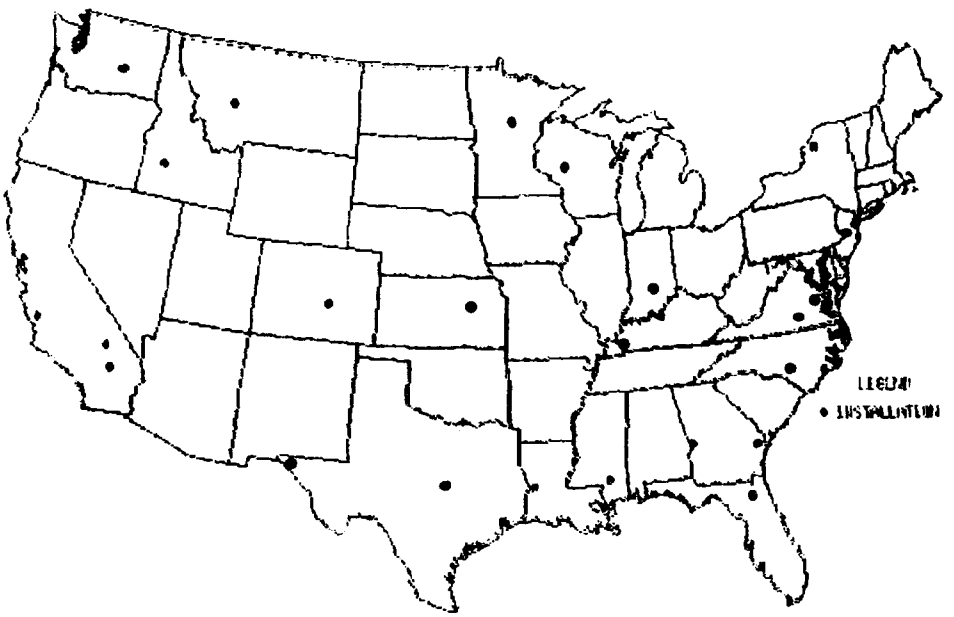

Figure 3-6. Bradley Firing Ranges

(5) Tank/Bradley Table VIII. Figure 3-7 shows the location of the 19 installations which contain either a tank or a Bradley qualification range (Table VIII). All but two of the sites contain both a tank and a Bradley Table VIII. The two exceptions are Ft Huachuca, Arizona, which has a tank Table VIII but no Bradley tables and Camp Atterbury Reserve Forces Training Area, Indiana, which contains a Bradley Table VIII but no tank tables. Table 3-3 provides a list of installations containing a multipurpose range complex (MPRC). This list was developed in coordination with DAMO-TRO (the Training Operations Division of DCSOPS) at the conclusion of the study and contains locations such as Ft Hunter-Liggett, Ft Campbell, and Ft Polk which were not identified in DIRT (an MPRC is capable of supporting up to Table XII).

Figure 3-7. Tank/Bradley Table VIII

Table 3-3. Multipurpose Range Complexes

Installation	State
Ft Hunter-Liggett	CA
Ft Carson	CO
Ft Stewart	GA
Orchard Range Training Site	ID
Ft Campbell	KY
Ft Knox	KY
Ft Polk	LA
Ft Bragg	NC
Ft Bliss	TX
Ft Hood	TX
Yakima Firing Center	WA

(6) Aerial Gunnery/Rocket Ranges. Figure 3-8 shows the 36 installations identified in DIRT as containing aerial gunnery/rocket ranges. Once again, Ft Hunter-Liggett, Ft Campbell, and Ft Polk were omitted (an MPRC is also capable of supporting aerial gunnery).

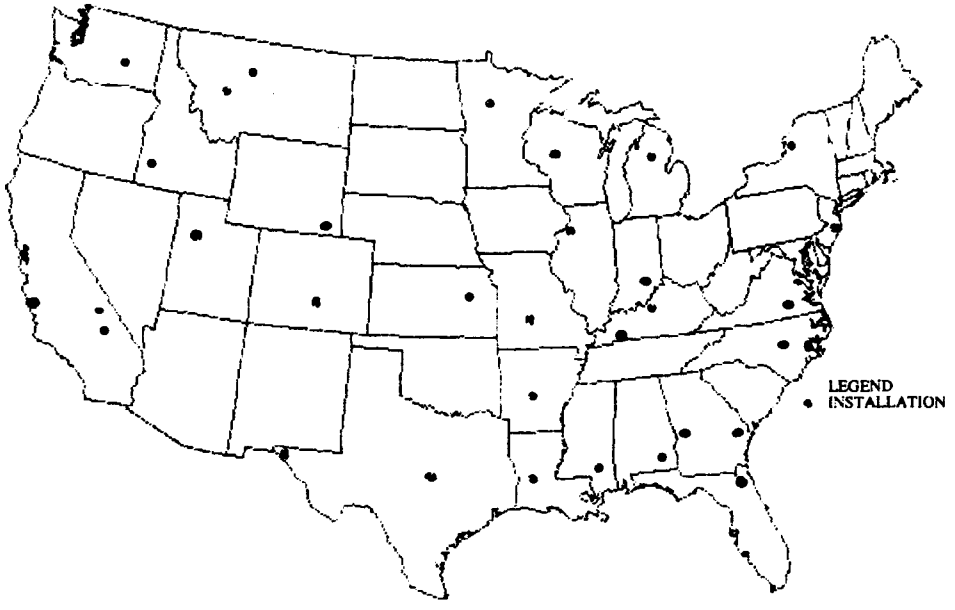

Figure 3-8. Aerial Gunnery/Rocket Ranges

(7) Demolition Ranges: Figure 3-9 shows the location of the 35 sites containing demolition ranges.

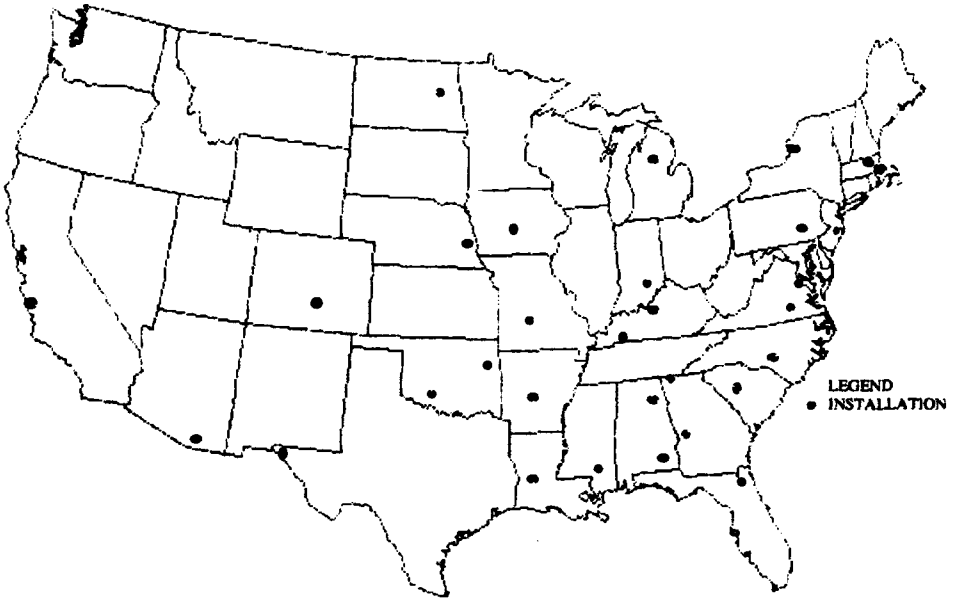

Figure 3-9. Demolition Ranges

3-4. TRAINING RANGE/INSTALLATION SUMMARY. Figure 3-10 summarizes the various types of training ranges selected for use in this study (as detailed in paragraph 3-3) and shows the number of installations that contain them. The upper half of the figure identifies the data elements used in the AT analysis (air defense missile, MLRS, mortar, and artillery ranges) while the lower half shows the data elements unique to the IDT evaluation (Bradley and tank firing--not qualification--ranges, artillery ranges/impact areas, demolition ranges, and small arms ranges). Data elements that are in the overlapped portion of the figure (tank and Bradley Table VIII, helicopter gunnery ranges, and maneuver land) were used in both the AT and IDT analysis. One distinction, that can be made between the AT and IDT sites, is in the amount of maneuver land they contain. All of the installations examined in the AT analysis contained at least 4 sq km of maneuver land, in addition to their firing ranges, while many of the IDT sites (particluarly those selected for their small arms ranges) contained no maneuver land at all.

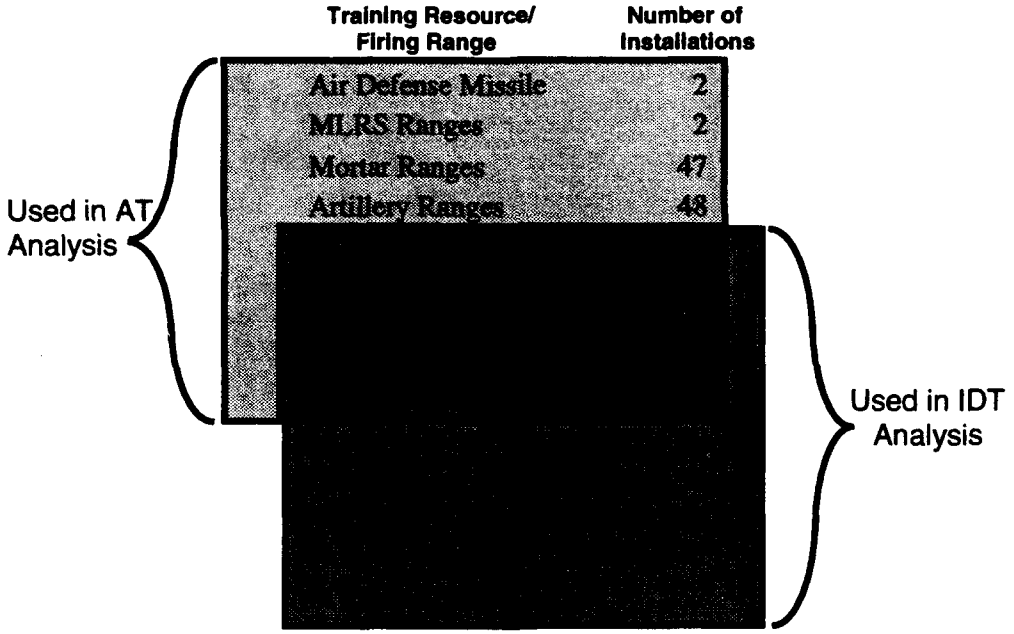

Figure 3-10. Training Resource/Firing Range Summary

CHAPTER 4

METHODOLOGY

4-1. GENERAL. To this point, the report has shown how the RC units and training sites were developed for inclusion in the study. This chapter deals with the methodology used for the allocation of the RC units to the training facilities in the AT portion of the analysis. The IDT analysis was based strictly on a unit's proximity to training resources; therefore, a straightforward distance versus geographic dispersion procedure was employed.

4-2. CONSIDERATIONS IN METHODOLOGY DEVELOPMENT. The study directive required that three types of criteria be considered in the development of a methodology. These criteria are readiness, economic, and environmental.

a. Readiness. The purpose of annual training is to enhance unit readiness. This can be done by maximizing the amount of time available for unit training (or, equivalently, minimizing the amount of time a unit spends in traveling to and from its training site) and by ensuring that the commander's training options are not limited through the allocation of units to facilities capable of supporting only certain types of training (i.e., range firing or maneuver but not both). In the implemented methodology, the concerns just discussed are incorporated into the developed solution through the use of the generic unit category codes and the training resources required for AT which are associated with each code. The development of these codes was discussed previously in paragraph 2-7, Chapter 2.

b. Economic. In an era of shrinking budgets and cost consciousness, the least cost solution will probably hold sway over all others. The formulation must therefore take training costs into account. The incremental costs associated with training consist of travel costs and facility use reimbursement costs.

(1) Travel costs (i.e., the cost of moving a unit and its equipment to and from the training site) are sensitive to distance and can be minimized by assigning units to the closest available training areas (thus the implementation of a minimum travel cost solution is equivalent to finding a maximum readiness solution, as discussed in paragraph 4-2a, above). They are also sensitive to unit size (i.e., it costs less to move a 200-person company than it does to move an 800-person battalion) and can be further reduced by giving larger units priority over smaller ones. Additional savings can be realized through the use of prepositioned equipment. This, however, raises cost effectiveness issues involving the one-time cost of the equipment and its annual storage/maintenance costs versus the number of units that would be required to make it economically feasible. These additional savings issues fall outside the scope of this study and are better left to a follow-on analysis.

(2) Facility reimbursement costs are called for under the Defense Business Operating Fund (DBOF). The reimbursement costs associated with non-Army facilities were not readily available. These installations could therefore only be evaluated by assessing the impact of not having access to the facilities (see paragraph 5-8, Chapter 5). In the case of Army and state-owned facilities, the incremental costs per soldier, for RC training, were considered for inclusion in the analysis. However, it was felt that these costs were so clearly dominated by the readiness issues involved that they were not pursued further.

c. Environmental. Land rotation, noise abatement, protected areas, and maneuver/firing restrictions all serve to limit the training resources available to units and must be taken into account. Access to environmental data was, however, very limited. DIRT contains a text entry giving the

environmental restrictions (e.g., no night firing, no pyrotechnics during dry season, no use during hunting season, etc.) associated with each range. However, there are 9,800 entries in the data base, making this an unwieldy source of information. Furthermore, environmental restrictions on maneuver were not directly addressed in DIRT. The actual implementation of the methodology is flexible enough to allow for environmental restrictions to be incorporated into the individual installation resource descriptions. However, further consideration of environmental factors will be left to a follow-on effort, should a better source of the needed data be identified.

4-3. SCOPE OF THE PROBLEM. This paragraph illustrates the scope of the unit allocation problem, and some of the difficulties associated with its resolution. The problem of selecting suitable training sites for armor battalions is used as a demonstration vehicle.

a. The first step is to identify the tank battalions and their training requirements. The RCTIFYRS unit list contains 37 of these battalions. Figure 4-1 shows the location of the 61 the Reserve Component armor units in the FY 95 force (including cavalry squadrons and troops). The distribution of the 37 battalions used in this example is indicated by the circled numbers overlaid on the map (i.e., there is one battalion in Oregon, four battalions in California, one battalion in Arizona, etc.). Care should be taken in viewing Figure 4-1 because it shows units plotted down to their component subunit locations (i.e., an armor battalion can be represented by a single point on the map, or as many as five points, if all of its subordinate companies are located in different cities or towns).

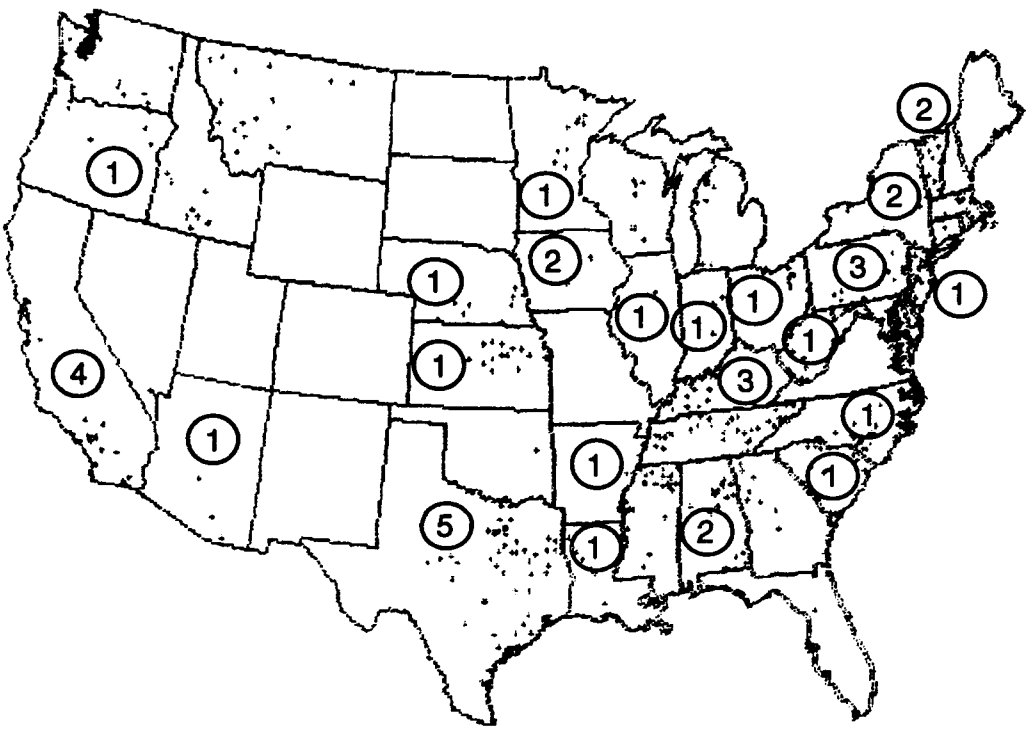

Figure 4-1. Armor Battalions

b. The next step is to identify suitable training sites and their resources. The AT requirements of a "typical" armor battalion consist of 248 sq km of maneuver land; a tank gunnery range with Tank Table VIII; and a mortar range/impact area. Figure 3-5, Chapter 3, shows the 60 installations containing tank gunnery ranges. Of these 60 sites, 20 have at least 248 sq km of maneuver area, 18 (see Figure 3-7) have ranges which support Tank Table VIII, and 43 contain a mortar range/impact area. However, only the 12 training sites circled in Figure 4-2 below meet all three of these requirements.

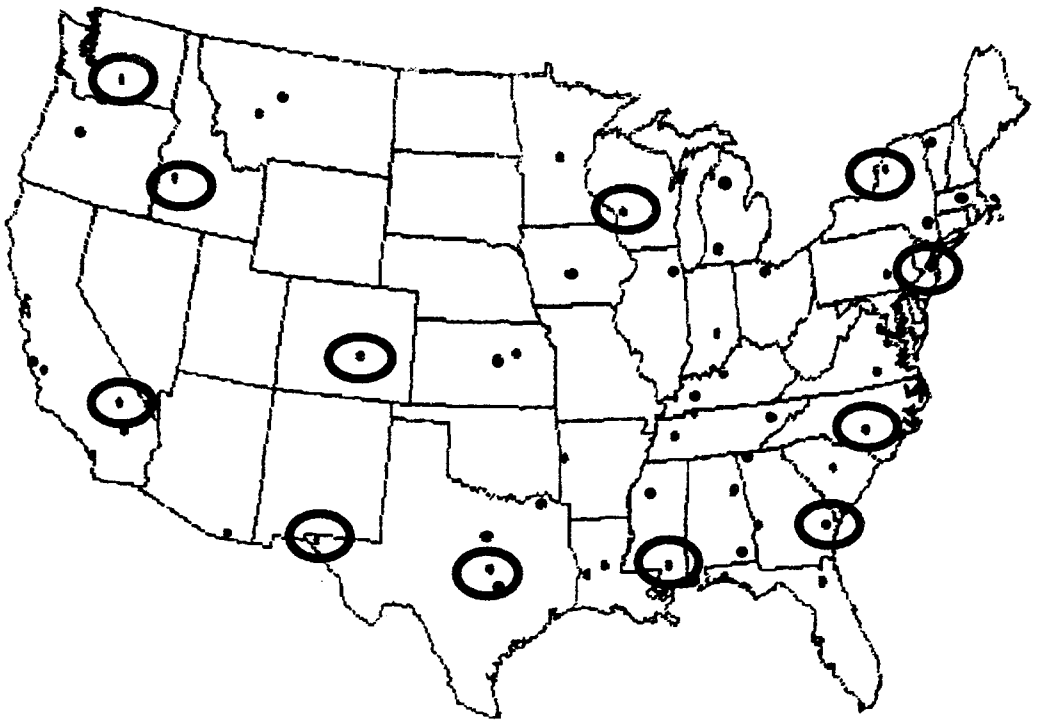

Figure 4-2. Training Sites Which Can Support Armor Battalion AT

c. The final step consists of matching each of the armor battalions to one of the training sites. For purposes of this example, the relative proximity of the armor battalions and the 12 potential training sites will be examined. Effectiveness will be judged by using 1 day's travel as a standard (i.e., no unit should have to spend more than 1 of its 14 training days just getting to its AT site). Figure 4-3 combines Figures 4-1 and 4-2 and overlays a circle with a 250-mile radius (approximately 1 day's travel) above each of the 12 training sites capable of meeting the training requirements of the 37 armor battalions in this example.

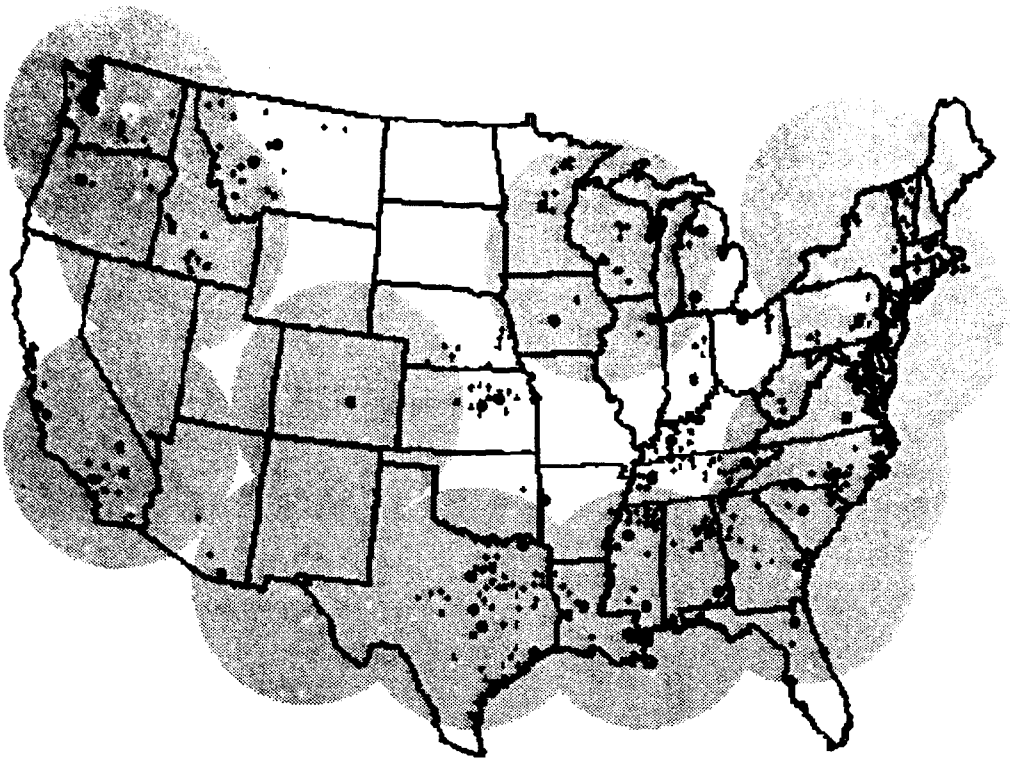

Figure 4-3. Armor Units Within 1 Day's Travel of Training Sites

(1) Figure 4-3 shows that 30 of the 37 armor battalions reside within 1 day's travel of a suitable AT site. A problem arises, however, in the case where more units are situated near a training site (e.g., six armor battalions are located within 250 miles of Ft Hood) than the site can support (i.e., Ft Hood's 567 sq km of maneuver space can only accommodate two armor battalions at a time). This can be dealt with by either "bumping" some of the units to the next closest site capable of accommodating them or by rescheduling them to the same site, but at a later AT period. Bumping units raises the issue of who has priority at a facility, the closest unit to it, or the unit that was bumped there from another installation. Rescheduling units to later AT periods raises the prospect of running out of time. Assuming that units are willing/able to train year round, and that training facilities are willing/able to train them, there are 26 2-week AT time periods available in a year. The six armor battalions in this example alone will use up three of the 26 time periods available at Ft Hood; that leaves 23 AT periods for the remaining 140 RC units located in Texas.

