

# **MEB Training Exercise Study: Final Report**

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A handwritten signature in black ink, appearing to read 'A. Brown'.

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# Executive summary

The purpose of this project was to define the requirements for conducting large-scale Marine Expeditionary Brigade (MEB) training exercises and to identify the resources required to establish these exercises on a recurring basis. Marine Corps Training and Education Command (TECOM) sponsored the project. The project included three main tasks:

- Identify MEB training requirements
- Determine the required, supporting, training environment
- Assess specific MEB training areas.

We used MEB 2015 [1] to shape