(2) Figure 4-3 also shows that seven of the armor battalions are located near installations which are not capable of meeting all of their training needs. The most obvious instances of this are the two battalions stationed near Ft Riley, Kansas (insufficient maneuver space); and the three battalions located between Ft Knox (insufficient maneuver space) and Ft Campbell, Kentucky (no Tank Table VIII). These units will be forced to travel greater distances to reach a suitable AT location (e.g., the units in Kansas and Nebraska would have to travel an additional 150 miles each to reach Ft Carson, Colorado). Should the distances be great enough, or the number of units affected large enough, it may prove more cost effective to expand a local facility's resources than it is to transport the units.

d. This discussion shows that the difficulty is not in deciding to which installations to allocate units, but in resolving conflicts between multiple units placing demands on a single training site. Conflicts will arise as the number of units increases from 37 to 2,550, while the number of potential training locations only increases from 12 to 85; and will be compounded by the fact that (as was seen in the example) installations are limited in the numbers and types of units that they can support.

4-4. FORMULATION OF THE PROBLEM

a. Overview. Figure 4-4 offers a visual representation of the problem. Simply stated, the goal is to allocate each of the 2,550 Reserve Component units on the left to one of the 85 training areas on the right. The required objective function and the associated constraints are as stated below.

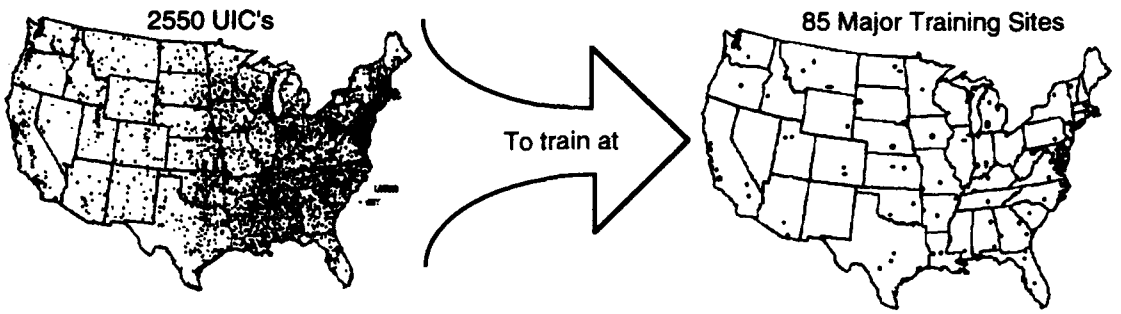

Figure 4-4. RCTIFYRS Allocation Problem

(1) Objective. The overall objective is to minimize the total distance that the RC units travel to train. Distance equates to lost training time (i.e., the time a unit spends traveling to and from a training site is time that is taken away from training) and lost dollars (i.e., travel costs).

(2) Constraints. The following factors must be considered in meeting the objective:

(a) All unit training needs, in terms of maneuver space (identified in TC 25-1) and firing ranges (identified in TC 25-8), must be met.

(b) The installation training capacities and capabilities (identified in the DIRT data base) may not be exceeded.

(c) The number of 2-week AT periods over which units are allocated to training sites cannot be greater than 26.

b. Mathematical Formulation. The problem stated above is an assignment/resource allocation problem; hence, it can be formally expressed as a 0-1 integer programming problem as follows:

(1) Variable Definitions

X_{ijk} = 1 if unit i is assigned to installation j during AT period k, 0 otherwise.

d_{ij} = distance from unit i to installation j.

r_{pi} = amount of resource p required by unit i for the conduct of AT.

R_{pjk} = amount of resource p available at installation j during AT period k.

(2) Formulation

$$\text{Min} \sum_i \sum_j \sum_k d_{ij} x_{ijk}$$

st:

$$\sum_{\forall i} r_{pi} x_{ijk} \leq R_{pjk}, \quad \forall j, \forall k,$$

$$x_{ijk} \in \{0,1\},$$

$$i \in \{1,2,...,2550\},$$

$$j \in \{1,2,...,85\},$$

$$k \in \{1,2,...,26\} \approx 10.$$

c. RCTIFYRS AT Methodology

(1) Relevant Characteristics of the Mathematical Formulation. For the application of the mathematic model defined in 4-4b(2) to the RC forces and installations developed in Chapters 2 and 3, the indexes i, j, and k have the following bounds: $1 \leq i \leq 2550$; $1 \leq j \leq 85$; and k Œ [1,26]. Since the decision variables (X) are indexed by i, j, and k, there are between 216,750 and 5,634,590 0-1 decision variables to consider, with 2,167,500 being typical. While this number can be reduced somewhat by preprocessing the data, the current state of optimization can handle approximately 2,000 0-1 variables at most. Furthermore, the time dimension aspects of the problem are known to be typical of problems that are extremely resistant to solution using current techniques. Hence, the goal of obtaining an absolute optimum solution to the problem was abandoned in favor of finding "good" (near optimal) solutions quickly.

(2) Bin Packing

(a) Application to the AT Allocation Problem. In the field of industrial engineering, problems similar to the RC AT allocation problem occur frequently. Typical examples are the need to fit items into a packing crate for shipment, or cutting up the minimum number of sheets of plywood to fabricate a manufacturing order. In this context, each AT period available at an installation would equate to a sheet of plywood, with the resources available at that installation being the dimensions of the plywood (e.g., maneuver space being length, Tank Tables being width, etc. Note that since the problem will be addressed mathematically, it will not be limited to the two or three dimensions of the real-world example). The units will be the pieces of plywood to be cut out of the sheets, with the training resources required being the equivalent of the dimensions of the final pieces. In general, these types of problems are known as bin packing problems.

(b) Bin Packing Heuristics. Since the bin packing class of problems is extremely prevalent in civilian industry, a large body of literature exists on appropriate heuristic methodologies and the expected performance each can achieve. Several of these are identified below, and the interested reader is directed to the technical journals of operations research for more details.

1. Bin Packing. The classical bin packing problem consists of items into packing containers. All of the packing containers are of the same size, but the items to be packed are of differing sizes. The goal is to use the fewest number of containers possible, thus achieving a minimum cost solution. A typical heuristic used to solve this problem consists of choosing, at random, an item to be packed and placing it into the current container. If it does not fit into the current container, then this container is closed and sealed (i.e., no more items will be placed into it), and the item is placed into a fresh container.

2. Generalized Bin Packing. In this variant of the problem, the packing containers are allowed to be of differing sizes. All of the methods for solving normal bin packing can be modified to be used under this variant.

3. First Fit. First Fit is an alternative methodology to that described in 1. for bin packing. In this methodology, the packing containers are not sealed prior to starting a fresh container. The methodology will attempt to add each item to every open container, placing it into the first container into which the item will fit. Hence, the name "First Fit." This variant of the bin packing heuristic can be shown to achieve better performance than the one originally discussed.

4. First Fit-Largest. Even better performance than straight First Fit can be achieved by sorting the items into some order prior to starting the packing process. The items are then selected one by one in the sorted order, rather than randomly as previously discussed. Generally speaking, the best performance (lowest cost) will be achieved by sorting the items into largest to smallest order, although the best sort order may vary depending on the specifics of the individual bin packing problem under consideration.

(3) RCTIFYRS AT Methodology

(a) Bin Packing Variant. A variant of the First Fit-Largest procedure was selected for the AT site allocation methodology. In this variant, each AT period of an installation is considered to be a separate bin, with the dimensions of the bin equivalent to the training resources available at that particular installation. The items to be "packed" into the bins are the units of the Reserve Component, as developed in Chapter 2. For each of these units, the dimensions of the "item" to be "packed" relate to the training resources to be dedicated to the individual unit for the conduct of AT. In order to make the methodology a First Fit-Largest bin packing, the "items" or units must be sorted in order, with the largest users of training resources at the top of the resulting list. This sorting has the desirable by product that the combat units tend to be at the top of the list, since combat units tend to be the major users of training resources. Thus, combat units will typically have the first choice of alternative training sites, which matches the preferences of the Army trainers. The details of the implementation of the methodology is explained in the next paragraph.

(b) Allocation Rules. Units were allocated to training facilities as either battalions, separate companies, or independent detachments. The location of the "battalion flag" (i.e., HHC) was used as a surrogate for the location of each of a battalion's subordinate companies. The following rules were used in determining the order in which the units were allocated.

1. Units were sorted on the basis of the number of training options available to them, with units having the fewest number of options at the top of the list.

2. Units were allocated from the list one at a time, starting at the top (i.e., units with the greatest number of training options were allocated last).

3. Each unit was assigned to the closest training site capable of meeting all of its training requirements. If that site was filled, the unit was reallocated to the same site at a later 2-week time period. If all of the available AT time periods at the nearest site were filled, the unit was allocated to the next closest site capable of meeting all of its training needs.

4. The process was repeated until either the list of units, the list of training sites, or the number of time periods available for training was exhausted.

(c) **Sample Allocation.** Table 4-1 provides a sample of how the allocation process works, using three different types of units (MLRS, Hawk, and attack helicopter), all of which could train at Ft Bliss (note that Table 4-1 shows the units sorted according to the number of options available to them, as discussed in paragraph 4-3c(3)(a)). Under the allocation rules, each of the four MLRS battalions would be allocated to Ft Bliss before any site was selected for use by any of the four air defense battalions. The Hawk units would then be allocated to either Ft Bliss or Camp Lejeune (which ever was closer) before any of the attack helicopter battalions were allocated to a training site. The attack helicopter battalions, having the greatest number of training options available to them, would be allocated only after all of the MLRS and Hawk units had been provided for.

Table 4-1. Sample Allocation Based on Fewest Options

Units	Unit Type	Possible Locations
4	MLRS Bn	Ft Bliss
4	ADA Bn (Hawk)	Ft Bliss Camp Lejeune
19	Atk Helo Bn	Ft Irwin Ft Carson Ft Stewart Ft Bragg Ft Bliss Yakima Firing Center

CHAPTER 5

ANNUAL TRAINING ANALYSIS

5-1. GENERAL

a. This chapter presents the results of the RCTIFYRS analysis of annual training requirements. It is not intended to provide an exhaustive evaluation of the topic but rather to highlight the capabilities of the RCTIFYRS methodology and to offer areas for future research. All findings and conclusions are highly dependent on the accuracy and timeliness of the DIRT and SAMAS data used.

b. Annual training is the high point of an RC unit's training cycle. The emphasis of the AT portion of this analysis was on maximizing the unit commander's training flexibility. This was accomplished by allocating each unit all of the resources (i.e., maneuver space and ranges) needed to exercise any of its typical AT training tasks. The larger Army goal, of maximizing training, was addressed by minimizing the amount of nontraining time (i.e., travel) units expended at the beginning and end of each AT period. Battalion training packages, as discussed in paragraph 2-7c, were used as the basis for determining unit requirements and allocating units to training facilities. Installation training resources were constrained by the number of AT time periods available. RC units therefore competed with each other for access to installation resources.

5-2. NUMBER OF TIME PERIODS AVAILABLE FOR TRAINING

a. Figure 5-1 shows the effect that the number of AT time periods has on the total distance that units travel to reach their designated training sites. The y-axis shows the distance traveled in unit miles. These are one-way distances, and an identical distance will be traversed when the units return to their home stations at the end of training. The x-axis ranges from 7 to 26 AT (2-week) time periods. The "ideal solution" (i.e., the absolute minimum possible distance that the 2,550 RC units must travel to reach the closest training site that can accommodate them) is 244,255 miles and has been overlaid as a point of reference. It took seven AT time periods to achieve the first feasible solution (i.e., to assign each of the units to a suitable training site). While this value is of interest, the reader is warned that it constitutes a mathematical minimum and, as such, is unlikely to represent a practical solution in terms of actual units and installations. For example, in order to achieve the minimum shown, the model may well have been forced to designate an infantry unit stationed in Maine to go to Fort Hunter-Liggett, California, for AT. This is obviously an unacceptable assignment, from a training standpoint, since all of the unit's training time would be expended in traveling to and from its AT site. Admittedly, this is a somewhat artificial and exaggerated example, but it does serve to emphasize the types of situations that can occur whenever blind faith is placed in the absolute mathematical minimum, without regard to the real-world process being modeled. More palatable, and better quality, solutions can be obtained from the model by allowing the methodology more freedom to allocate units. This can be achieved by increasing the number AT periods over which RC units can be allocated.

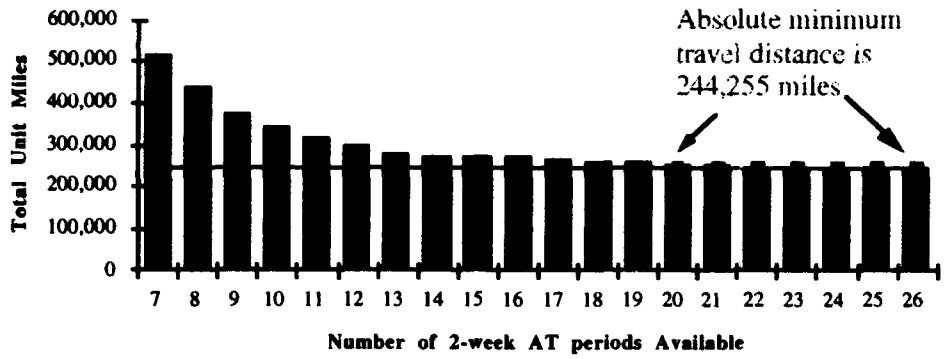

Figure 5-1. Travel Distance (unit miles) Over Time

b. Figure 5-2 affords an alternate view of Figure 5-1, by converting unit miles into soldier miles (i.e., the distance that a unit travels multiplied by the number of personnel in the unit). The two graphs serve to illustrate the notion that as the number of 2-week AT time periods available increases, the cumulative distance that units travel decreases (in fact, it begins to approach the "ideal solution" asymptotically). This is because more of the units can be rescheduled to later time periods, at the sites closest to them, rather than being "bumped" to the next closest installation capable of meeting all of their training needs. Allowing the model more "room" to operate results in a better quality solution. A baseline of 10 2-week time periods was therefore selected for use in the remainder of the AT analysis. This value equates to 4 $^1/_2$ months of training time, or approximately the period from May to September, which is the timeframe traditionally favored by the Reserve Component for the scheduling of their AT. Two possible alternatives to 10 AT periods have been suggested for use. These are 13 periods (6 months) and 16 periods (8 months). Figures 5-1 and 5-2 show that using either of these alternatives would have resulted in a better mathematical solution. However, either of these alternatives would have been met with resistance from within the reserve community, as they constitute a radical departure from the existing RC training cycle. The focus of the RCTIFYRS Study was on the development and demonstration of the methodology. Therefore, the study team felt that, despite having the latitude to do so, it would be inappropriate to unilaterally extend the length of the training year beyond what was currently accepted. A determination as to the proper number of AT periods to be considered will be left to the appropriate DA Staff agencies and future study sponsors. The model is capable of accepting any time parameter it may be given.

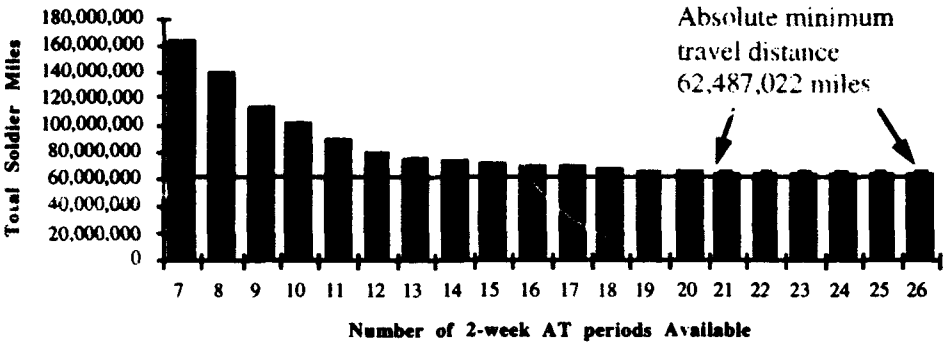

Figure 5-2. Travel Distance (soldier miles) Over Time

c. Despite the decision to use 10 AT time periods, no attempt has been made to link a particular 2-week calendar period with any of the model's AT periods (i.e., the 10 AT periods evaluated do not have to run concurrently). This analysis should be looked at as a capacity evaluation without any regard to when the capacity occurs. The actual implementation of any of the AT allocations generated by this study would typically result in an installation spreading the unit load over its entire training season/year. The results of this analysis, therefore, do not require that the AT periods of any two installations correspond to the same calendar periods (i.e., AT period number 1 could be implemented in May at one installation and in July at another). RCTIFYRS results should be interpreted as saying that the units allocated to attend AT at an installation should be scheduled to do so sometime during the training year, given that no more than 10 2-week AT periods will be available at the specified installation during that entire training year.

5-3. MANEUVER LAND AVAILABLE FOR TRAINING. Figure 5-3 provides a representation of the amount of maneuver land that is available to meet the training needs of the reserves, using the baseline of 10 AT time periods discussed above. The y-axis shows the amount of maneuver land available or used over time. In this context, each parcel of maneuver space at an installation is counted 10 times, as it can be used once in each of the 10 AT time periods considered in the development of the chart. Conversely, the needs of any given unit for maneuver land are counted just once, as each unit attends AT only once during any given training year. The x-axis shows the various increments of training land associated with the 2,550 units and the 85 installations (note that the scale of the x-axis is not linear). At the base of the figure is a listing of the number of training sites and the number of units corresponding to each of the maneuver land increments (note that the listing is cumulative, since the maneuver land increments along the x-axis are given in decreasing order). The first set of entries indicates that there are 17 Reserve Component units which require 600 sq km of maneuver land for AT (i.e., 600 sq km x 17 units x 1 time period) and there are 9 training sites which contain at least 600 sq km of maneuver space (i.e., 600 sq km x 9 sites x 10 time periods). The second set of entries indicates that there are 11 Reserve Component units (28 minus 17) which require 499 sq km of maneuver land for AT (i.e., 499 sq km x 11 units x 1 time period) and there are 2 training sites (11 minus 9) which contain at least 499 sq km of maneuver space (i.e., 499 sq km x 2 sites x 10 time periods).

a. The graph provides a conservative estimate of the availability of maneuver space, since the amount of maneuver land available at an installation has been rounded down to the values shown along the x-axis (i.e., while there are 9 installations in CONUS with 600 sq km or more of maneuver space, Figure 5-3 assumes that these 9 installations have exactly 600 sq km, and no

more, available for use during each of the 10 AT periods under consideration). Despite its conservative nature, the graph shows that the 85 training sites selected contain sufficient maneuver capacity (over a 10-time period scenario) to meet the maneuver training needs of all 2,550 RC units.

b. Figure 5-3, when looked at in conjunction with Figures 5-1 and 5-2, shows that, as long as the length of training year is not overly restricted (i.e., less than 10 2-week time periods), there is sufficient capacity available to meet all of the training needs of the Reserve Components. As the number of time periods is increased, the amount of available land (upper portion of the graph) will increase. Similarly, if the unit requirements were to be reduced, the lower portion of the graph would also be reduced.

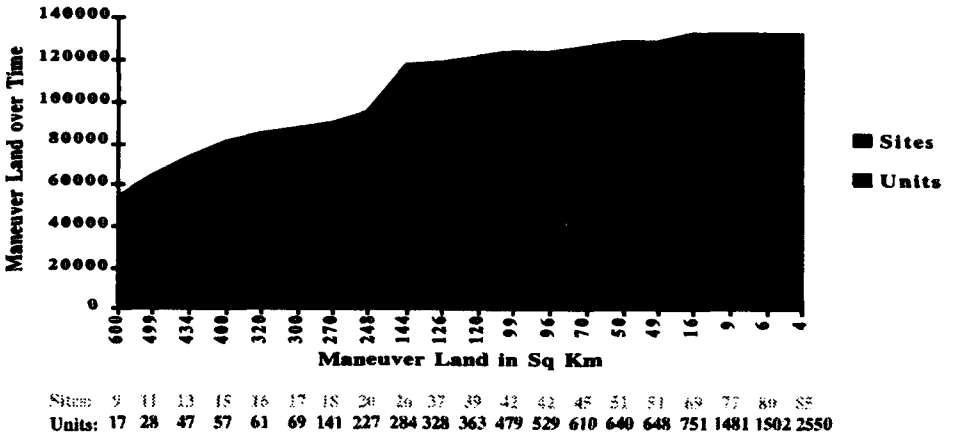

Figure 5-3. Training Land Requirements versus Resources

5-4. BASE CASE ANALYSIS. The base case resulted in units traveling 343,699 miles to reach their training areas. This translates to 100,615,277 soldier miles.

a. Length of a Travel Day. There were 267 units forced to travel over 250 miles (approximately 1 day's travel) to reach a training site. In keeping with the DA goal of maximizing training time, those units which required more that a single day's travel to reach their designated AT site merited special consideration and examination in this study. The 250-mile figure (as calculated by a straightline, flat earth distance method) was selected as a measure for identifying these units. A "better" value for this figure, from the DA standpoint, would have been 350 miles. This equates to the Joint Travel Regulation (JTR) standard for 1 day of travel. However, the JTR figure relates to "true" distance over a full day. It was felt that an RC unit, no matter how experienced, would be forced to sacrifice a portion of its "full" work day to travel preparations. Given this, and the topographical realities of the road network, it was felt that 250 "as the crow flies" miles would be more than equivalent to the JTR's 350 road miles.

b. Site Utilization. Figure 5-4 provides a visual indication of training site utilization in the base case. The figure shows that 44 of the 85 sites were utilized 100 percent of the time (i.e., at least one unit was allocated there in each of the 10 AT time periods) while 4 of the training areas were never used. Installation utilization, under the methodology adopted for this study, is a function of an installation's resources (i.e., maneuver land and ranges) and its proximity to units with matching requirements.

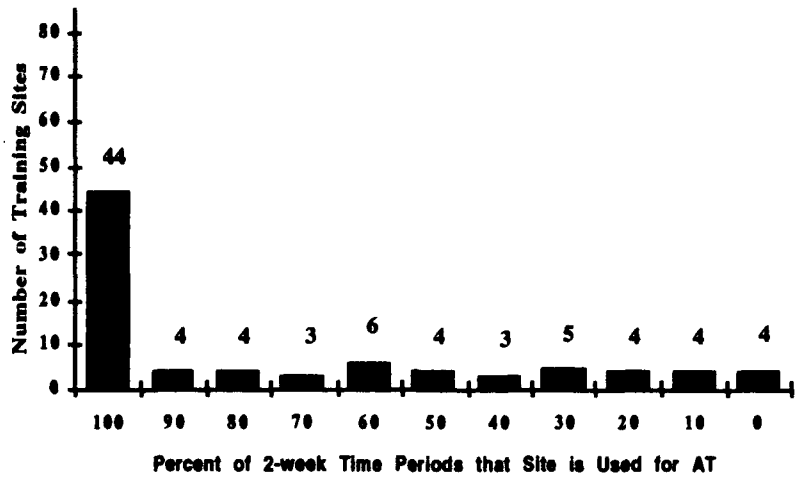

Figure 5-4. Training Site Utilization (base case)

(1) To better understand Figure 5-4, refer to Table 5-1. The table shows that Ft McClellan and Dugway Proving Ground offer the same types of ranges (artillery and mortar) but that Dugway has six times the available maneuver land. However, Dugway was only used 10 percent of the time while Ft McClellan was occupied during each of the 10 AT time periods. This disparity can be attributed to the higher density of units along the East Coast. Ft McClellan serviced 49 units (40 of them located within 100 miles of the installation) while Dugway supported 3 units (only one of which traveled less than 100 miles).

Table 5-1. Utilization Comparison of Ft McClellan and Dugway Proving Ground

Installation	Maneuver Land	Types of Ranges	Percent of Utilization	Number of Units
Ft McClellan, AL	149	Arty, Mort	100	49
Dugway Pvng Gnd, UT	1,012	Arty, Mort	10	3

(2) The reader should be cautioned, however, that the percent of utilization is also highly dependent upon the gross amount of maneuver land available at an installation. To illustrate the point, consider a hypothetical situation where the 49 units allocated to Ft McClellan are reassigned to Dugway Proving Ground, while at the same time, the 3 units allocated to Dugway are sent to Ft McClellan for AT. Ft McClellan has only 149 sq km of maneuver space, but it is now using it to service 3, rather than 49, units. If it is assumed that each of the three units are battalions, it is likely that each would be allocated to a separate time period. This would lead to Ft McClellan

being used 30 percent of the time. Meanwhile, Dugway has 1,012 sq km of space, and it is likely that all 49 of the units could be accommodated in no more than 2 time periods. Dugway would therefore bc used only 20 percent of the time. This hypothetical switching of unit allocations reduces Ft McClellan's use from 100 percent to 30 percent while Dugway's only increases from 10 percent to 20 percent usage. The point here is that the reader should not rely on any one measure of importance in evaluating sites for RC usage, but should examine a variety of measures and check for robustness in the results before coming to any conclusions.

(3) Referring to Figure 5-4, some conclusions concerning the relative usefulness of installations can be drawn from the end points of the graph (i.e., the 52 sites with at least 80 percent utilization can probably be considered to be superior to the 12 locations that are used only 20 percent or less of the time). Care, however, should be taken in making decisions on the relative importance of installations which fall close together on the graph. This is especially true for the 21 installations falling in the center of the graph, since their utilization will tend to fluctuate as the constraints are tightened or relaxed. Paragraph 5-5 deals with the relaxation of unit training land requirements. This is followed by a look at the impact of more ranges and an examination of site availability in paragraphs 5-6 and 5-7. The recommended procedure for drawing conclusions from the results is to obtain a series of model outputs generated from a variety of assumptions on site availability and unit requirements and then examine the questions of interest across the spectrum of results. In this manner, relatively high confidence can be placed in the results obtained, and, in addition, insight will be gained on precisely what conditions make an installation(s) important for the conduct of reserve trainir

5-5. ALTERNATIVE TRAINING STRATEGIES

a. Introduction. As discussed in the generation of the units' maneuver requirements in paragraph 2-7c, four separate values for the units' maneuver needs were developed to address the lack of a definitive doctrinal outline for the conduct of AT under the BOLD SHIFT initiatives. These four strategies were: (1) the maneuver space required by most terrain-intensive battalion mission, used as the base case for this effort and discussed in paragraph 5-4 above; (2) a percentage reduction from (1), discussed in paragraph 5-5 c; (3) the maneuver space required by a typical battalion mission (usually defense), discussed in paragraph 5-5d; and (4) the maneuver spaced required by a battalion attending a nominal AT where only half of the unit was in the field at any one time, to be discussed in paragraph 5-5e.

b. Sensitivity to Maneuver Land. As mentioned above, four separate values for the maneuver area requirement are routinely used in the execution of the RCTIFYRS process.

(1) The maneuver requirements under these four distinct strategies, for typical units, are shown in Table 5-2. As can be seen from the table, the effects of the different strategies on the maneuver area requirements vary widely between the units shown in the table. This is a function of the information contained in TC 25-1. TC 25-1 is most detailed in specifying the missions and requirements for infantry and armor battalions and their subunits. Thus, as can be seen from the table, the maneuver requirements for these two types of units vary widely between the four different training strategies. Alternatively, only a single mission is specified for artillery battalions, "support combat operations," while all five of the missions for engineer battalions are listed as having the same space requirement, 96 km^2. Thus, from the table, it can be seen that the maneuver space requirement for both artillery and engineer battalions does not vary between the maximum and typical training strategies. Furthermore, the values identified for the engineer companies and platoons subordinate to the engineer battalion also specify a requirement of 96 km^2 for the conduct of all of the company and platoon missions. Under a rigorous interpretation of the platoon/company development procedure, this would imply that an engineer battalion would require 384 km^2 for the conduct of AT under this strategy. This was felt to be excessive and an

indication of deficiencies in the development of TC 25-1 rather than a valid maneuver requirement; hence, the existing maximum battalion value was carried over to the platoon/company lanes strategy as being the most realistic value available.

Table 5-2. Comparison of Maneuver Requirements

Unit	Maneuver Requirement			
	Max	80 %	Typical	Plt/Co Lanes
Inf Battalion	248	198	138	140
Armor Battalion	248	198	138	60
Arty Battalion	270	216	270	96
Engineer Battalion	96	77	96	96

(2) Table 5-3 summarizes the effects achieved by varying a unit's maneuver training requirements among the various training strategies. In this table, the number of potential training locations for a given unit is displayed. This is interpreted to mean the total number of locations having all of the ranges required by a unit and sufficient maneuver space to meet the requirements of the current training strategy. The four possible training strategies are listed across the top right-hand section of the table under the heading "number of training strategies." On the left of the chart are the generic names of the unit types of interest with the total number of this type within the RC units considered. For example, there are 4 MLRS battalions within the 2,550 RC units considered by this iteration of RCTIFYRS. As can be seen from the table entries, as the training strategies are varied, the number of potential training sites available to the unit changes. The training strategies are roughly ordered so that the strategies to the left generally require more maneuver space than the strategies to the right. Training options for MLRS and Hawk battalions are limited because of ranges, not training land, and so no gain is realized. The number of training sites available to tube artillery battalions, however, increases from 12, under the most restrictive requirements, to 34 using a platoon/company lanes training strategy. As expected, the table demonstrates that as the maneuver area requirement is reduced, the number of potential training sites increases. Any increase in the number of training sites available to the RC units translates directly into a decrease in the total distance that units travel to train. This emphasizes a concern among the study team that the values selected for the maneuver area requirement properly reflect the unit's true needs.

Table 5-3. Effect of Maneuver Land on Training Site Selection

Number of Units	Type of Unit	Number of Training Locations			
		TC 25-1 Standards	20% Waiver	Typical Mission	Platoon & Co Lanes
4	MLRS Bn	1	1	1	1
4	Hawk Bn	2	2	2	2
11	Cav Sqdn	6	6	6	10
8	Sep Cav Trp	9	9	11	16
19	Atk Helo Bn	9	12	10	10
42	Armor Bn	9	11	16	17
13	Mech Inf Bn (IFV)	9	11	16	16
17	Asslt & Mdm Helo Bns	9	13	11	11
72	FA Bn	12	18	16	34

(3) Occasionally a particular phenomena occurred wherein the reduction of the maneuver area requirement would result in an increase of total distance and numbers of units traveling long distances. This occurred when the reduction in the maneuver requirement resulted in opening up a nearby site to a unit with significant maneuver needs (typically combat units). In the methodology, this unit would be afforded an early choice of AT sites and would take the new, nearby site. If the selected site was previously filled with low priority units, the new combat unit would displace a large number of CSS units, resulting in a larger expenditure of travel miles by the CSS units than was saved by the combat unit selecting a closer site. Also, since a large number of CSS units would be involved, it is not unreasonable that several of them would need to travel more than 250 miles, resulting in a net increase in both of the mileage measures of interest. It should be noted, however, that the new solution, being favorable to combat units at the expense of CSS units, follows the mindset and preferences of the Army and the study sponsor. Hence, the new solution is preferable to the old, even though the selected model performance measures do not correctly reflect this.

c. **Maneuver Area Waiver.** Figure 5-5 shows what impact a 20 percent, across the board, reduction of each unit's maneuver land requirements (e.g., an armor battalion which needed 248 sq km to train would now require only 198 sq km, or 80 percent of what it needed in the base case) would have on facility utilization. Range requirements were not changed. This reduction afforded units more options (i.e., a greater number of training areas was now able to meet their maneuver needs) and, as a consequence, they did not travel as far (289,896 unit miles or 71,221,453 soldier miles) to train. In addition, only 194 of the units were required to travel over 250 miles to reach their training sites. The installations at the lower end of the graph (i.e., least utilized) did not change, while there was a slight shift from the higher end toward the center.

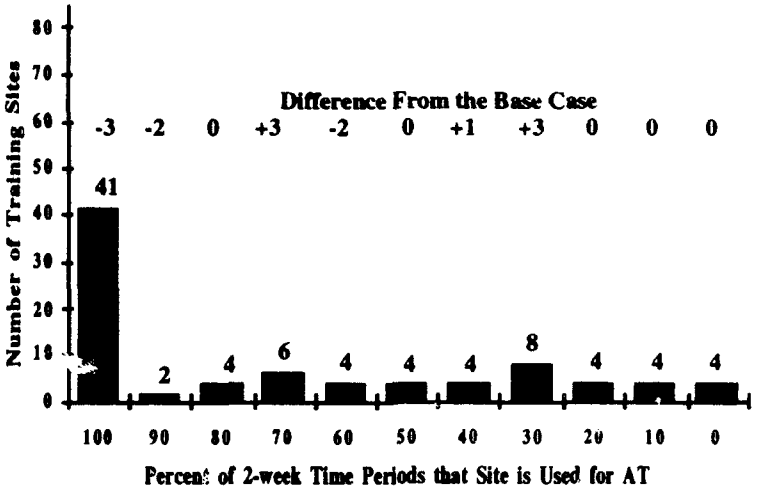

Figure 5-5. Training Site Utilization (80 percent of requirement)

d. Typical Mission Training Strategy. Figure 5-6 shows the training site utilization under a typical mission training strategy, as alluded to previously. This strategy reduced the maneuver land requirements of 1,832 of the 2,550 RC units, increasing the number of training sites available to them. The units traveled 293,541 miles (50,158 miles less than the base case but 3,645 miles more than under a 20 percent waiver) and 85,853,383 soldier miles (14,761,894 less than the base case but 14,631,930 more than under a waiver). There were 223 units which had to travel over 250 miles to train (again, less than the base case but more than under a blanket maneuver waiver).

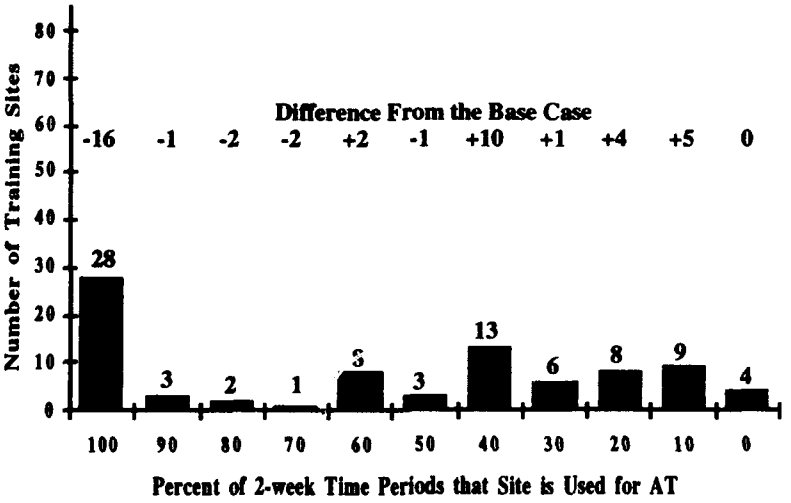

Figure 5-6. Training Site Utilization (typical mission strategy)

e. Platoon/Company Lane Training Strategy. Figure 5-7 shows the training site utilization under a platoon/company lane training strategy. This strategy reduced the maneuver land requirements of 2,041 of the 2,550 RC units and produced the most favorable results (in terms of total mileage) to date. The units traveled 237,729 miles (105,970 miles less than the base case and less than under either of the other alternatives) and 57,619,421 soldier miles (42,995,856 less than the base case and less than either of the other alternatives). There were 123 units which had to travel over 250 miles to train.

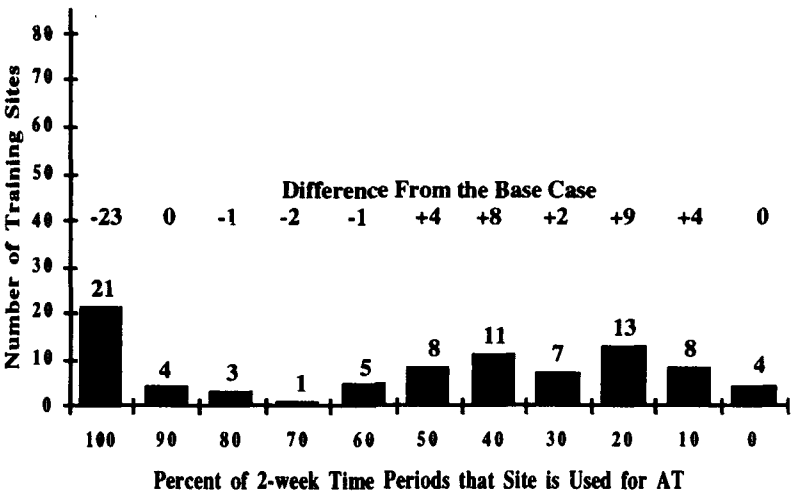

Figure 5-7. Training Site Utilization (plt/co lane strategy)

f. Summary. As shown in the discussion in the previous paragraphs, the actual allocation of units to installations varies markedly as the training strategy is varied and the performance measures related to distance occasionally fail to correctly identify superior solutions as defined by Department of the Army preferences. Therefore, in order to be able to draw conclusions from the model output, it is recommended that a variety of training strategies be used (especially as no definitive doctrine exists in this area) and that the units directly involved be examined to obtain an understanding for the quality of the solution presented. If this is done, and the findings are based on the robustness and quality of a particular result, full confidence can be placed in the conclusions drawn. Difficulties in relating the results drawn from the model to the real-life process will occur if only minimal output is obtained and no critical examination of the findings for robustness is made.

5-6. EXPANSION OF INSTALLATION RANGE CAPACITIES. A logical alternative to the reduction of a unit's maneuver land requirements is the procurement of additional maneuver land. Although highly desirable, this was considered to be impractical, given the nature of BRAC and the difficulties associated with the location of suitable terrain. This option was therefore not explicitly examined in this study. The addition of new firing ranges was, however, deemed to be feasible, given that sufficient savings (in travel and time) could be generated to offset the costs. Table 5-4 lists the 20 training areas containing enough maneuver land to support the training associated with the construction of new ranges (indicated with a (+) symbol, a "yes" indicates that the range already exists at the site). Although the list was not limited to Army (active and National Guard) owned installations, Camp Pendelton was the only non-Army site with

enough maneuver land to warrant the construction of additional firing ranges. Figure 5-8 shows the impact that upgrading the ranges indicated above had on training site utilization. Units traveled a total of 338,161 miles to reach their training areas, a savings of only 5,538 miles over the base case. This would tend to argue against the cost effectiveness of wholesale upgrades to firing ranges. However, there were a number of instances where specific units were able to achieve significant travel savings through the introduction of new firing ranges.

Table 5-4. Potential Locations for New/Modified Ranges

Name	State	Maneuver	Tank/Bradley Table VIII	Arty/Mort	MLRS	Aerial(Helo)
Fort Rucker	AL	202 km^2	(+)	(+)	No	Yes
Fort Chaffee	AR	257 km^2	(+)	(+)	No	Yes
Fort Huachuca	AZ	226 km^2	(+)	Yes	No	(+)
Fort Hunter Liggett	CA	202 km^2	(+)	(+)	No	(+)
Fort Irwin	CA	1902 km^2	Yes	Yes	(+)	Yes
Camp Pendleton	CA	463 km^2	No	Yes	(+)	Yes
Fort Carson	CO	1392 km^2	Yes	Yes	(+)	Yes
Fort Stewart	GA	1127 km^2	Yes	Yes	(+)	Yes
Orchard Range Tng Site	ID	404 km^2	Yes	Yes	(+)	Yes
Fort Campbell	KY	266 km^2	(+)	Yes	No	Yes
Fort Polk	LA	535 km^2	(+)	Yes	(+)	Yes
Camp Grayling	MI	364 km^2	(+)	Yes	(+)	Yes
Camp Shelby	MS	405 km^2	Yes	Yes	(+)	Yes
Fort Bragg	NC	871 km^2	Yes	Yes	(+)	Yes
Camp Rilea	OR	820 km^2	(+)	(+)	(+)	(+)
Fort Jackson	SC	231 km^2	(+)	Yes	No	(+)
Fort Hood	TX	567 km^2	Yes	Yes	(+)	Yes
Dugway Proving Ground	UT	1012 km^2	(+)	Yes	(+)	(+)
Yakima Firing Center	WA	971 km^2	Yes	Yes	(+)	Yes
Fort McCoy	WI	459 km^2	Yes	Yes	(+)	Yes

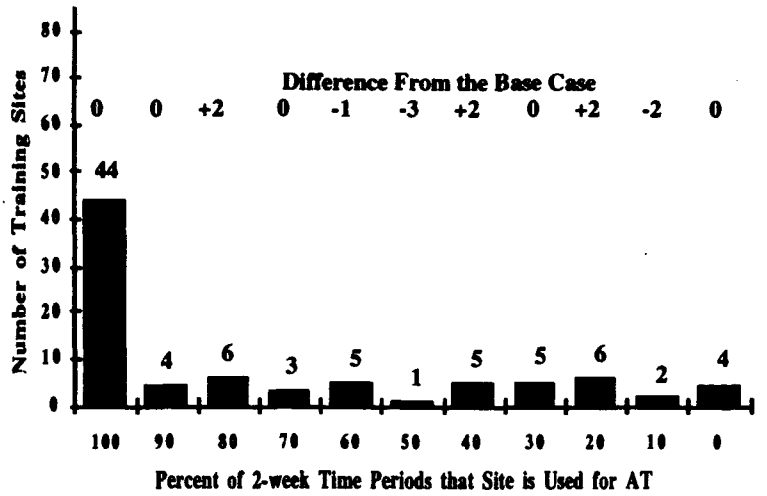

Figure 5-8. Training Site Utilization (additional firing ranges)

a. MLRS Ranges. The base case allocated all four of the MLRS units to Ft Bliss, Texas, for AT. The construction of an MLRS firing range at Camp Grayling, Michigan, would save a battalion from Detroit 1,337 travel miles. Similarly, an MLRS battalion from Glasgow, Kentucky, would save 834 miles if a firing range were to be built at Ft Bragg. The remaining two battalions were both located in Oklahoma and would save a combined 451 miles by going to Ft Hood, rather than Ft Bliss, to fire. Ft Sill, which is closer and contains an MLRS firing range, does not contain enough maneuver land (91 sq km versus the 320 required) to support AT. The data call conducted at the end of this effort determined that significantly more installations were capable of supporting MLRS firing than had been indicated in DIRT (Ft Bragg and Ft Hood were among these, but Camp Grayling was not). The need for MLRS training sites is expected to increase as the Army's modernization programs allocate new equipment, or redistribute equipment from deactivated units, to the reserves.

b. Tank/Bradley Table VIII. The construction of tank and Bradley tables at Fort Campbell led to nine additional battalions (eight armor and one mech) being allocated there for a net savings, to these units, of 1,545 miles. Individual mileage savings ranged from 5 miles (for a unit from Talladega, Alabama) to 386 miles (for a unit from Bowling Green, Kentucky). In addition, one of the armor battalions affected was stationed at Ft Knox and saved 311 miles by going to Ft Campbell for AT instead of Ft Bragg. Ft Knox, its home station, had the necessary tank tables but fell 20 square kilometers short of the 248 sq km of maneuver space needed to support the unit's training (this, once again, emphasizes the need to examine a range of training strategies). The introduction of tank and Bradley tables at Ft Polk had less of an impact. It generated only 536 miles in travel savings for four battalions (two armor and two mech).

5-7. COMPETITION WITH ACTIVE DUTY UNITS. To this point, the analysis has assumed that there would be sufficient unused capacity available at active duty installations to allow Reserve Component units 20 weeks (10 AT time periods) of training per year or, equivalently, that the RC units would be given priority over their active duty brethren for access to training resources. This paragraph will assess the impact of considering only the incremental capacity available at active duty installations (see paragraph 1-4d) for use by the reserves. Figure 5-9

shows the distribution of active duty units over the 85 RCTIFYRS AT installations. The solid disks represent approximately 25 UICs each, while the hollow disks indicate installations with less than 10 active duty units. There are 1,297 CONUS-based, active duty, TOE units in the FY 95 force. Figure 5-9 accounts for 1,203 of them on 29 RCTIFYRS installations. The remainder are located on non-RCTIFYRS installations (e.g., Ft Eustis, Ft Lee, Ft Sam Houston, Hunter Army Airfield, etc.). For the purposes of this evaluation, the attack helicopter and Ranger battalions stationed at Hunter Army Airfield, Georgia, have been added to the list of units at Ft Stewart.

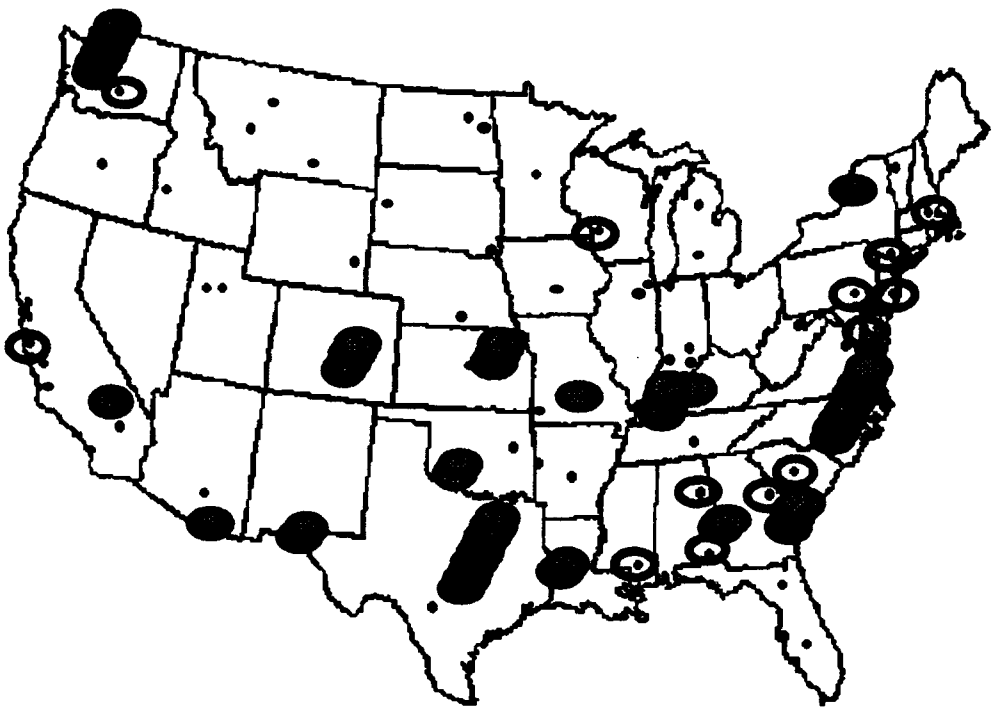

Figure 5-9. Distribution of Active Duty Units

a. Calculation of Residual Capacity. Figure 5-10 shows how the Active Component training requirements were calculated. The box on the left contains an extract of the maneuver land requirements for an armor/mechanized battalion or task force, taken from TC 25-1. This is similar to Figure 2-3, except that a number of additional items of information, unique to active duty units, have been added. In order to maintain proficiency, active duty units are required to train in each of the missions listed periodically, and at each echelon (i.e., at the platoon, company, and battalion level). The number of times, per year, and the duration associated with each of the tasks has been inserted next to the battalion maneuver area requirements for that mission. These were then multiplied and added to show that an armor/mechanized battalion or task force requires 2,368 square kilometer days per year to conduct its battalion-level training. Similar calculations were performed for companies and platoons and the results summarized in the figure, showing that each armor/mechanized battalion or task force required 29,608 square kilometer days of the installation's training capacity each year to train itself and its major subordinate units. The calculation shown does not account for the training needs of the battalion's "specialty" units (e.g., mortar, scout, communications, maintenance, etc.). Table 5-5 shows the results obtained by performing similar calculations on every active duty unit stationed on an active duty installation in the RCTIFYRS installation list (note that Ft Lewis and the Yakima Firing Range were combined

since most of the active duty units stationed at Ft Lewis train at Yakima). An "active duty use day" was calculated by dividing the number of square kilometer days, required by all of the active duty units resident on the installation, by the amount of maneuver area (in square kilometers) available on the training site. This yielded a close approximation of the number of days that each installation would be used by active duty units. The residual capacity was then calculated on the basis of 26 available 2-week AT time periods per installation per year. Only 12 of the 22 active duty installations had the requisite 10 AT time periods of unused capacity needed to support the reserves. Of particular note was the fact that seven of the installations (see the bottom of the table) were overcommitted and lacked sufficient capacity to support the TC 25-1 derived training requirements of the Active Component units stationed there.

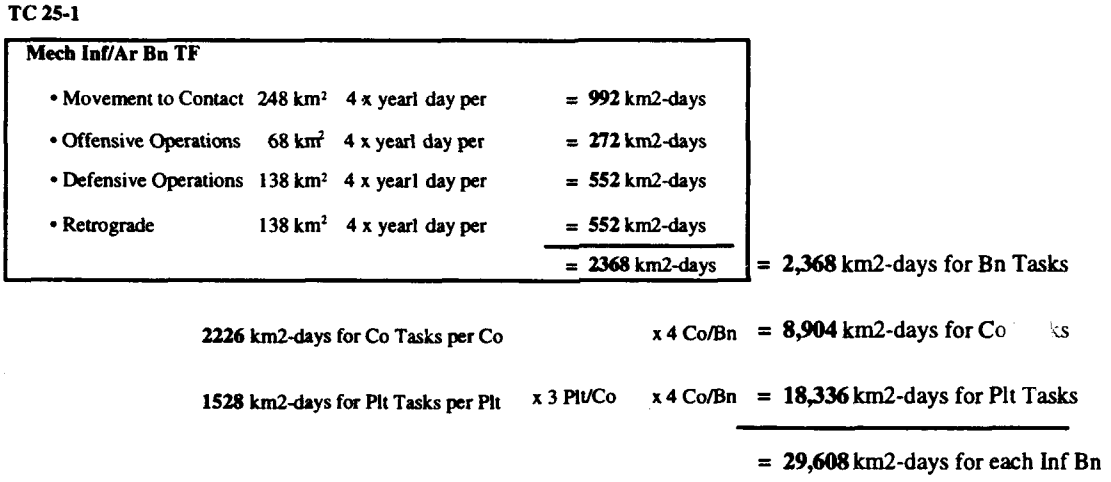

Figure 5-10. Extract of TC 25-1 Data

Table 5-5. Residual Capacity Available at Active Duty Installations

Training Site	Maneuver Area (in sq km)	Active Duty use (in days)	Residual Capacity (AT periods)
Ft Jackson	231	3	25
Ft McClellan	149	7	25
Ft Meade	12	13	25
Ft Irwin	1,902	16	25
Ft Gordon	156	20	24
Ft Bliss	1,360	30	23
Ft Drum	271	83	20
Ft Huacuha	226	100	19
Ft Knox	228	115	17
Ft Stewart	1,127	115	17
Ft Rucker	202	116	17
Ft Polk	535	160	15
Ft Devens	30	333	2
Ft Carson	1,392	340	1
Ft Sill	91	506	NONE
Ft Bragg	871	539	NONE
Ft Riley	202	618	NONE
Ft Hood	567	673	NONE
Ft Lewis/Yakima	257/971	1,113/233	NONE
Ft Leonard Wood	19	1,480	NONE
Ft Benning	25	2,076	NONE

b. Training Site Utilization Based Upon Incremental Capacity. Prior to modifying the RCTIFYRS installation list on the basis of the residual capacity available at active duty installations and reallocating the RC units to training sites, some consideration was given to the concept of time sharing between Active and Reserve Component units. One of the underlying assumptions of this study has been that the reserves would not have to compete for resources with active duty units during the 10 AT time periods which serve as the baseline; therefore, no consideration was given to what time of the year these 10 AT time periods would occur (i.e., the May through August timeframe traditionally favored by the reserves or some other, less desirable, part of the year). In considering incremental capacity, it was decided to allow active duty units a proportional share of both the resources and the preferred training times at their home installations. Table 5-6 shows the incremental capacity available at each of the 12 installations identified at the top of Table 5-5 (i.e., it shows the Reserve Component's share of the 10 AT time periods).

Table 5-6. Incremental Capacity Available at Active Duty Installations

Training Site	Active Duty use (in days)	Active Duty use (percent)	Incremental Capacity (AT periods)
Ft Jackson	3	0	10
Ft McClellan	7	0	10
Ft Meade	13	4	10
Ft Irwin	16	4	10
Ft Gordon	20	5	9
Ft Bliss	20	8	9
Ft Drum	83	23	8
Ft Huacuha	100	27	7
Ft Knox.	115	32	7
Ft Stewart	115	32	7
Ft Rucker	116	32	7
Ft Polk	160	44	6

(1) The center column shows active duty use as a percentage of the year (i.e., the number of days in the first column divided by 365). The incremental capacity available for use by the RC was calculated by reducing the 10 AT time periods by this amount. Figure 5-11 reflects training site utilization once active duty unit needs have been met. This figure is based upon 75 installations, 8 of which are available for less than 10 AT periods.

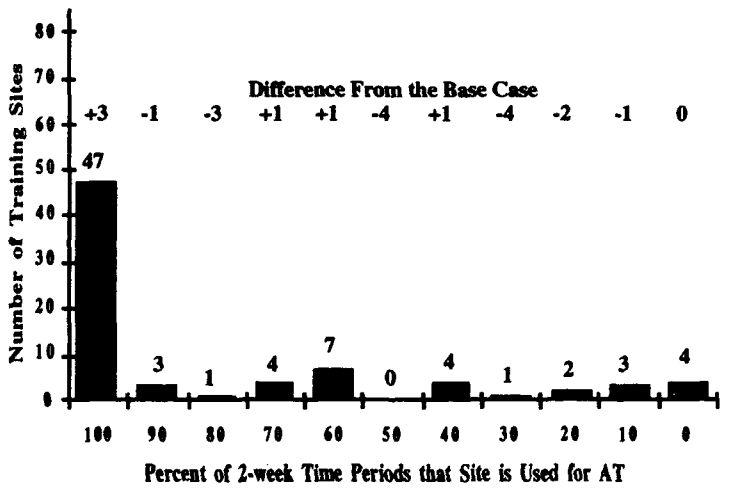

Figure 5-11. Training Site Utilization (incremental capacity)

(2) The units traveled 467,572 miles to train. This is 123,873 miles more than in the base case. This is not surprising, considering that the number of training options available to RC units has been reduced. Soldier miles increased by 60,674,541, and the number of units traveling over 250 miles increased by 104. All of which serves to highlight the RC's reliance on unrestricted access to active installations. This topic was pursued further, and more rigorously, in a separate analysis entitled Training Load on Active Duty Installations (TRAINLOAD), which was generated as an outgrowth of this study.

5-8. RELIANCE ON FACILITIES NOT UNDER ARMY CONTROL. Table 3-2 showed that 10 of the 85 installations considered in this study belonged to other services. This paragraph looks into the reliance that RCTIFYRS places on facilities which do not fall under Army control. Table 5-7 lists these facilities and summarizes their utilization under the base case. Fort Irwin and West Point have been added to the list because their year-round training missions may render them unavailable for RC use. The table indicates that these installations supported a total of 373 RC units and that their levels of utilization, over the 10 AT periods, ranged from 0 to 100 percent. The second, third, and fourth and columns from the right show the size of the units supported, while the fifth column shows the number of combat arms and engineer units trained at each installation. The combat and engineer units have been highlighted because of the high degree of importance placed on them by the sponsor. Figure 5-12 shows the impact that deleting the 12 installations had on facility utilization. The units traveled 398,898 miles to train. This is 55,199 miles more than in the base case. Once again, reducing the number of training options available to RC units led to an increase in the total distance the units traveled to reach their AT locations. Soldier miles increased by 13,899,882 and the number of units traveling over 250 miles increased by 81. A complete examination of this topic would require a detailed look into where each of the 373 (or at least the 31 combat arms) units were reallocated for training and what impact their presence had on these new training locations. This was, however, considered to be outside the scope of the study, and further pursuit of this issue was put into abeyance, pending sponsor interest.

Table 5-7. Base Case Use of Facilities Not Under Army Control

Name	State	Number of Soldiers	Number of Units	(CBT-Eng)	Bn	Co	Det/Tms	Percent of Time Used
Little Rock, AFB	AR	2,123	19	(0-0)	1	11	7	30%
Fort Irwin	CA	8,383	21	(12-0)	12	3	6	30%
Camp Pendleton (USMC)	CA	14,184	77	(5-1)	15	47	15	60%
29 Palms (USMC)	CA	0	0	(0-0)	0	0	0	0%
Air Force Academy	CO	453	6	(0-0)	2	1	3	60%
Avon Park (AF)	FL	4,152	27	(0-0)	6	9	12	90%
Naval Wpns Center	IN	6,872	40	(0-6)	7	25	8	100%
Camp LeJeune	NC	5,408	23	(5-0)	6	13	4	70%
Grand Forks AFB	ND	216	2	(0-0)	1	1	0	20%
West Point	NY	4,330	42	(0-0)	4	25	13	100%
Quantico	VA	8,723	71	(2-0)	7	35	29	100%
Volk Field (Air NG)	WI	4,670	45	(0-0)	4	20	21	100%
TOTALS		59,514	373	(24-7)	62	190	118	

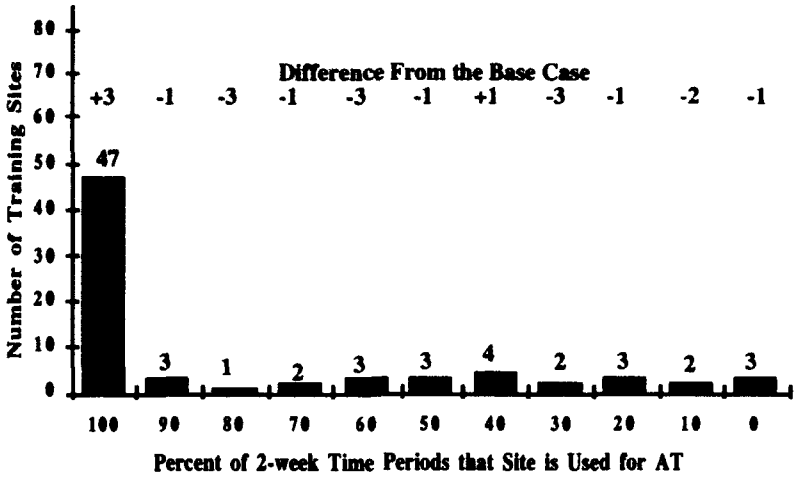

Figure 5-12. Training Site Utilization (Army installations only)

5-9. ANNUAL TRAINING SUMMARY. The AT analysis showed that sufficient capacity exists to meet all of the training needs of the FY 95 RC force over a 14-week period. This, however, represents the minimum amount of time required for a solution, and aspects of it may prove to be unpalatable to the sponsors of the study. The "quality" of the solution (i.e., the number of units able to travel less than a day to reach their training site) increased as the number of 2-week AT time periods under consideration increased. Ten AT time periods was selected for use as the baseline comparison in this study. Site selection was found to be very sensitive to a unit's maneuver land requirements. These requirements were developed from the guidelines contained in TC 25-1. The "quality" of the solution improved as these requirements were relaxed through the implementation of waivers or the adoption of alternative training strategies. Site selection was found to be much less sensitive to a unit's range requirements, since the majority of the RC units required access to little more than small arms ranges. However, the units which did require specialized ranges (combat units) were the ones which merited the greatest interest. The wholesale upgrade of all firing ranges produced only a modest improvement in the "quality" of the solution. However, a case can be made for a number of specific upgrades (e.g., upgrading the artillery ranges at Camp Grayling and Ft Bragg to fire MLRS). An examination of the incremental capacity available at active duty installations, based upon TC 25-1, indicated that Ft Benning, Ft Bragg, Ft Carson, Ft Hood, Ft Riley, and Ft Sill (among others) were likely to be fully committed to tenant unit training and therefore unable to support the reserves.

CHAPTER 6

INDIVIDUAL DUTY TRAINING ANALYSIS

6-1. GENERAL

a. This chapter presents the results of the RCTIFYRS analysis of individual duty training requirements. It is not intended to provide an exhaustive evaluation of the topic but rather to highlight the capabilities of the RCTIFYRS methodology and to offer areas for future research. All findings and conclusions are highly dependent on the accuracy and timeliness of the DIRT and SAMAS data used.

b. The emphasis of the IDT portion of the analysis is on a unit's access to training resources. It is understood that the majority of a unit's IDT will be conducted at, or near, its garrison location. This training can, however, be augmented through the use of nearby firing ranges and facilities. The purpose of this portion of the analysis is to gauge the Reserve Component's access to firing and training ranges at local training areas which allow units to train on all of their organic weapons and equipment. The next paragraph assesses the availability of small arms ranges. Subsequent paragraphs look at specialized unit range requirements. The final paragraph considers maneuver land. The IDT analysis differs from the AT evaluation in that units are not considered to compete for installation resources. The rationale for this is based upon the expectation that IDT will be conducted on a small unit basis; therefore, the actual resource requirements for any single IDT period will be small, and throughput calculations can be omitted. In addition, units should have sufficient scheduling flexibility to ensure that their requirements will always be met (i.e., it should not matter if range firing takes place the first, second, or third week of the month, or even next month, as long as it can take place. The actual determination of the dates for the training is a scheduling problem and is best left to the unit trainers and the installation's range control to resolve the details).

c. In analyzing access to ranges in support for IDT, two separate viewpoints can be considered. First, from the unit's perspective, the question of the number of alternative sites possessing a desired resource within a given travel radius of the unit can be asked (i.e., what is the unit's training options?). Alternatively, the question from an individual installation's viewpoint is: how many Reserve Component units, of what types, are in the population that can be expected to use the installation for IDT? The basis for addressing the IDT question from both of these viewpoints is the same; the analysis differs primarily on how the information is collated and displayed to address the current issues of interest.

6-2. SMALL ARMS RANGES. Figure 3-3, Chapter 3, shows the location of the 252 small arms qualification ranges identified in DIRT. Figure 6-1 shows the effect of adding 150-mile (approximately one-half day's travel) radius circles over each of the training sites in Figure 3-3 and then overlaying the locations of the 2,550 RC units requiring small arms ranges. A large number of units, particularly those located in the eastern portion of the country, are overlapped by multiple circles, indicating their proximity to multiple training sites. Figure 6-2 shows that only 15 of the 2,550 units had to travel more than one-half of a day to reach a small arms qualification range. Two of these units (an ordnance and a quartermaster company, both from Brownsville, Texas) had to travel 260 miles, to Lackland Air Force Base, to reach the nearest small arms range. The majority of the units (2,068 of the 2,550) were within 50 miles of a small arms qualification range.

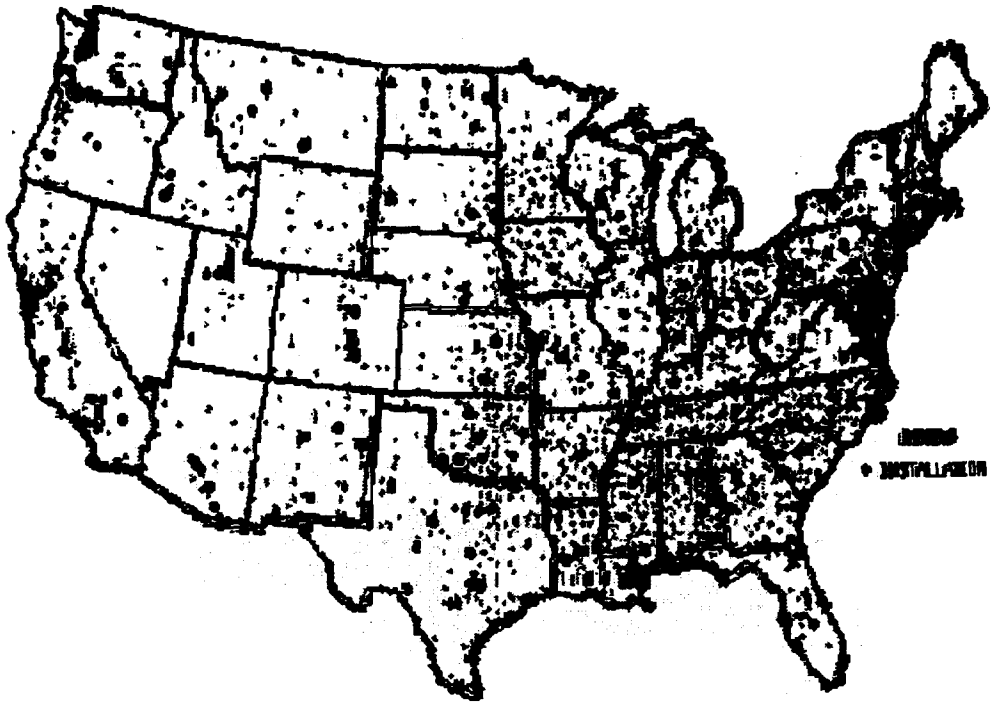

Figure 6-1. RC Units Within a Half Day's Travel of Small Arms Ranges

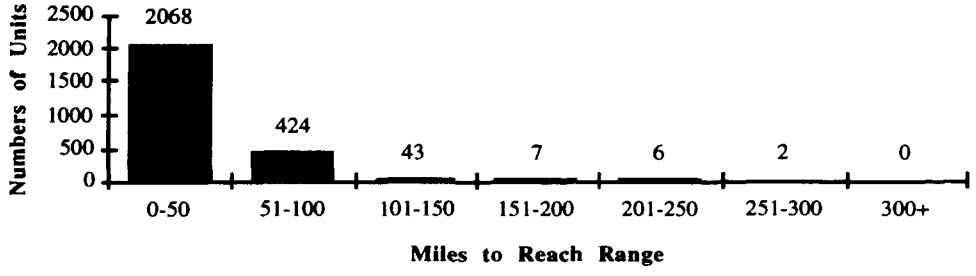

Figure 6-2. Distance RC Units Travel to Reach a Small Arms Range

6-3. ARTILLERY RANGES. Figure 3-4 shows the location of the 71 installations identified by DIRT as containing either artillery ranges or impact areas. Figure 6-3 shows the effect of adding 150-mile radius circles over each of the sites in Figure 3-4 and then overlaying the locations of the 73 tube artillery units in the FY 95 RC force. Figure 6-4 shows that only 8 of the 73 units fell outside one of the 150-mile radius circles. The most extreme case was a 155mm howitzer battalion from Caribou, Maine, which had to travel 306 miles to Ethan Allen Firing Range, Vermont. This unit's AT site is at Ft Drum, an additional 139 miles (Ethan Allen Range does not contain enough maneuver land to support AT). However, most of the units (50 of the 73) were within 100 miles of an artillery impact area.

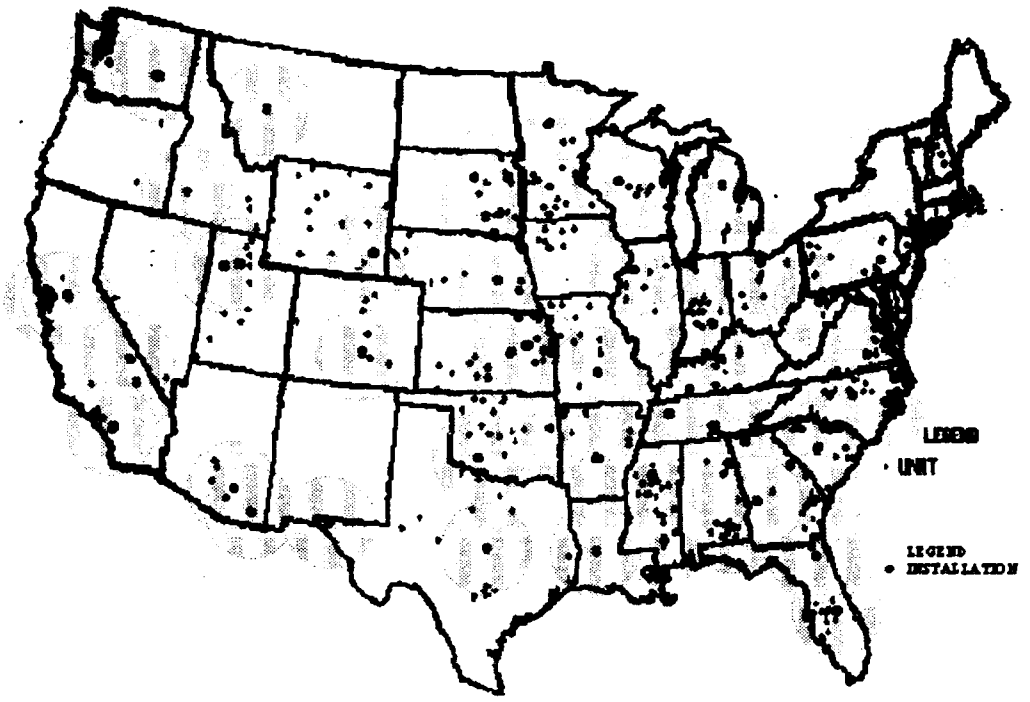

Figure 6-3. RC Units Within a Half Day's Travel of Artillery Ranges

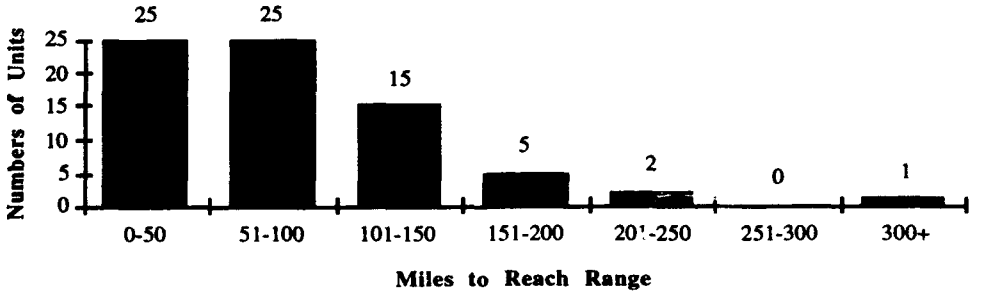

Figure 6-4. Distance RC Units Travel to Reach an Artillery Range

6-4. TANK RANGES. Figure 3-5 shows the location of the 60 installations identified by DIRT as containing tank main gun ranges (18 of these contain only subcaliber devices). Figure 6-5 shows the effect of adding 150-mile radius circles over each of the sites in Figure 3-5 and then overlaying the locations of the 61 armor and armored cavalry units in the RC. Figure 6-6 shows that 6 of the units had to travel more than 150 miles to fire their main guns. However, the majority of the units (51 of 61) were within 100 miles of a firing range.

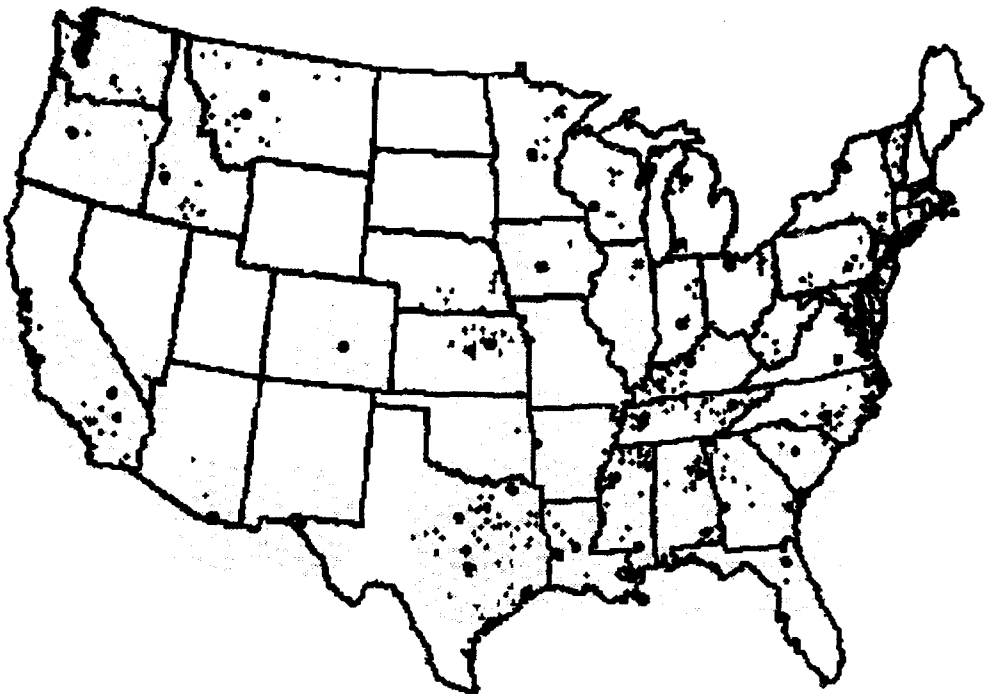

Figure 6-5. RC Units Within a Half Day's Travel of Tank Ranges

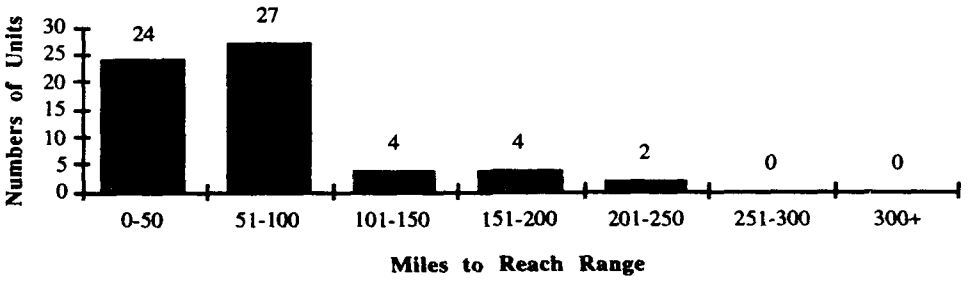

Figure 6-6. Distance RC Units Travel to Reach a Tank Range

6-5. BRADLEY RANGES. Figure 3-6 shows the location of the 29 installations identified by DIRT as containing Bradley ranges. Figure 6-7 shows the effect of adding 150-mile radius circles over each of the sites in Figure 3-6 and then overlaying the locations of the 37 RC units requiring these ranges. Figure 6-8 shows that 12 of the units had to travel more than 150 miles to fire their 25mm guns but that 17 of the units were within 100 miles of a firing range.

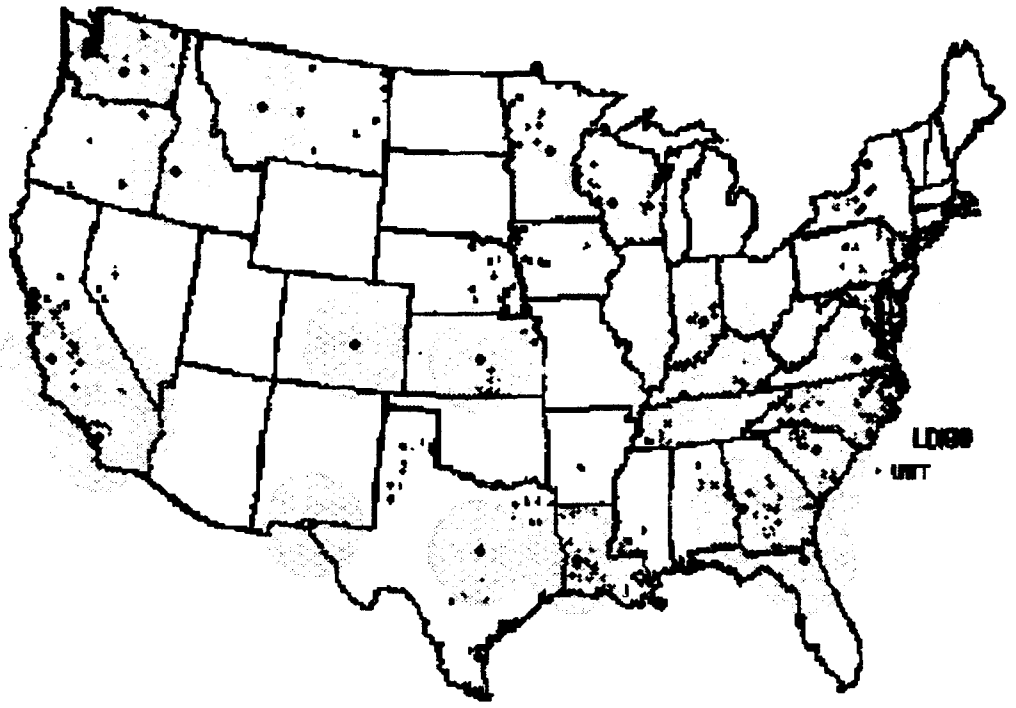

Figure 6-7. RC Units Within a Half Day's Travel of Bradley Ranges

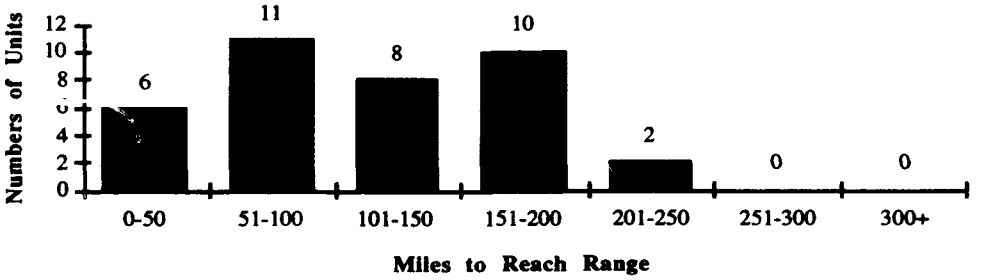

Figure 6-8. Distance RC Units Travel to Reach a Bradley Range

6-6. RANGES WITH TANK/BRADLEY TABLE VIII. Figure 3-7 shows the location of the 19 installations identified by DIRT as containing tank or Bradley Table VIII. Figure 6-9 shows the effect of adding 150-mile radius circles over each of the sites in Figure 3-7 and then overlaying the locations of the 74 armor, armored cavalry, and Bradley units in the RC force. Figure 6-10 shows that 40 of the units had to travel more than 150 miles to reach a qualification range. The farthest any single unit had to travel was 538 miles (a cavalry troop from Malta, Montana, had to travel to Orchard Range Training Site, Idaho). Less than half (34 of the 74) were within half a day's travel of a tank/Bradley qualification table. Upgrading the tank/Bradley ranges (see Figures 6-5 and 6-7) at Camp Dodge, IA; Ft Hunter Liggett, CA, and Ft Polk, LA (both of which were subsequently identified as containing a multipurpose range complex capable of supporting Table VIII); and at Limestone Hills, MT, would provide some relief for these units.

Figure 6-9. RC Units Within a Half Day's Travel of Tank/Bradley Table VIII

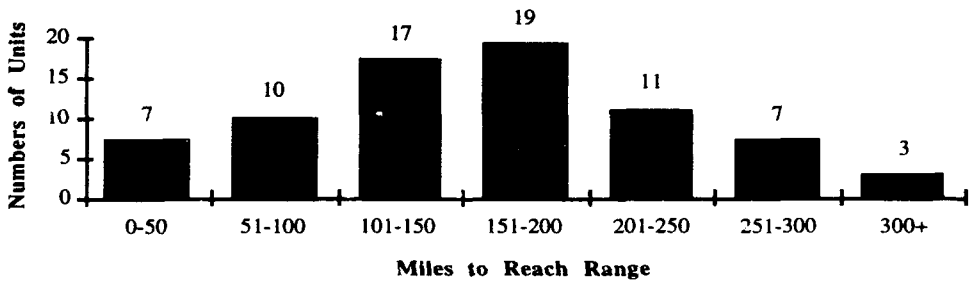

Figure 6-10. Distance RC Units Travel to Reach a Table VIII

6-7. ATTACK HELICOPTER RANGES. Figure 3-8 shows the location of the 36 installations identified by DIRT as containing aerial gunnery/rocket ranges. Figure 6-11 shows the effect of adding 150-mile radius circles over each of the sites in Figure 3-8 and then overlaying the locations of the 23 RC units requiring these ranges. Figure 6-12 shows that only 4 of the 23 units fell outside one of the 150-mile circles. The most extreme case was that of an attack helicopter battalion from Marana, Arizona, which had to travel 322 miles to reach the nearest range at 29 Palms, California. This battalion's AT site is at Ft Bliss, 326 miles from its home station (29 Palms does not contain enough maneuver land to support AT).

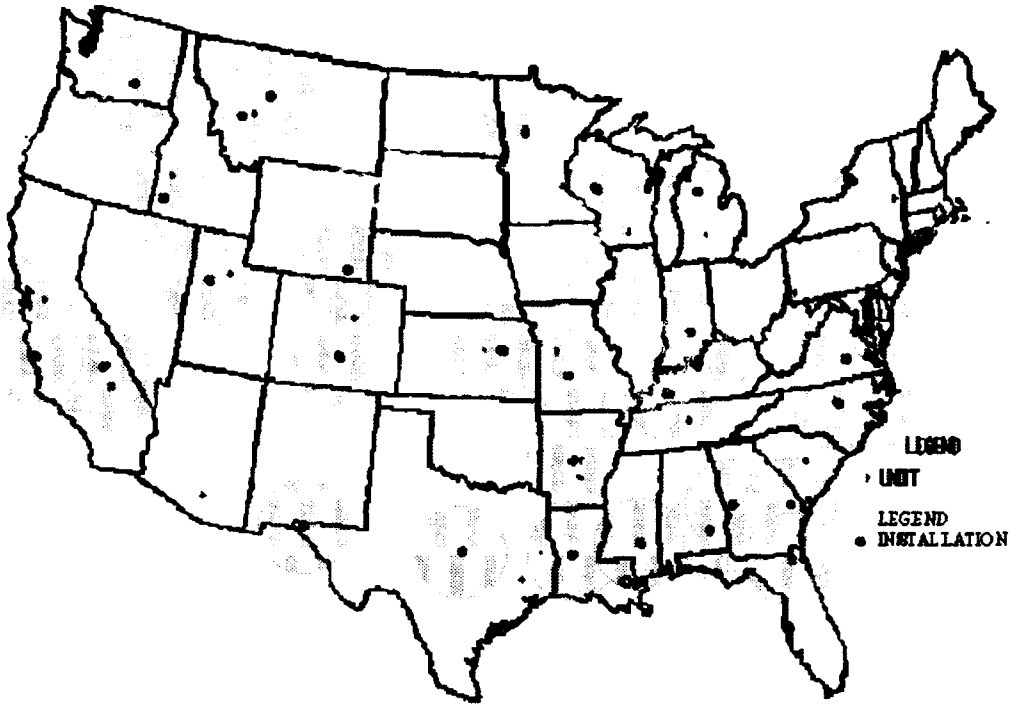

Figure 6-11. RC Units Within a Half Day's Travel of Aerial Gunnery/Rocket Ranges

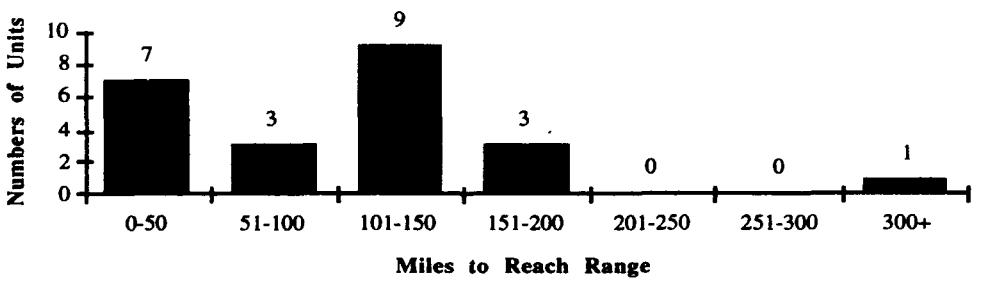

Figure 6-12. Distance RC Units Travel to Reach an Aerial Gunnery/Rocket Range

6-8. DEMOLITION RANGES. Figure 3-9 shows the location of the 35 installations identified by DIRT as containing demolition ranges. Figure 6-13 shows the effect of adding 150-mile radius circles over each of the sites in Figure 3-9 and then overlaying the locations of the 105 engineer units in the RC which require demolition ranges. Figure 6-14 shows that 39 of the units had to travel more than 150 miles to train with demolitions. The farthest any single engineer unit had to travel was 803 miles (a battalion in Belingham, Washington, had to go to Camp Parks, California). However, more than half of the units (66 of 105) were with in 150 miles of a demolition training range. The 35 sites selected for analysis were extracted from the DIRT data base using a search for all locations with demolition ranges. A second query, asking for all locations where C-4 demolitions could be used, turned up an additional 43 facilities. Figure 6-15 shows that the addition of just 11 of these sites would greatly reduce the number of units falling outside one of the "half day" circles.

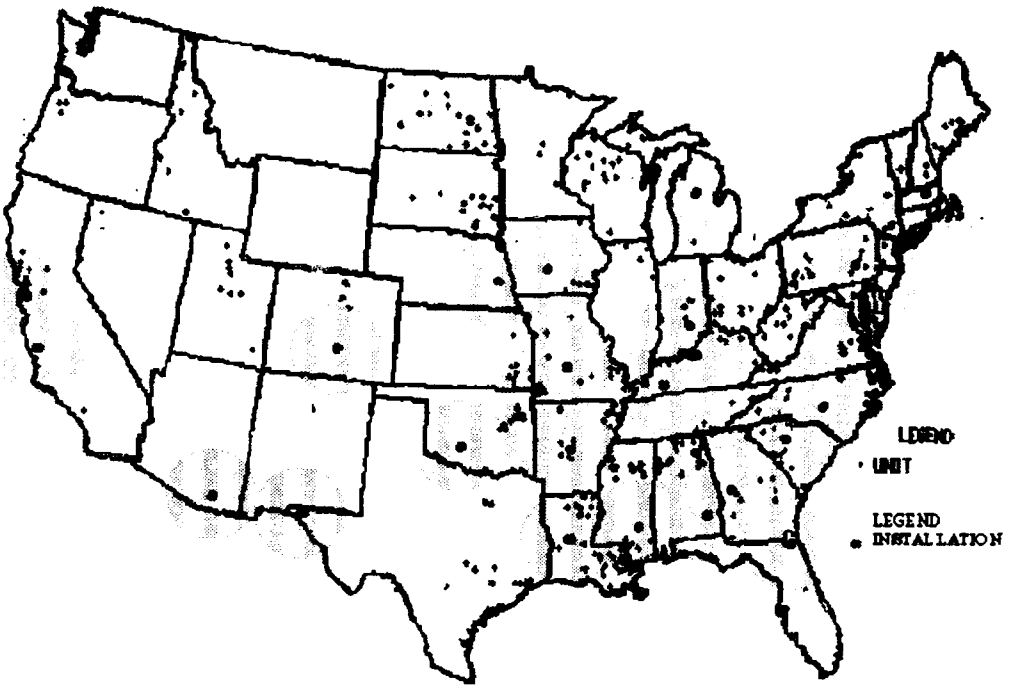

Figure 6-13. RC Units Within a Half Day's Travel of Demolition Ranges

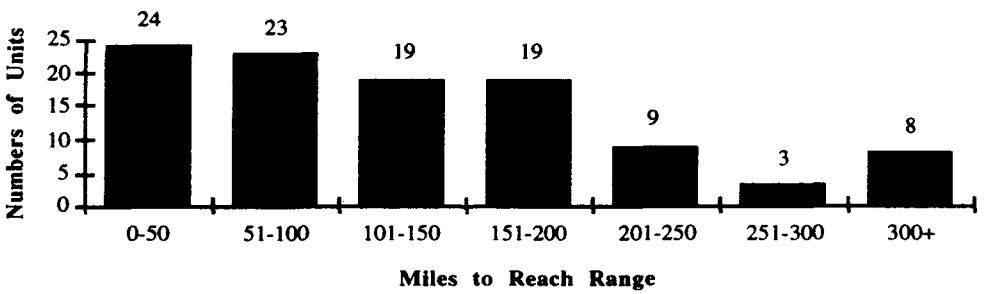

Figure 6-14. Distance RC Units Travel to Reach a Demolition Range

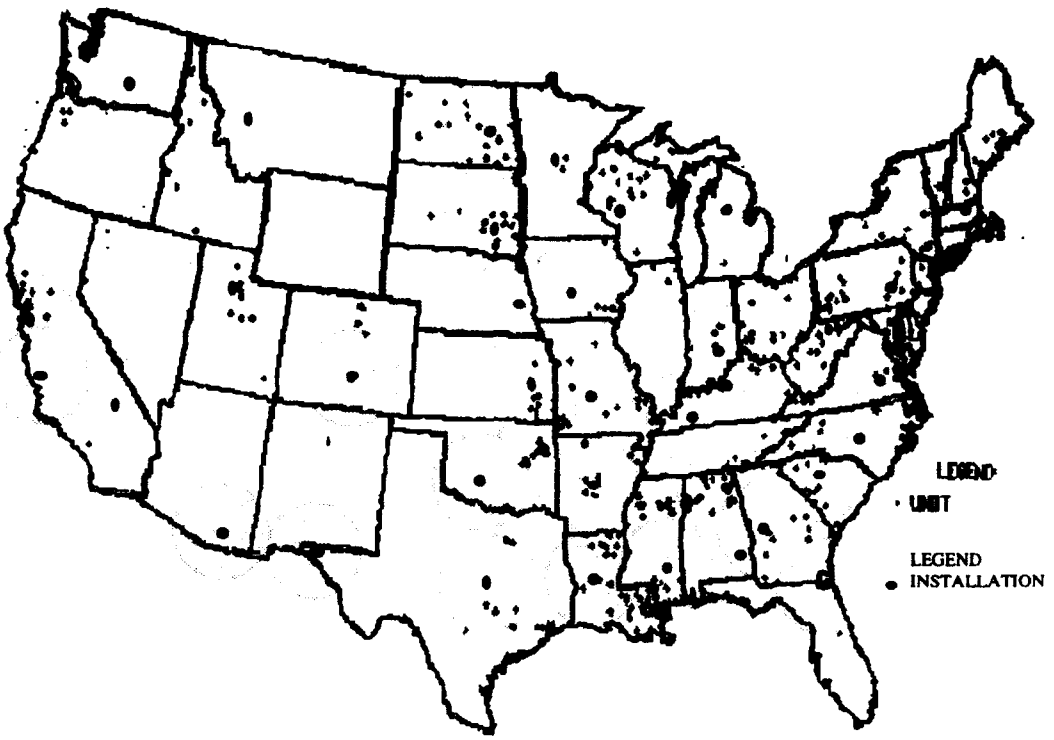

Figure 6-15. Impact of Additional Demolition Ranges

6-9. MANEUVER AREAS. Figure 3-2 shows the 85 installations used in the AT portion of the analysis. The common denominator among these ranges is that they all contain at least 4 sq km of maneuver land. Figure 6-16 shows the effect of adding 150-mile radius circles over each of these sites and then overlaying the locations of the 2,550 RC units. Figure 6-17 shows that only 172 of the 2,550 units fell outside one of the 150-mile circles. The most extreme case was that of a 155mm howitzer battalion from Caribou, Maine, which had to travel 306 miles to Ethan Allen Firing Range, VT (see paragraph 6-3). The majority of the units (1,966 of the 2,550) were within 100 miles of a maneuver area.

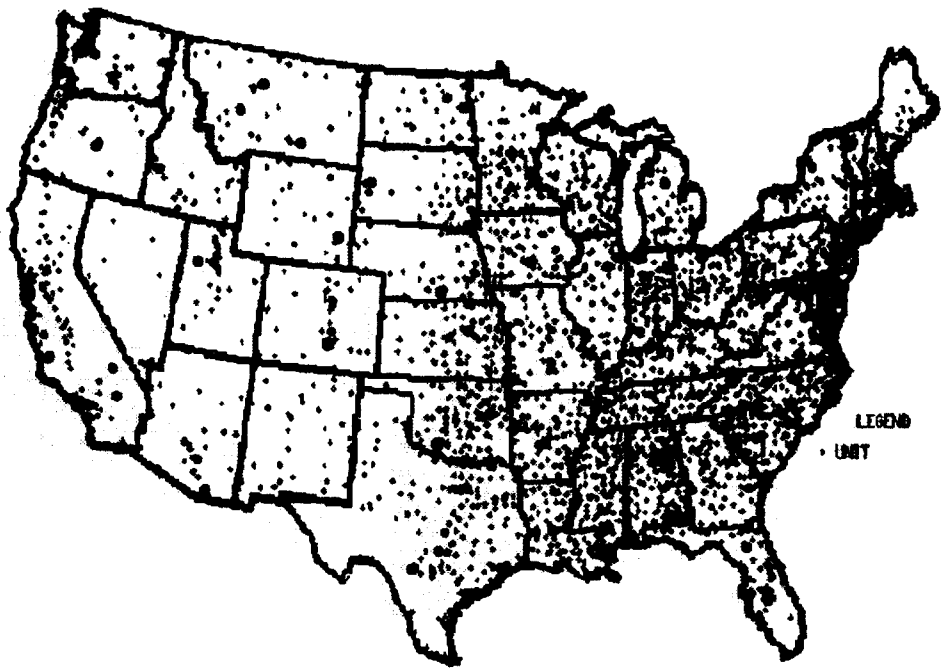

Figure 6-16. RC Units Within a Half Day's Travel of Maneuver Areas

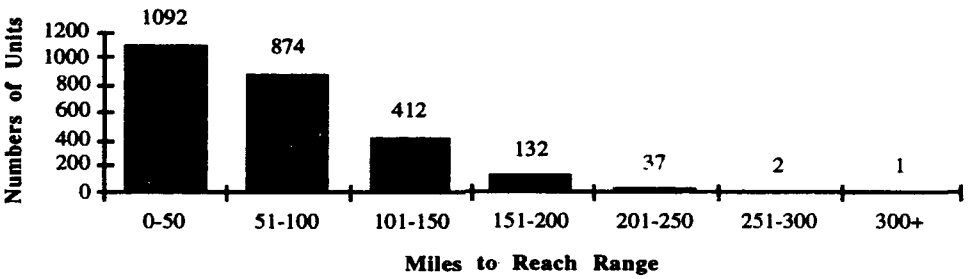

Figure 6-17. Distance RC Units Travel to Reach a Maneuver Area

6-10. INDIVIDUAL DUTY TRAINING SUMMARY. The IDT analysis shows that RC units have reasonable (i.e., within half of a day's travel) access to all facilities/ranges, that they may require, except tank/Bradley Table VIII and demolition ranges. The lack of demolition ranges appears to be a data problem. The lack of Table VIII can be ameliorated through the modification or upgrade of several of the existing tank and Bradley ranges at other facilities.

CHAPTER 7

SUMMARY AND FINDINGS

7-1. GENERAL. This chapter provides a summary and presents the findings of the Reserve Component Training Installation/Facility Yearly Requirements Study.

7-2. SUMMARY. The purpose of the study was to develop and demonstrate a methodology and means for identifying and selecting training locations for the Army National Guard and Army Reserve based on economic, environmental, and readiness issues. This was accomplished. The methodology addresses readiness issues directly (economic issues were subordinated to these and handled by inference) and is flexible enough to incorporate environmental impacts should the data become available.

7-3. FINDINGS

a. The RCTIFYRS methodology provides a tool for evaluating installations on the basis of the support they are capable of providing to the Reserve Components. An individual installation, or a group of installations, can be spotlighted (see Figure 7-1) in terms of the number of units that can be supported for AT and IDT and the competing installations in the immediate area. The impact of an installation's closure can be assessed in terms of the RC force as a whole, or the other installations which must pick up its training load. RCTIFYRS offers a better tool for justifying the retention of a given facility than it does for identifying candidates for closure. The methodology does not consider mitigating factors (e.g., training resources unique to a given facility) which may argue against its closure.

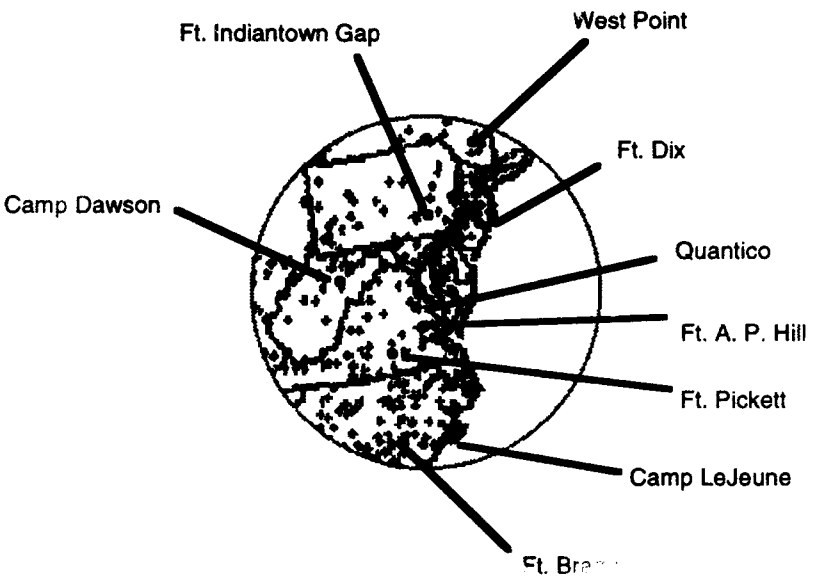

Figure 7-1. Training Facilities and RC Units in Mid-Atlantic Region

b. RCTIFYRS is only as accurate and current as the data that it uses.

(1) The FY 95 force, used to establish the RC training requirements for this study, was derived from the November 1992 SAMAS. The November 1993 update of the SAMAS increases the number of RC units in the force structure from 2,550 to 2,751. This is an increase of 201 units in just 12 months.

(2) The capacities and capabilities contained in the 85 AT facilities and 271 IDT sites examined in this study were primarily derived from the DIRT data base. A comparison of Appendix D and Appendix E will highlight the differences between the data that was used in the study and the "ground truth" developed by surveying each of the 85 AT facilities. Updating the IDT information (see Appendix F) would involve contacting 186 additional installations (all of the AT sites are included on the IDT list). This was considered to be outside the scope of the study but may well prove to be a worthwhile undertaking for headquarters agencies desiring to employ the RCTIFYRS methodology in support of management decisions.

c. As long as the number of AT periods is not excessively restricted, there is more than enough capacity at CONUS installations to train the Reserve Components.

(1) The annual training requirements of the Reserve Components, as specified in TC 25-1, can be met by 81 of the 85 installations considered in this study, in a minimal timeframe of 14 weeks (i.e., seven 2-week AT time periods).

(2) Training sites can only accommodate a finite number of units during any given 2-week AT period. When a site runs out of room, a unit must either be sent to another site or rescheduled to the original site but at a later time period. Total training capacity therefore varies as a function of time, with additional capacity becoming available as the number of 2-week AT periods considered increases beyond seven. The presence of additional capacity increases the number of options available to units and allows more of them to be allocated to facilities close to their home stations. This reduces the number of anomalies, when comparing the results to a "real-world" solution, and improves the overall quality of the allocation provided. Ten AT time periods was selected as the baseline for this study.

(3) The major factor affecting training site selection is the presence of maneuver land. Any waiver to the maneuver land requirements specified in TC 25-1 (e.g., a 20 percent reduction or the adoption of an alternative training strategy) yields a marked increase in the number of potential training sites available to most units. The increase is most notable among the combat arms units which have greater maneuver needs than the combat support or combat service support units.

d. An analysis of active duty training requirements, based upon TC 25-1, indicated that Ft Benning, Ft Bragg, Ft Carson, Ft Hood, Ft Riley, and Ft Sill (among others) were fully committed to tenant unit training and therefore likely to be unable to support the reserves.

e. An analysis of individual duty training needs showed that RC units have reasonable (i.e., within half of a day's travel) access to all facilities/ranges that they may require, except, possibly, tank/Bradley Table VIII and demolition ranges. The uncertainty expressed here is due to a lack of confidence in the accuracy of the data obtained from DIRT.

f. The construction of MLRS firing ranges (or the upgrade of existing artillery ranges) at Camp Grayling and Ft Bragg would result in significant travel savings for two of the RC's four MLRS battalions.

7-4. AREAS FOR FURTHER ENHANCEMENT

a. Variable AT Periods per Installation. Currently, the installations are assumed to have a uniform length training cycle. This is unlikely to be valid, as installations in the northern regions will probably have a fewer number of AT periods available due to inclement weather patterns. The methodology has been set up to handle variable numbers of AT periods by installation; this variation has been tested, but the data collection effort has not been made to fully incorporate it into the RCTIFYRS process.

b. Prioritization of the RC by Class. Discussions with the sponsor indicate that not all RC units have the same importance for access to training resources. Those units designated for early activation, or which are roundout units for active forces, are considered more vital than other portions of the RC. This sorting of the RC by class of importance can be easily incorporated into the methodology by applying the current procedures iteratively to each class of the RC in order.

c. Environmental Impacts. The presence of environmentally prohibited areas can be used to modify the maneuver land available in order to more fully reflect the installation's capability to train units. In the current edition of RCTIFYRS, it was found that the information to take the environmental restrictions into account was not readily available and is not included in the results of this study. The procedure for taking the restrictions into account has been included in the methodology and has been tested as correct. Three specific areas of environmental concern which could be included in the RCTIFYRS process are identified below. (Note: this is not meant as an exhaustive listing.)

(1) First, the currently identified environmentally sensitive areas can be decremented from the gross maneuver land available to provide a net usable figure for maneuver.

(2) Next, the maneuver areas available can be classified as to the types of units which are suitable for training in those specific areas.

(3) Finally, any range control guidelines for rest and recovery of the maneuver acreage can be incorporated in the guidelines used to select and allocate terrain for use during AT.

d. Costing of the Developed Solution. The economic impact of training the Reserve Component was found in the study to be dominated by the readiness concerns. However, cost aspects of the solutions could be further expanded and incorporated explicitly into the methodology. Three such areas are immediately apparent.

(1) First, the different proposed solutions currently generated by RCTIFYRS could be costed directly within the methodology. These costs could be developed to include not only the direct transportation costs, but also the marginal costs at the installations for training the units designated to perform AT at any specific site.

(2) Secondly, the current methodology prioritizes units on the basis of the number of potential training locations available. Within this scheme, no further distinction is made that unit A is more important to assign to AT before some unit B with the same number of overall potential training sites. Total costs to train, or just travel, could be used as a secondary criterion to obtain not only the current allocation to training sites, but also the best cost allocation which meets the overall prioritization.

(3) Lastly, since the current analysis pays little attention to units traveling less than a day's travel, incurred costs to train could be used to distinguish between alternative installations which meet the overriding criterion of being within a single day's travel. This is handled somewhat implicitly, as closer installations are given priority for assignments over more distant

installations, and travel costs are related to distance traveled. However, a more rigorous treatment of the total costs may well result in changes in the actual installations selected.

e. Revised Allocation of Maneuver Space. The current methodology allocates maneuver space through a gross measure. A more accurate procedure would be to have detailed data on the maneuver boxes available at each installation and to allocate units to AT depending on the boxes available at each installation. This is within the capability of the optimization procedure, but the data collection effort required may exceed the incremental value of the improved solution obtained. A second method of improving the maneuver space allocation is to evaluate what specific types and classes of units each installation is suitable to support. This information can then be used in the determination of the number of alternative potential training sites and also in the allocation process.

APPENDIX A

STUDY CONTRIBUTORS

1. STUDY TEAM

a. Study Director

LTC Rodger A. Pudwill (Jul 92 - Present)
LTC Robert R. Koury (Mar 92 - Jul 92)

b. Team Members

LTC James G. Goodenkauf
Mr. Andrew Kourkoutis
Mr. Ernest J. Rose

2. PRODUCT REVIEW BOARD

Mr. Ronald J. Iekel, Chairman
LTC Robert C. Bailey
Dr. Ralph E. Johnson

APPENDIX B

STUDY DIRECTIVE

DEPARTMENT OF THE ARMY
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS
WASHINGTON, DC

REPLY TO
ATTENTION OF
DAMO-ZB

15 MAY 1992

MEMORANDUM FOR DIRECTOR, U.S. ARMY CONCEPTS ANALYSIS AGENCY,
ATTN: CSCA-FSR, 8120 WOODMONT AVENUE,
BETHESDA, MARYLAND 20814-2797

SUBJECT: Reserve Component Training Installation Facility Yearly Requirements Study (RCTIFYRS) -- Study Directive

1. PURPOSE. This directive tasks U.S. Army Concepts Analysis Agency (CAA) to develop and demonstrate a methodology and set of tools for identifying and selecting training locations for the Army National Guard and Army Reserve based on environmental, economic and readiness requirements.

2. STUDY TITLE. Reserve Component Training Installation Facility Yearly Requirements Study (RCTIFYRS).

3. BACKGROUND. The Base Closure and Realignment Commission of 1991 took exception with the Army's submission of installations to be closed or realigned. This exception was based on the lack of justification to support Reserve Component unit stationing and for maintaining major training areas to support the Reserve Components. The U.S. Army Concepts Analysis Agency undertook a quick reaction analysis to determine the feasibility of conducting a study to determine major training areas necessary to support required Reserve Component training. Results of this quick reaction analysis indicated that it was feasible to conduct such a study.

4. STUDY PROPONENT. Assistant Deputy Chief of Staff for Operations and Plans (DAMO - ZB) is the study proponent. MAJ Eli Alford, DAMO-ZR, 697-3508, will serve as the proponent's representative.

5. TERMS OF REFERENCE.

a. Purpose. To develop and demonstrate a set of practical and comprehendible tools of sufficient fidelity to evaluate the economic implications of expansion of currently or potentially available training facilities or closure of facilities oriented toward supporting Army National Guard and Army Reserve peacetime training.

b. Objectives.

(1) Identify and catalog applicable training facilities considered by this study. Such activity to include verification of current capabilities and tentative changes in training facilities available due to probable future events (e. g., BRAC actions).

DAMO-ZB
SUBJECT: Reserve Component Training Installation Facility Yearly Requirements Study (RCTIFYRS) -- Study Directive

(2) Provide an assessment of Reserve Component training requirements versus facility capabilities in order to determine resource inefficiencies.

(3) Identify potential environmental constraints at available facilities within the study.

(4) Develop capabilities to display results in a fashion that would be useful and understandable to multiservice, Congressional and executive bodies.

c. Scope.

(1) Conduct the study in three phases. Phase I will address combat units only and will focus on force packages by priority. Phase II will incorporate combat support and combat service support units by force package priority. Phase III will address inactive duty training (IDT) requirements.

(2) Address all CONUS (to include Alaska and Hawaii) Reserve Component units and all federally and selected state owned installations for MTAs only.

(3) Address the incremental capacity that may be available at selected division-size installations (e. g., Forts Stewart, Carson, and Riley).

(4) Initially focus on the 15-day annual training period for Reserve Component units with respect to major training areas (e. g., Forts A.P. Hill, Pickett, Chaffee, and Shelby). Requirements will be based at company level in keeping with the most recent FORSCOM initiative, BOLD SHIFT.

(5) Base training requirements on Base Force structure and current weapon systems.

6. RESPONSIBILITIES.

a. Study proponent will:

(1) Provide a study coordinator/executive.

(2) Assist CAA in obtaining data and points of contact.

(3) Prepare an analysis of study results IAW AR 5-5, Army Studies and Analyses.

b. Study agency will:

(1) Appoint a study director and full-time study team.

DAMO-ZB
SUBJECT: Reserve Component Training Installation Facility Yearly Requirements Study - (RCTIFYRS) -- Study Directive

(2) Establish direct communications with HQDA and other Army organizations required for the conduct of the study.

(3) Provide in-progress reviews as requested and a final study report to the study proponent.

7. ADMINISTRATION.

a. CAA will provide all administrative support necessary for the conduct of the study.

b. CAA will coordinate with study proponent for TDY funding as required for study research purposes.

c. Milestones:

EVENT	DATE
Study Directive Approval	18 May 92
In-process Reviews	As Requested
Model Demo (Phase I Only)	15 Aug 92
Phase II Results	1 May 93
Phase III Results	1 Aug 93
Publish Final Report	15 Sep 93

d. DAMO-ZR, in coordination with CAA, will prepare the initial DD Form 1498.

e. CAA will submit the final, approved report to DTIC.

f. CAA will provide study results to the sponsor as a study report.

g. This directive has been coordinated with CAA IAW paragraph 4, AR 10-38, United States Army Concepts Analysis Agency.

DANIEL R. SCHROEDER
Major General, GS
Assistant Deputy Chief of Staff for
Operations and Plans

APPENDIX C

GENERIC UNIT CATEGORIES

This appendix contains an alphabetical listing of the 71 generic unit category codes discussed in paragraph 2-6, Chapter 2. These codes were used to describe unit training requirements for the analysis of Reserve Component annual training. Next to each category code is its associated maneuver requirement (in square kilometers) and a "Yes" indicator under each of the major firing ranges (Tank Table VIII, Bradley fighting vehicle Table VIII, artillery, MLRS, mortar, helicopter gunnery/rocket, and air defense missile) which apply. Listed under each code are the SRCs, a description of the type of unit, and the number of units in the FY 95 force.

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Generic Category	SRC	Type of Unit	Qty	Mnvr Area	Ranges TNK	BFV	AMRY	MLRS	MORT	HEAL	HADQ
AD10				**99**							**Y**
	44445L200	BN CHAPARRAL (CORPS)	7								
AD11				**99**							**Y**
	44495L000	BN HAWK (CORPS)	4								
	44635L200	BN PATRIOT (4 BTY)	1								
AD12				**99**							
	44115L200	BN INF DIV (LIGHT)	1								
	44125L200	BN HVY GUN/STINGER	7								
	44435L000	BN AVENGER	1								
AD20				**99**							
	44413L300	BTY ACR/SEP BDE	1								
	44603L000	HHB ADA BDE	2								
AR10				**248**	**Y**				**Y**		
	17375L000	BN TANK (M1)	37								
AR11				**248**	**Y**	**Y**			**Y**		
	17375L200	BN TANK (M1A1)	5								
AR12				**600**	**Y**				**Y**		
	17055H040	SQ ACR M113/M60	1								
AR13				**600**	**Y**	**Y**			**Y**		
	17285L100	SQ CAV (M60)	7								
	17485L100	SQ ACR (M1)	3								
AR20				**9**							
	17442L000	HHT CAV REGT	1								
	87004L100	HHC DIV	3								
	87004L200	HHC HVY DIV	4								
	87042L100	HHC HVY BDE	10								
	87042L200	HHC HVY BDE	12								
	87102L100	HHC HVY SEP BDE	2								
	87102L200	HHC HVY SEP BDE	4								
AR22				**300**	**Y**	**Y**			**Y**		
	17387L100	TRP CAV	1								
	17387L200	TRP CAV (M1/M3)	7								
AR30				**9**							
	87103L000	DET DIV REAR CP OPNS	16								
AV10				**434**						**Y**	
	01175L000	BN ATK HEL LT IN DIV	1								
	01385L100	BN ATK HEL AH-1	5								
	01385L200	BN ATK HEL AH-64	13								
AV11				**499**							
	01115L300	BN ASLT HEL (LT)	1								
	01205L000	BN ASSLT HEL (UH-60)	7								
	01245L100	BN MDM HEL	1								
	01405L100	BN ASLT HEL	1								
	01865L000	BN CBT SOF	1								
AV12				**600**							
	01415L000	BN CMD AVN	2								

Generic Category	SRC	Type of Unit	Qty	Mnvr Area	TNK	BFV	ARTY	MLRS	MORT	HELO	ADA
											Ranges
AV20				**9**							
	01112L300	HHC AVN BDE	1								
	01246L000	HHC MDM HEL BN CH-47D	3								
	01302L000	HHC AVN BDE	7								
	01402L000	HHC AVN BDE	1								
	01422L000	HHDATS GP	1								
	01426L000	HHDATS BN	1								
	01482L000	HHC ATK GP	11								
	01606L000	HHC THEATER AVN BN	1								
	01946L000	HHC MAINT BN CORPS	3								
	01966L000	HHCAVN MAINT(EAC)	1								
AV21				**600**						**Y**	
	01315L100	SQ CBT AVN ACR	1								
	01387L200	CO E ATK HEL AH-64	2								
	17185L000	BN RECON LID	1								
AV22				**9**							
	01304L000	CO D CMD AVN (GS)	7								
	01427L000	CO ATC (FWD)	1								
	01427L100	CO ATS (DIV)	8								
	01607L200	CO THTR AVN	3								
	01933L100	CO F AVN MAINT	1								
	01933L300	CO F AVN MAINT	6								
	01947L200	CO L AVN MAINT	2								
	01947L600	CO E	1								
	01947L800	CO F AVN MAINT	3								
	01967L100	CO A AVN MAINT	2								
	01967L400	CO F AVN MNT	1								
	01977L000	CO AVN MAINT ID (LT)	1								
	32093H500	CO AVIATION (REAR)	1								
AV23				**99**							
	01247L000	CO D MDM HEL CH-47D	9								
	01303L100	CO E ASLT HEL UH-1	4								
	01303L200	CO E ASLT HEL UH-60	3								
CM10				**9**							
	03472L000	HHC CHEM BDE	3								
	03476L100	HHD CHEM BN	8								
CM11				**4**							
	03579LB00	TM NBC ELEM JB	9								
CM20				**126**							
	03157L000	CO HEAVY DIV	7								
	03377L000	CO ACR (S/D/R)	1								
	03417L000	CO DECON	11								
	03427L000	CO NBC RECON	2								
	03437L000	CO SMOKE GENR (MECH)	2								
	03447L000	CO SMOKE GENR	20								
	03467L000	CO SMOKE/DECON (L)	1								

Generic Category	SRC	Type of Unit	Qty	Ranges: Mnvr Area	A M M H T B R L O E A N F T R R L D K V Y S T Q A
CO10				**9**	
	12113L000	BAND ARMY	68		
	14612L000	CMD THEATER FINANCE	1		
	33702L000	HHC PSYOP GP	3		
	33703L000	CO STRAT DISSEM	2		
	33704L000	CO RESEARCH&ANALYSIS	3		
	33706L000	HHC PSYOP BN	6		
	33707L000	CO OPNL SPT	1		
	33708L000	CO TACTICAL SPT	22		
	41701L000	HHC THEATER CMD	3		
	41702L000	HHC BDE	9		
	41705L000	BN (GENERAL PURPOSE)	16		
	41715L000	BN (FID/UW)	4		
	41718L000	DET (DS) (FID/UW)	1		
	41725L000	BN (DS)	8		
CO11				**4**	
	12402J420	HHC PERSONNEL CMD	1		
	12402L000	HHD PERS GRP TAACOM	1		
	12407L000	REP CO CRC	32		
	12413L100	CO POSTAL (DS)	3		
	12413L400	CO POSTAL (DS)	8		
	12423L100	CO POSTAL (GS)	5		
	12423L300	CO POSTAL (GS)	1		
	12426L000	HHD PERSONNEL BN	17		
	12426L100	HHD PERSONNEL BN	1		
	12427L000	DET PERSONNEL BN	55		
	12606L000	HHD REPL BN-CRC	8		
	14412L000	GRP FINANCE	3		
	14423L000	DET FINANCE BN	59		
	14426L000	HHD FINANCE BN	16		
	14426L100	HHD FINANCE BN	3		
	27512LA00	DET LEGAL SPT ORG	24		
	45413L000	DET MOBILE PUBLIC AFF	38		
	45423L000	DET PRESS CAMP HQ	6		
	45607L000	DET RADIO STA MGT	2		
	51002L000	DET ARMY LIAISON(BCE)	1		
	51603L000	DET RTOC (TAACOM)	2		
	51613L000	DET RTOC (ASG)	7		
	52403L000	DET CORPS REAR CP OP	3		
	52413L000	CTR RAOC (CORPS)	12		
CS10				**49**	
	63135L000	BN MAIN SPT HVY DIV	7		
CS11				**49**	
	63225L000	BN MAIN SPT	1		
CS12				**120**	
	63005L100	BN FWD SPT 2X1	9		
	63005L300	BN FWD SPT 1X2	13		

Generic Category	SRC	Type of Unit	Qty	Ranges: Mnvr Area	A M M H T B R L O E A N F T R R L D K V Y S T O A
CS13				**120**	
	63215L000	BN FWD SPT	3		
CS14				**120**	
	63065L000	SQ SPT ACR	1		
	63085L100	BN HVY SEP BDE SUPT	3		
	63085L200	BN SPTHVY BDE(SEP)1X2	4		
	63613L000	CTR TAACOM MMC	2		
CS20				**9**	
	54422H400	HHC AREA SPT GP	7		
	63002L000	HHC DISCOM	7		
	63222L000	HHC DISCOM LID	1		
	63422L000	HHC CORPS SPT GP	12		
	63426L000	HHD CORPS SUPPORT BN	40		
	63431L000	HHC COSCOM	1		
	63433L000	CTR COSCOM MMC	1		
	63612L000	HHC TAACOM	2		
EN10				**70**	
	05035H500	BN CBT CORPS	7		
	05045H100	CO CBT CORPS MECH	2		
	05155L000	BN LID	1		
	05335L000	BN HEAVY DIV ERI	26		
	05415L000	BN COMBAT HEAVY	24		
	05417L000	CO CBT BN HVY	3		
	05425L000	BN CBT CORPS WHEEL	5		
	05425L500	BN CBT CORPS WHEEL	1		
	05435L000	BN CBT CORPS MECH	9		
	05435L600	BN CBT CORPS MECH	2		
EN20				**9**	
	05201H400	HHC ENGR COMMAND	2		
	05332L000	HHC HVY DIV ERI BDE	7		
	05402L000	HHC BDE CORPS	2		
	05412L100	HHCGP (EAC)	6		
	05412L200	HHC GP (CORPS)	8		
	05500LA00	TM ADMIN-BN HQ	7		
	05602L000	HHC BDE THEATER ARMY	3		
	05606L000	HHC BN TOPO TA	1		
EN21				**96**	
	05037H500	CO CBT CORPS	1		
	05058H400	CO CBT SPT EQUIP	2		
	05113L000	CO ACR	1		
	05143L000	CO SEP HVY BDE	4		
	05423L000	CO CBT SPT EQUIP	18		
EN22				**96**	
	05079J200	CO ASLT FLT BRG	13		
	05463L100	CO MEDIUM GIRDER BR	6		
	05463L200	CO PANEL BRIDGE	5		

Generic Category	SRC	Type of Unit	Qty	Mnvr Area	TNK	BFV	ARTY	MLRS	MORT	HELO	ADA
EN23				**9**							
	05114H200	CO CONSTRUCT SPT	4								
	05124H600	CO DUMP TRUCK	2								
	05129H500	CO PORT CONSTRUCT	1								
	05177H400	CO PIPELINE CONST	3								
	05413L000	CO CONSTRUCT SPT	2								
	05424L000	CO DUMP TRUCK	1								
	05510H2FA	TM FFTG HQ	19								
	05520H6GA	DET FORESTRY	1								
	05530H6HG	DET PWRPLANT OP-MAINT	2								
	05530H6HI	DET POWER LINE	2								
	05530LA00	DET REAL ESTATE	2								
	05530LC00	DET DIVING LT WEIGHT	1								
	05530LH00	TM UTILITIES (4000)	18								
	05540LB00	DET SURVEY	1								
	05540LM00	DET MAINT	1								
	05607L000	CO TOPO (-LHTECH SEC)	1								
FA10				**270**			**Y**				
	06107L000	BTY 155T (1X8)	1								
	06125L000	BN 105T LID	3								
	06425L200	BN 155 T 3X8	8								
FA11				**270**			**Y**				
	06365L400	BN 155 SP (3X8/2X1)	11								
	06365L500	BN 155 SP(3X8/1X2)	11								
	06375L300	BN 155 SP (3X8/2X1)	4								
	06375L400	BN 155 SP(3X8/1X2)	4								
	06445L100	BN 8 IN SP	13								
	06445L300	BN 8 IN SP (3X8	3								
	06447L200	BTY 8 IN SP (1X6)	7								
	06455L200	BN 155 SP (3X8	7								
FA12				**320**				**Y**			
	06465L000	BN MLRS	4								
FA20				**6**							
	06102L000	HHB DIVARTY LID	1								
	06302L000	HHB DIVARTY	7								
	06402L100	HHB BDE	12								
	06403L000	HHB CORPS ARTY	1								
FA21				**9**							
	06303L000	BTY F TGT ACQ	7								
	06413L000	DET TGT ACQ (Q37)	1								
IN10				**248**		**Y**			**Y**		
	07245L100	BN MECH (FVS)	1								
	07245L200	BN MECH (FVS)	12								
IN11				**248**					**Y**		
	07245L000	BN MECH (M113)	31								

Column group "Ranges" covers TNK, BFV, ARTY, MLRS, MORT, HELO, ADA.

Generic Category	SRC	Type of Unit	Qty	Mnvr Area	Ranges TNK	BFV	ARTY	MLRS	MORT	HELO	ADA
IN12				**400**					**Y**		
	07015L000	BN INF (LIGHT)	10								
	07315L000	BN MTN WRFR	1								
IN20				**99**							
	07102H000	HHC BDE	1								
	77004L000	HHC LT IN DIV	1								
	77042L000	HHC BDE LT IN DIV	3								
IN21				**70**					**Y**		
	07109L000	DET (LRS)	1								
	07157L000	CO F (LRS)	2								
MD10				**4**							
	08112H600	HHC MED BDE	1								
	08422L100	HHC MED BDE (CORPS)	2								
	08422L200	HHC MED BDE (COMMZ)	8								
	08432L000	HHD MEDICAL GRP	9								
	08446L000	HHD EVAC BN	3								
	08455L000	BN AREA SUPPORT MED	2								
	08476L000	HHD MED BN DENTAL	4								
	08485L000	BN MED LOG (FWD)	3								
	08695L000	BN MED LOG (REAR)	2								
	08705L000	HOSPITAL COMBAT SPT	25								
	08715L000	HOSPITAL FIELD	14								
	08725L000	HOSPITAL GENERAL	14								
	08737L000	HSPCSH (HUS)	4								
	08765L000	HOSPITAL MASH	2								
MD20				**9**							
	08449L000	CO GROUND AMBULANCE	17								
MD21				**99**							
	08447L100	CO AIR AMB (UH-1)	19								
MD22				**4**							
	08417L000	DET VET SVC LARGE	6								
	08418L000	DET VET MED	1								
	08458L000	CO MEDICAL HOLDING	2								
	08467L000	CO CBT STRESS CNTL	5								
	08478L000	CO DENTAL SVC	20								
	08479L000	DETDENTAL SVC	6								
	08498L000	DET PM SANITATION	9								
	08499L000	DET PM ENTOMOLOGY	4								
	08567LA00	DET CBT STRESS CNTL	9								
	08657L000	DET AREA MED LAB	1								
	08897L000	DETTMMMC	1								
	08909L000	DET LOG SPT	3								

Generic Category	SRC	Type of Unit	Qty	Mnvr Area	TNK	BFV	ARTY	MLRS	MORT	HELO	ADA
					Ranges						
MI10				**16**							
	34225L000	BN TEB CORP	2								
	34235L100	BN TEB-RC CORP	1								
	34235L200	BN TEB-RC CORP	3								
	34285L000	BN CEWI HVY DIV	7								
	34295L000	BN CEWI INF DIV (LT)	1								
	34505LA00	BN LINGUIST	6								
	34645L000	BN IMAGERY ANALYSIS	1								
MI20				**4**							
	34506LA00	HHC BN	4								
	34646L000	BN IA (HHD)	1								
	34666L000	HHC BN (COL&EXP)	1								
MI21				**50**							
	34114L000	CO CEWI ACR	1								
	34144L000	CO CEWI SEP BDE	4								
	34613L000	CO SIGINT (SEP)	1								
	34617L000	CO SIG INTEL (EAC)	2								
	34624L000	CO TECH INTEL	2								
	34627L000	CO INTG&EXL (EPW)	2								
	34628L000	CO INTG&EXPL (GS EAC)	2								
	34657L000	CO CI	3								
	34724L000	CO CEWI	1								
MI22				**9**							
	34526LA00	DET TAREX	1								
	34647L000	DET TAC REC BN	9								
MP10				**144**							
	19323L000	CO LID	1								
	19333L000	CO HVY DIV	7								
	19477L000	CO CBT SPT	45								
	19647L000	CO ESCORT GUARD	3								
	19762L000	HHC PW BRIGADE	1								
MP20				**9**							
	19472L000	HHC BDE	2								
	19476L000	HHD BN	9								
	19641L000	HHC PW CMD	1								
	19646L100	HHD BN EPW 1000	4								
	19646L200	HHD BN EPW 2000	2								
	19646L400	HHD BN EPW 4000	7								
	19656L000	HHC BN CFN	2								
	19667L000	CO GUARD	14								

Generic Category	SRC	Type of Unit	Qty	Mnvr Area	TNK	BFV	AMRTY	MLRS	MORT	HEALDOA
MP21				4						
	19283L100	DET HVY DSE	5							
	19483L000	DET CASE	9							
	19543LE00	TM EPW ADVISORY	4							
	19543LH00	DET EPW/CI C&C	1							
	19643L000	DET PWIC	1							
	19683L000	DET TASE	6							
	19686L000	DET TSE	2							
	19687L000	DET PASE	2							
OD20				9						
	09574LA00	HHC BN AMMO DS/GS	1							
	09662L000	HHC GRP AMMO DS/GS	1							
	43436L000	HHD BN MAINT DS/GS	15							
OD21				4						
	09433L000	CO AMMO GS CSA MO/PLS	1							
	09483L000	CO AMMO MOADS DS	2							
	09484L000	CO AMMO MOADS/PLS DS	8							
	09497L000	CO HAWK MAINT 3X2	4							
	09574LB00	CO WHNS	9							
	09633L000	CO AMMO GS TSA MO/PLS	2							
OD22				9						
	43209L000	CO MAINT NON-DIV DS	57							
	43469L000	CO MAINT GS	2							
	43649L000	CO MAINT GS	40							
OD23				4						
	09527LA00	TM EOD CONTROL	2							
	09527LB00	DETEOD TEAM	10							
	09528LB00	TM MLRS BN DS AUG	7							
	09528LD00	TM CHAP AUG MSL SPT C	7							
	09528LP00	DET MSL SPT	1							
	09528LV00	TM AVENGER BN	1							
	09529LX00	TM PATRIOT DS AUG	1							
	43509LC00	TM TRAC VEH REP	26							
	43509LO00	TM MOB MAINT	10							
	43509LP00	TM LID SPT	1							
	43549LB00	PLT TRACK VEH REP	25							
	43549LC00	PLT WHEEL VEH REP	65							
	43549LD00	PLT CONSTR EQ REP	15							
	43549LE00	PLT ARMT REP	19							
	43549LF00	PLT PWR GEN REP	18							
	43549LG00	PLT QM/CHEM REP	28							
	43549LH00	PLT COMMO REP	34							
	43549LI00	PLT RDR/DIGI REP	10							

Generic Category	SRC	Type of Unit	Qty	Ranges Mnvr Area	A M M H T B R L O E A N F T R R L D K V Y S T Q A
QM20				**4**	
	10416L000	HHC POL PL&TML OP BN	1		
	10426L000	HHD POL SUPPLY BN	11		
	10466L000	HHD WATER SUPPLY BN	3		
	10602L000	HHC PETROLEUM GRP	1		
	42446L000	HHD S&S BN	13		
QM21				**16**	
	10443L000	CO AIRDROP SUPPLY LT	1		
	10449L100	CO AD EQ REP&SUP	1		
	10468L000	CO WATER SUPPLY	4		
	10497L000	CO GRREG	2		
	10643L000	CO AIRDROP SUPPLY HVY	1		
	29139H300	CO SVC COLL/CLASS	6		
	42414L000	CO FLD SVC DS FWD	24		
	42418L000	CO GENERAL SUPPLY GS	11		
	42419L000	CO REP PARTS SUP	5		
	42427L100	CO SUPPLY HVY MAT	5		
	42427L200	CO SUPPLY HVY MAT EAC	7		
	42447L000	CO SUPPLY DS	15		
QM22				**9**	
	10417L000	CO POL PL&TML OP	7		
	10427L000	CO PETRO SUPP LUPS	23		
QM23				**4**	
	10469L000	DET WATER PURIF	5		
	10560LM00	TM PETRL LAISION	5		
	10570LA00	TM ROWPU BARGE MTD	2		
	10570LC00	TM WATER PURIF 12K	11		
	10570LG00	TM TAC WATER DISTR	11		
	42507LA00	TM QM GRREG HVY	1		
	42507LC00	TM ARID ENV WATER HVY	2		
	42510LY00	DET SUP SPT	1		
	42518LA00	TM BAKERY	6		
	42518LB00	PLT QM PERISH SUBST	1		
	42518LC00	PLT QM MAP DISTRIBUT	5		
	42519LA00	PLT AV REP PRTS AUG	4		
	42519LB00	TM LIAISON REP PRT	1		
SC10				**99**	
	11065L000	BN DIV MSE	8		
	11402L200	BDE CORPS SIG MSE	1		
	11435L000	BN CORPS AREA (MSE)	5		
	11445L000	BN CORPS SPT MSE	4		
	11602L000	HHC THEATER SIG CMD	2		
	11635L000	BN EAC AREA TRITAC	7		
	11669L000	CO COMMAND OPERATIONS	2		

Generic Category	SRC	Type of Unit	Qty	Ranges: Mnvr Area	A M M H T B R L O E A N F T R R L D K V Y S T O A
SC21				**4**	
	11413L000	CO CORPS COMBAT CAMER	2		
	11450L000	DET DATA PROC UNIT	6		
	11500LC00	DET CP SUPPORT (MCU)	1		
	11570LD00	DET REPRO 128K-AMSCO	1		
	11612L000	BDE THEATER SIG HHC	2		
	11613L000	CO TA COMBAT CAMERA	1		
	11626L000	BN COMPOSITE HHC	7		
SC22				**50**	
	11623L000	CO CABLE & WIRE	5		
	11667L000	CO TROPO LIGHT-TRC170	4		
	11668L000	CO HEAVY TROPO	3		
SF10				**99**	
	31711L000	HHC SOSC (TA)	2		
	31802L000	HHC ABN SF GROUP	4		
	31803L000	CO SPT SF GP (ABN)	4		
	31805L000	BN SF (ABN)	9		
TC20				**9**	
	55002H000	HHC TRANSCOM	1		
	55012H600	HHD GRP MOTOR TRANS	1		
	55016H400	HHD BN MOTOR TRANS	4		
	55052H100	HHC GRP COMPOSITE	2		
	55116H200	HHCBN TERMINAL	2		
	55226H800	HHC BN RAILWAY	1		
	55500LD00	HHD BN MVMT CON	3		
	55716L000	HHD BN MOTOR TRANS	3		
TC21				**9**	
	55718L200	CO LIGHT TRUCK 5T	1		
	55719L200	CO LT-MDM TRUCK	8		
	55727L100	CO MDM TRK CNTR/CGO	24		
	55727L200	CO MDM TRK 7.5K GAL	10		
	55728L100	CO MDM TRK CNR/CGO	16		
	55728L200	CO MDM TRK 5K GAL TAN	16		
	55728L300	CO MDM TRK PLS	9		
	55739L100	CO CBT HET	8		
	55818L000	CO TERM SVC BK BULK	4		
	55827L000	CO TMNL SVC BB/CNR	3		
TC22				**9**	
	55157H600	CO FLT CFT MNT GS	1		
	55227H800	CO RY ENGINEERING	1		
	55228H800	CO RY EQUIP MAINT	2		
	55229H800	CO TRAIN OPERATING	1		
	55500H2AC	CO FLTG CRFT HQ	2		
	55500LC00	CO WC TRANS AND MAINT	1		
	55828L000	CO MEDIUM BOAT	2		
	55829L000	CO HEAVY BOAT	2		
	55833L000	CO MDM LIGHTER ACV	1		

Generic Category	SRC	Type of Unit	Qty	Ranges: Mnvr Area	A M M H T B R L O E A N F T R R L D K V Y S T Q A
TC23				**4**	
	55118J420	CO CARGO TRANSFER	16		
	55510LA00	TM HOST NATION SPT	4		
	55530LJ00	DET LSV SPT	1		
	55540LE00	DET TLR TRANSFER PT	16		
	55560LB00	DET FRT CONS/DISTRB	1		
	55560LC00	DET CONTRACT SUPV	5		
	55580LD00	DET MVMT CON AIR	1		
	55580LF00	DET MCTL AIRTERM	9		
	55580LG00	DET MVMT CON AIR TEAM	2		
	55604L000	CTR MOV CON COSCOM	1		
	55717L100	CO COMMAND TRANSPORT	4		

APPENDIX D

RCTIFYRS ANNUAL TRAINING INSTALLATIONS

This appendix contains an alphabetical listing (by state) of the 85 installations shown in Figure 3-2. These facilities were used for the analysis of Reserve Component annual training requirements. Each entry indicates the major firing ranges (Tank Table VIII, Bradley fighting vehicle Table VIII, artillery, MLRS, mortar, helicopter gunnery/rocket, and air defense missile) and the amount of maneuver area (in square kilometers) available at the training site.

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Installation	ST	ZIP	TNK	BFV	ARTY	AMLRS	MORT	HELQ	ADA	Man Area (sqkm)
FORT MCCLELLAN	AL	36205			Y		Y			149
FORT RUCKER	AL	36360			Y			Y		202
CAMP JOSEPH T. ROBINSON	AR	72118			Y					120
FORT CHAFFEE	AR	72905			Y			Y		257
LITTLE ROCK AFB	AR	72099								46
FLORENCE TRAINING SITE	AZ	85232			Y		Y			50
FORT HUACHUCA	AZ	85613	Y		Y		Y			226
CAMP PARKS	CA	94568								7
CAMP ROBERTS	CA	93451			Y		Y	Y		86
CAMP SAN LUIS OBISPO	CA	93403								10
FORT HUNTER LIGGETT	CA	93928								202
FORT IRWIN	CA	92310	Y	Y	Y		Y	Y		1902
FORT ORD	CA	93941					Y	Y		58
USMC BASE CAMP PENDLETON	CA	92055			Y		Y	Y		463
USMC BASE, 29 PALMS	CA	92278			Y		Y	Y		236
FORT CARSON	CA	80913	Y	Y	Y		Y	Y		1392
US AIR FORCE ACADEMY	CO	80840								7
AVON PARK AFS	FL	33825			Y		Y			20
CAMP BLANDING	FL	32091			Y		Y	Y		188
FORT BENNING	GA	31905			Y		Y	Y		25
FORT GORDON	GA	30905					Y			156
FORT STEWART	GA	31314	Y	Y	Y		Y	Y		1127
CAMP DODGE	IA	50131								6
ORCHARD RNGE TRNING SITE	ID	83707	Y	Y	Y		Y	Y		404
MARSEILLES TRAINING AREA	IL	61341								10
US ARMY TNG AREA, JOLIET	IL	60421								14
CP ATTERBURY RFTA	IN	46124		Y	Y		Y	Y		68
JEFFERSON PROVING GROUND	IN	47250								49
LA PORTE TRAINING AREA	IN	46350								4
NAVAL WPNS CEN, CRANE	IN	47522								202
FORT RILEY	KS	66442	Y	Y	Y		Y	Y		202
NICKELL BARRACKS TNG CEN	KS	67401			Y					12
FORT CAMPBELL	KY	42223			Y		Y	Y		266
FORT KNOX	KY	40121	Y	Y	Y		Y	Y		228
CAMP BEAUREGARD	LA	71360								49
FORT POLK	LA	71459			Y		Y	Y		535
CAMP EDWARDS	MA	02542			Y		Y			46
FORT DEVENS	MA	01433					Y			30
FORT GEORGE G. MEADE	MD	20755								12
CAMP GRAYLING	MI	49738			Y		Y	Y		364
FORT CUSTER TNG CENTER	MI	49012								20
CAMP RIPLEY	MN	56345	Y	Y	Y		Y	Y		162

Installation	ST	ZIP	TNK	BFV	ARTY	MLRS	MORT	HELO	ADA	Man Area (sqkm)
CAMP CLARK TNG SITE	MO	64772								4
CAMP CROWDER TNG SITE	MO	64850								17
FORT LEONARD WOOD	MO	65473			Y		Y	Y		19
CAMP SHELBY	MS	39407	Y	Y	Y		Y	Y		405
FORT WILLIAM H. HARRISON	MT	59601						Y		16
LIMESTONE HILLS TRAINING	MT	59644			Y		Y	Y		61
WACO TRAINING AREA	MT	59102								18
CAMP BUTNER	NC	27581								14
FORT BRAGG	NC	28307	Y	Y	Y		Y	Y		871
USMC BASE, CP LEJEUNE	NC	28542			Y		Y	Y	Y	212
CAMP GRAFTON (SOUTH)	ND	58301								53
GRAND FORKS AFB	ND	58205								7
HASTINGS TRAINING SITE	NE	68901								12
FORT DIX	NJ	08640	Y	Y	Y		Y	Y		312
CAMP SMITH	NY	10566								5
FORT DRUM	NY	13602	Y	Y	Y		Y	Y		271
WEST POINT MILITARY RES	NY	10096			Y		Y			32
CAMP GRUBER	OK	74423								138
FORT SILL	OK	73503			Y	Y	Y			91
CAMP RILEA	OR	97146								820
REDMOND TRAINING AREA	OR	97756								70
FORT INDIANTOWN GAP	PA	17003			Y		Y			45
FORT JACKSON	SC	29207			Y		Y			231
CAMP ROSENBAUM	SD	57038								5
FORT MEADE TNG AREA	SD	57702								11
TULLAHOMA TRAINING SITE	TN	37388								121
CAMP BULLIS	TX	78229								101
CAMP MAXEY	TX	75473								26
CAMP SWIFT	TX	78602								48
FORT BLISS	TX	79916	Y	Y	Y	Y	Y	Y	Y	1360
FORT HOOD	TX	76544	Y	Y	Y		Y	Y		567
CAMP W.G. WILLIAMS	UT	84065			Y		Y	Y		101
DUGWAY PROVING GROUND	UT	84022			Y		Y			1012
FORT A.P. HILL	VA	22427	Y	Y	Y		Y	Y		223
FORT PICKETT	VA	23824	Y	Y	Y		Y	Y		121
USMC BASE, QUANTICO	VA	22134			Y		Y	Y		186
ETHAN ALLEN FIRING RANGE	VT	05465			Y		Y			23
FORT LEWIS	WA	98433			Y		Y			257
YAKIMA FIRING CENTER	WA	98901	Y	Y	Y		Y	Y		971
FORT MCCOY	WI	54656	Y	Y	Y		Y	Y		459
VOLK FIELD ANGB	WI	54618								32
CAMP DAWSON	WV	26519								2958
CAMP GUERNSEY	WY	82214			Y		Y	Y		85

APPENDIX E

RCTIFYRS ANNUAL TRAINING INSTALLATION UPDATE

This appendix contains the results of a data call conducted between December 1993 and January 1994. Each of the 85 installations was contacted and requested to verify/update their portion of the data shown in Appendix D. Installations responding to the data call, either directly or indirectly (FORSCOM and the US Army Training and Doctrine Command (TRADOC) provided a consolidated reply for facilities under their control), have been highlighted. As before, each entry indicates the major firing ranges (Tank Table VIII, Bradley fighting vehicle Table VIII, artillery, MLRS, mortar, helicopter gunnery/rocket, and air defense missile) and the amount of maneuver area (in square kilometers) available at the training site. This data was received after the RCTIFYRS analysis had been completed and is not reflected in the results of this study. It will, however, be the installation data of record for any future analyses.

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Installation	ST	ZIP	TNK	BFV	ARTY	AMLRS	MORT	HELO	ADA	Man Area (sqkm)
FORT MCCLELLAN	AL	36205			Y		Y			157
FORT RUCKER	AL	36360			Y		Y	Y		166
CAMP JOSEPH T. ROBINSON	AR	72118			Y		Y			120
FORT CHAFFEE	AR	72905	Y		Y		Y	Y		256
LITTLE ROCK AFB	AR	72099								46
FLORENCE TRAINING SITE	AZ	85232			Y		Y			50
FORT HUACHUCA	AZ	85613	Y		Y		Y			226
CAMP PARKS	CA	94568								7
CAMP ROBERTS	CA	93451			Y		Y			129
CAMP SAN LUIS OBISPO	CA	93403								10
FORT HUNTER LIGGETT	CA	93928	Y	Y	Y		Y	Y		668
FORT IRWIN	CA	92310	Y	Y	Y		Y	Y		1902
FORT ORD	CA	93941					Y	Y		58
USMC BASE CAMP PENDLETON	CA	92055			Y		Y	Y		463
USMC BASE, 29 PALMS	CA	92278			Y		Y	Y		236
FORT CARSON	CA	80913	Y	Y	Y	Y	Y	Y		1095
US AIR FORCE ACADEMY	CO	80840								7
AVON PARK AFS	FL	33825			Y		Y			24
CAMP BLANDING	FL	32091	Y	Y	Y		Y	Y		280
FORT BENNING	GA	31905	Y	Y	Y		Y			360
FORT GORDON	GA	30905			Y		Y			156
FORT STEWART	GA	31314	Y	Y	Y	Y	Y	Y		669
CAMP DODGE	IA	50131								14
ORCHARD RNGE TNG SITE	ID	83707	Y	Y	Y		Y	Y		346
MARSEILLES TRAINING AREA	IL	61341								10
US ARMY TNG AREA, JOLIET	IL	60421								14
CP ATTERBURY RFTA	IN	46124		Y	Y	Y	Y	Y		107
JEFFERSON PROVING GROUND	IN	47250								49
LA PORTE TRAINING AREA	IN	46350								4
NAVAL WPNS CEN, CRANE	IN	47522								189
FORT RILEY	KS	66442	Y	Y	Y		Y	Y		263
NICKELL BARRACKS TNG CEN	KS	67401			Y		Y			12
FORT CAMPBELL	KY	42223	Y	Y	Y		Y	Y		265
FORT KNOX	KY	40121	Y	Y	Y	Y	Y	Y		216
CAMP BEAUREGARD	LA	71360								136
FORT POLK	LA	71459	Y	Y	Y	Y	Y	Y		651
CAMP EDWARDS	MA	02542			Y		Y			46
FORT DEVENS	MA	01433					Y			12
FORT GEORGE G. MEADE	MD	20755								0
CAMP GRAYLING	MI	49738			Y		Y	Y		364
FORT CUSTER TNG CENTER	MI	49012								20
CAMP RIPLEY	MN	56345	Y	Y	Y	Y	Y	Y		158

Installation	ST	ZIP	TNK	BFV	ARTY	MLRS	MORT	HELO	ADA	Man Area (sqkm)
CAMP CLARK TNG SITE	MO	64772								4
CAMP CROWDER TNG SITE	MO	64850								17
FORT LEONARD WOOD	MO	65473			Y		Y	Y		143
CAMP SHELBY	MS	39407	Y	Y	Y		Y	Y		546
FORT WILLIAM HARRISON	MT	59601								3
LIMESTONE HILLS TNG	MT	59644			Y		Y	Y		14
WACO TRAINING AREA	MT	59102								18
CAMP BUTNER	NC	27581								8
FORT BRAGG	NC	28307	Y	Y	Y	Y	Y	Y		648
USMC BASE, CP LEJEUNE	NC	28542			Y		Y	Y	Y	212
CAMP GRAFTON (SOUTH)	ND	58301								53
GRAND FORKS AFB	ND	58205								7
HASTINGS TNG SITE	NE	68901								12
FORT DIX	NJ	08640	Y	Y	Y	Y	Y	Y		291
CAMP SMITH	NY	10566								6
FORT DRUM	NY	13602	Y	Y	Y		Y	Y		243
WEST POINT MIL RES	NY	10096					Y			28
CAMP GRUBER	OK	74423								129
FORT SILL	OK	73503			Y	Y	Y			174
CAMP RILEA	OR	97146								1827
REDMOND TNG AREA	OR	97756								126
FORT INDIANTOWN GAP	PA	17003	Y	Y	Y		Y			56
FORT JACKSON	SC	29207			Y		Y			50
CAMP ROSENBAUM	SD	57038								2
FORT MEADE TNG AREA	SD	57702								11
TULLAHOMA TNG SITE	TN	37388								37
CAMP BULLIS	TX	78229								101
CAMP MAXEY	TX	75473								26
CAMP SWIFT	TX	78602								48
FORT BLISS	TX	79916	Y	Y	Y	Y	Y	Y	Y	3676
FORT HOOD	TX	76544	Y	Y	Y	Y	Y	Y		632
CAMP W.G. WILLIAMS	UT	84065			Y		Y	Y		101
DUGWAY PROVING GROUND	UT	84022			Y		Y			1012
FORT A.P. HILL	VA	22427			Y	Y	Y	Y		174
FORT PICKETT	VA	23824	Y	Y	Y		Y			121
USMC BASE, QUANTICO	VA	22134			Y		Y	Y		186
ETHAN ALLEN FIRING RNG	VT	05465			Y		Y			15
FORT LEWIS	WA	98433			Y		Y			253
YAKIMA FIRING CENTER	WA	98901	Y	Y	Y	Y	Y	Y		743
FORT MCCOY	WI	54656	Y	Y	Y		Y	Y		429
VOLK FIELD ANGB	WI	54618								32
CAMP DAWSON	WV	26519								2958
CAMP GUERNSEY	WY	82214			Y		Y	Y		183

APPENDIX F

RCTIFYRS INDIVIDUAL DUTY TRAINING INSTALLATIONS

This appendix contains an alphabetical listing (by state) of the 271 installations shown in Figures 3-3 through 3-9. These facilities were used for the analysis of Reserve Component individual duty training requirements. Each entry indicates the number of the figure from Chapter 3,to which it refers (Figure 3-3, M16/small arms ranges; 3-4, artillery ranges; 3-5, tank gunnery ranges; 3-6, Bradley gunnery ranges; 3-7, tank or Bradley Table VIII ranges; 3-8, helicopter gunnery/rocket ranges; 3-9, demolition ranges). The 85 installations used in the AT analysis have been highlighted in bold text.

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INSTALLATION	ST	ZIP	Figure Number 3- 3	4	5	6	7	8	9
ANNISTON ARMY DEPOT	AL	36201	Y		Y				
FORT MCCLELLAN	AL	36205	Y	Y	Y				Y
FORT RUCKER	AL	36360	Y	Y	Y			Y	Y
MAXWELL AFB	AL	36112	Y						
REDSTONE ARSENAL	AL	35898	Y						
CAMP JOSEPH T. ROBINSON	AR	72118	Y	Y					
FORT CHAFFEE	AR	72905	Y	Y	Y		Y	Y	Y
IRA EAKER AFB	AR	72315	Y						
LITTLE ROCK AFB	AR	72099	Y						
DAVIS-MONTHAN AFB	AZ	85707	Y						
FLORENCE TRAINING SITE	AZ	85232	Y	Y					
FORT HUACHUCA	AZ	85613	Y	Y	Y		Y		Y
LUKE AFB	AZ	85309	Y						
MCAS, YUMA	AZ	85369	Y						
WILLIAMS AFB	AZ	85240	Y						
BEALE AFB	CA	95903	Y						
CAMP PARKS	CA	94568	Y						Y
CAMP ROBERTS	CA	93451	Y	Y	Y	Y		Y	Y
CAMP SAN LUIS OBISPO	CA	93403	Y						
CASTLE AFB	CA	95342	Y						
EDWARDS AFB	CA	93523	Y						
FORT HUNTER LIGGETT	CA	93928	Y		Y			Y	
FORT IRWIN	CA	92310	Y	Y	Y	Y	Y	Y	
FORT ORD	CA	93941	Y	Y				Y	Y
GEORGE AFB	CA	92394	Y						
KEYSTONE RIFLE RANGE	CA	95327	Y						
MARCH AFB	CA	92518	Y						
MATHER AFB	CA	95655	Y						
MCCLELLAN AFB	CA	95652	Y						
NAS, MIRAMAR	CA	92145	Y						
NAS, NORTH ISLAND	CA	92135	Y						
NAVAL CB CEN, PORT HUENEME	CA	93043	Y						
NAVSTA, MARE ISLAND	CA	94592	Y						
NORTON AFB	CA	92409	Y						
TRAVIS AFB	CA	94535	Y						
USCG TNG CENTER, PETALUMA	CA	94952	Y						
USMC BASE CAMP PENDLETON	CA	92055	Y	Y	Y	Y		Y	
USMC BASE, 29 PALMS	CA	92278	Y	Y	Y	Y		Y	
USMC LOGISTICS BASE, BARSTOW	CA	92311	Y						
VANDENBERG AFB	CA	93437	Y						
BUCKLEY ANGB	CO	80011	Y						
FORT CARSON	CO	80913	Y	Y	Y	Y	Y	Y	
LOWRY AFB	CO	80230	Y						
PETERSON AFB	CO	80914	Y						
PUEBLO ARMY DEPOT ACTIVITY	CO	81001	Y						
ROCKY MOUNTAIN ARSENAL	CO	80022	Y						
U.S. AIR FORCE ACADEMY	CO	80840	Y						
EAST HAVEN RIFLE RANGE	CT	06512	Y						
NAVSUBASE, NEW LONDON	CT	06349	Y						
NAVSTA, ANACOSTIA	DC	20374	Y						

INSTALLATION	ST	ZIP	Figure Number 3-3	3-4	3-5	3-6	3-7	3-8	3-9
DOVER AFB	DE	19902	Y						
STATE RIFLE RANGE, NEW CASTLE	DE	19720	Y						
AVON PARK AFS	FL	33825	Y	Y					
BLOUNT ISLAND COMMAND	FL	32226	Y						
CAMP BLANDING	FL	32091	Y	Y	Y	Y		Y	Y
EGLIN AFB	FL	32542			Y				
HOMESTEAD AFB	FL	33039	Y						
HURLBURT FIELD	FL	32544	Y						
MACDILL AFB	FL	33608	Y						
MARKHAM RANGE	FL	33315	Y						
PATRICK AFB	FL	32925	Y						
TYNDALL AFB	FL	32403	Y						
CATOOSA AREA TRAINING CENTER	GA	30755	Y		Y				Y
FORT BENNING	GA	31905	Y	Y	Y	Y		Y	Y
FORT GORDON	GA	30905	Y						
FORT STEWART	GA	31314	Y		Y	Y	Y	Y	
HUNTER ARMY AIRFIELD	GA	31409	Y						
MOODY AFB	GA	31699	Y						
ROBINS AFB	GA	31098	Y						
AVIATION FLIGHT ACTIVITY #60	IA	50321	Y						
CAMP DODGE	IA	50131	Y		Y				Y
FORT DES MOINES	IA	50315	Y						
IOWA ARMY AMMUNITION PLANT	IA	52638	Y						
SIOUX GATEWAY AIRPORT ANGS	IA	51054	Y						
MOUNTAIN HOME AFB	ID	83648	Y						
ORCHARD RNGE TRAINING SITE	ID	83707	Y	Y	Y	Y	Y	Y	
CAMP LINCOLN	IL	62702	Y						
CHANUTE AFB	IL	61868	Y						
FORT SHERIDAN	IL	60037	Y						
JOLIET ARMY AMMUNITION PLANT	IL	60436	Y						
MARSEILLES TRAINING AREA	IL	61341	Y	Y					
ROCK ISLAND ARSENAL	IL	61299	Y	Y		Y		Y	
SCOTT AFB	IL	62225	Y						
US ARMY TNG AREA, JOLIET	IL	60421	Y		Y				
ARNG FACILITY, MUNCIE	IN	47303	Y						
CAMP FOWLER	IN	46041	Y						
CP ATTERBURY RFTA	IN	46124	Y	Y	Y	Y	Y	Y	Y
FORT BENJAMIN HARRISON	IN	46216	Y						
GRISSOM AFB	IN	46971	Y						
JEFFERSON PROVING GROUND	IN	47250	Y						
LA PORTE TRAINING AREA	IN	46350		Y					
NAVAL WPNS CENTER, CRANE	IN	47522							
NEWPORT ARMY AMMO PLANT	IN	47966	Y						
FORT LEAVENWORTH	KS	66027	Y						
FORT RILEY	KS	66442	Y	Y	Y	Y	Y	Y	
MCCONNELL AFB	KS	67221	Y						
NICKELL BARRACKS TNG CEN	KS	67401	Y	Y	Y				
EASTERN KENTUCKY WETS	KY	40906	Y						
FORT CAMPBELL	KY	42223	Y	Y	Y	Y		Y	Y
FORT KNOX	KY	40121	Y	Y	Y	Y	Y	Y	Y
WESTERN KENTUCKY TNG SITE	KY	42345	Y		Y				

INSTALLATION	ST	ZIP	Figure Number 3- 3	4	5	6	7	8	9
BARKSDALE AFB	LA	71110	Y						
CAMP BEAUREGARD	LA	71360	Y		Y				
CAMP VILLERE	LA	70458	Y						
FORT POLK	LA	71459	Y	Y	Y	Y		Y	Y
JACKSON BARRACKS ANGS	LA	70183		Y					
ADAMS RANGE	MA	01220	Y						
CAMP CURTIS GUILD	MA	01867	Y						
CAMP EDWARDS	MA	02542	Y	Y					Y
FORT DEVENS	MA	01433	Y		Y				Y
WESTOVER AFB	MA	01022	Y						
ANDREWS AFB	MD	20331	Y						
FORT GEORGE G. MEADE	MD	20755	Y	Y					Y
GUNPOWDER MIL RESERVATION	MD	21057	Y						
HARRY DIAMOND LABS TEST AREA	MD	20693		Y					
LAUDERICK CREEK TRAINING SITE	MD	21040		Y					
NAS, PATUXENT RIVER	MD	20670	Y						
NAVSTA, ANNAPOLIS	MD	21402	Y						
AUBURN TRAINING SITE	ME	04210	Y						
BANGOR ANGS	ME	04401	Y						
FRYE MOUNTAIN TRAINING SITE	ME	04915	Y						
HOLLIS CENTER	ME	04042	Y						
LORING AFB	ME	04751	Y						
NAS, BRUNSWICK	ME	04011	Y						
NAVAL COMM UNIT, CUTLER	ME	04630	Y						
CAMP GRAYLING	MI	49738	Y	Y	Y			Y	Y
FORT CUSTER TNG CENTER	MI	49012	Y		Y				
K. I. SAWYER AFB	MI	49843	Y						
NAVY ELF DET, REPUBLIC	MI	49879	Y						
PHELPS/COLLINS ANGB	MI	49707	Y						
SELFRIDGE ANGB	MI	48045	Y						
WURTSMITH AFB	MI	48753	Y						
CAMP RIPLEY	MN	56345	Y		Y	Y	Y	Y	
CAMP CLARK TNG SITE	MO	64772	Y	Y					
CAMP CROWDER TNG SITE	MO	64850	Y	Y					
FORT LEONARD WOOD	MO	65473	Y	Y				Y	Y
RICHARDS-GEBAUR AFB	MO	64030	Y						
WHITEMAN AFB	MO	65305	Y						
CAMP MCCAIN	MS	38926	Y	Y	Y				
CAMP SHELBY	MS	39407	Y	Y	Y	Y	Y	Y	Y
COLUMBUS AFB	MS	39701	Y						
KEESLER AFB	MS	39534	Y						
FORT WILLIAM H. HARRISON	MT	59601	Y	Y	Y			Y	
GREAT FALLS IAP ANGS	MT	59401	Y						
LIMESTONE HILLS TRAINING	MT	59604		Y	Y	Y		Y	
MALMSTROM AFB	MT	59402	Y						
WACO TRAINING AREA	MT	59102	Y						
CAMP BUTNER	NC	27581	Y						
FORT BRAGG	NC	28307	Y	Y	Y	Y	Y	Y	Y
MCAS, CHERRY POINT	NC	28533	Y						
SEYMOUR JOHNSON AFB	NC	27531	Y						
USMC BASE, CP LEJEUNE	NC	28542	Y	Y	Y	Y		Y	

INSTALLATION	ST	ZIP	Figure Number 3-3	4	5	6	7	8	9
CAMP DAVIS LTA	ND	58072	Y						
CAMP GRAFTON (SOUTH)	ND	58301	Y						Y
GARRISON LTA	ND	58540	Y						
GRAND FORKS AFB	ND	58205	Y						
MINOT AFB	ND	58705	Y						
WILLISTON LTA	ND	58802	Y						
CAMP ASHLAND	NE	68003	Y						Y
HASTINGS TRAINING SITE	NE	68901	Y		Y				
MEAD TRAINING SITE	NE	68041			Y				
OFFUTT AFB	NE	68113	Y						
STAPLETON TRAINING SITE	NE	69163		Y					
HOPKINS-EVERETT RESERVOIR LTA	NH	00000		Y					
PEASE ANGB	NH	03803	Y						
FORT DIX	NJ	08640	Y	Y	Y	Y	Y		Y
SEA GIRT TRAINING CENTER	NJ	08750	Y						
BLACK MOUNTAIN TRAINING SITE	NM	88030	Y						
CAMP LUNA TRAINING SITE	NM	87701	Y						
CANNON AFB	NM	88103	Y						
CARLSBAD TRAINING SITE	NM	88220	Y						
HOLLOMAN AFB	NM	88330	Y						
KIRTLAND AFB	NM	87117	Y						
ROSWELL LTA, WALKER ANNEX	NM	88201	Y						
TUCUMCARI TRAINING SITE	NM	88401	Y						
NELLIS AFB	NV	89191	Y						
CAMP SMITH	NY	10566	Y	Y					
FORT DRUM	NY	13602	Y	Y	Y	Y	Y	Y	Y
GENESEO TARGET RANGE	NY	14456	Y						
GRIFFISS AFB	NY	13441	Y						
GUILDERLAND RIFLE RANGE	NY	12208	Y						
HANCOCK FIELD ANGS	NY	13211	Y						
OLEAN TARGET RANGE	NY	14760	Y						
PLATTSBURGH AFB	NY	12903	Y						
SENECA ARMY DEPOT	NY	14541	Y						
WEST POINT MILITARY RES	NY	10096	Y	Y	Y				
YOUNGSTOWN TRAINING AREA	NY	14213	Y						
CAMP PERRY TRAINING SITE	OH	43452	Y		Y				
CAMP SHERMAN RIFLE RANGE	OH	45601	Y						
RICKENBACKER ANGB	OH	43217	Y						
WRIGHT-PATTERSON AFB	OH	45433	Y						
YOUNGSTOWN MAP AFRS	OH	44473	Y						
ALTUS AFB	OK	73523	Y						
CAMP GRUBER	OK	74423	Y	Y					Y
FORT SILL	OK	73503	Y	Y					Y
MCALESTER ARMY AMMO PLANT	OK	74501	Y						
PAULS VALLEY RIFLE RANGE	OK	73075	Y						
TINKER AFB	OK	73145	Y						
VANCE AFB	OK	73705	Y						
CAMP RILEA	OR	97146	Y						
CAMP WITHYCOMBE	OR	97015	Y						
REDMOND TRAINING AREA	OR	97756			Y				

INSTALLATION	ST	ZIP	Figure Number 3- 3	4	5	6	7	8	9
FORT INDIANTOWN GAP	PA	17003	Y		Y				Y
GREENSBURG ARMORY TNG SITE	PA	15601		Y					
KEYSTONE TRAINING AREA	PA	16316	Y						
LEACH RANGE	PA	18501	Y						
CAMP FOGARTY	RI	02818	Y						
CHARLESTON AFB	SC	29404	Y						
FORT JACKSON	SC	29207	Y		Y				Y
MYRTLE BEACH AFB	SC	29579	Y						
SHAW AFB	SC	29152	Y						
USMC RECRUIT DEPOT, PARRIS IS	SC	29905	Y						
CAMP ROSENBAUM	SD	57038							
ELLSWORTH AFB	SD	57706	Y						
FORT MEADE TRAINING AREA	SD	57702	Y						
JOE FOSS FIELD ANGS	SD	57104	Y						
MITCHELL M-31 FIRING RANGE	SD	57301		Y					
REDFIELD CONT FIRING AREA	SD	57467		Y					
SALEM CONTROLLED FIRING RANGE	SD	57058		Y					
WATERTOWN CONT FIRING AREA	SD	57201		Y					
YANKTON CONTROLLED FIRING AREA	SD	57078		Y					
BRISTOL RIFLE RANGE	TN	37814	Y						
JOHN SEVIER RIFLE RANGE LTA	TN	37919	Y	Y	Y				
MCGHEE TYSON ANGS	TN	37901	Y						
MILAN AAP MAJOR TRAINING SITE	TN	38348	Y	Y	Y				
TULLAHOMA TRAINING SITE	TN	37388	Y	Y					
BERGSTROM AFB	TX	78743	Y						
CAMP BULLIS	TX	78229							
CAMP MAXEY	TX	75473	Y		Y				
CAMP SWIFT	TX	78602	Y		Y				
CARSWELL AFB	TX	76127	Y						
DYESS AFB	TX	79607	Y						
FORT BLISS	TX	79916	Y	Y	Y	Y	Y	Y	Y
FORT HOOD	TX	76544	Y	Y	Y	Y	Y	Y	
FORT WOLTERS	TX	76067	Y		Y				
GOODFELLOW AFB	TX	76908	Y						
LACKLAND AFB	TX	78236	Y						
LAUGHLIN AFB	TX	78843	Y						
REESE AFB	TX	79489	Y						
SHEPPARD AFB	TX	76311	Y						
CAMP W.G. WILLIAMS	UT	84065	Y	Y				Y	
DUGWAY PROVING GROUND	UT	84022	Y	Y					
HILL AFB	UT	84056	Y						
SALT LAKE CITY IAP ANGS	UT	84116	Y						
TOOELE ARMY DEPOT	UT	84074	Y						
UTAH ARMY NATIONAL GUARD STATE	UT	84020	Y						
CAMP PENDLETON	VA	23451	Y						Y
FLEET CBT TNG CEN, ATLANTIC	VA	23461	Y						
FORT A.P. HILL	VA	22427	Y	Y	Y	Y	Y	Y	Y
FORT EUSTIS	VA	23604	Y						
FORT LEE	VA	23801	Y						
FORT PICKETT	VA	23824	Y	Y	Y	Y	Y	Y	Y
LANGLEY AFB	VA	23665	Y						

INSTALLATION	ST ZIP	Figure Number 3- 3	4	5	6	7	8	9
NAVPHIBASE, LITTLE CREEK	VA 23521	Y						
USMC BASE, QUANTICO	VA 22134	Y	Y	Y	Y		Y	
ETHAN ALLEN FIRING RANGE	VT 05465	Y	Y	Y				
CAMP BONNEVILLE	WA 98662	Y	Y					
FORT LEWIS	WA 98433	Y	Y	Y				
YAKIMA FIRING CENTER	WA 98901	Y	Y	Y	Y	Y	Y	
BADGER ARMY AMMUNITION PLANT	WI 53913	Y						
CAMP WILLIAMS	WI 54660	Y						
FORT MCCOY	WI 54656	Y	Y	Y	Y			
INO SMALL ARMS RANGE	WI 54806	Y						
MITCHELL FIELD AFRS	WI 53207	Y						
RACINE CTY LINE SML ARMS RANGE	WI 53154	Y						
VOLK FIELD ANGB	WI 54618							
WISMER SMALL ARMS RANGE	WI 54643	Y						
CAMP DAWSON	WV 26519	Y						
ARNG CMD HQS, CHEYENNE	WY 82003	Y						
CAMP GUERNSEY	WY 82214	Y	Y				Y	Y
WARREN AFB	WY 82005	Y						

APPENDIX G

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GLOSSARY

ABBREVIATIONS, ACRONYMS, AND SHORT TERMS

AC	Active Component
AD	Air Defense
ADA	Air Defense Artillery
AF	Air Force
AFB	air force base
AG	Adjutant General
AR	Armor
ARCTDS	Army Reserve Component Training Data System
ARTEP	Army Training and Evaluation Program
asslt	assault
AT	annual training
atk	attack
arty	artillery
AV	Aviation
BCRC	Base Closure and Realignment Commission
bde	brigade
BFV	Bradley fighting vehicle
bn	battalion
BRAC	base realignment and closure
CAA	US Army Concepts Analysis Agency
cav	cavalry
cbt	combat
CEWI	combat electronic warfare intelligence
co	company
CM	Chemical
cmd	command
CONUS	continental United States
CS	combat support
CSS	combat service support
DA	Department of the Army
DBOF	Defense Business Operating Fund
DCSOPS	Deputy Chief of Staff for Operations and Plans
det	detachment

DIRT	Defense Installations, Ranges, and Training Areas Information System
div	division
DS	direct support
ECS	equipment concentration site(s)
EEA	essential element(s) of analysis
EN	Engineer
EOD	explosive ordnance disposal
FA	Field Artillery
FI	Finance
FORSCOM	US Army Forces Command
FY	fiscal year
GS	general support
hel	helicopter
HHB	headquarters and headquarters battery
HHC	headquarters and headquarters company
HHT	headquarters and headquarters troop
IDT	inactive duty training
IFV	infantry fighting vehicle
IN	Infantry (branch)
inf	infantry
IPR	in-process review
JA	Judge Advocate
JTR	Joint Travel Regulation(s)
km	kilometers
km^2	square kilometers
MD	Medical
mdm	medium
mech	mechanized
MI	Military Intelligence
MLRS	multiple launch rocket system
mort	mortar
MPRC	multipurpose range complex
MP	Military Police
MSE	mobile subscriber equipment
MTA	major training area(s)

NG	National Guard
NGB	National Guard Bureau
OD	Ordnance
PADS	Position and Azimuth Determining System
Pam	pamphlet
plt	platoon
PROBE	Program Optimization and Budget Evaluation
QM	Quartermaster
RC	Reserve Component
RTS	regional training site
SAMAS	Structure and Manpower Allocation System
SC	Signal Corps
sep	separate
SF	Special Forces
sq	square
sqdn	squadron
SRC	standard requirement code
TC	training circular; Transportation Corps
TDA	table of distribution and allowances
TF	task force
tm	team
tng	training
TOE	table of organization and equipment
TRADOC	US Army Training and Doctrine Command
TRAINLOAD	Training Load on Active Duty Installations
trp	troop
UIC	unit identification code
USMC	US Marine Corps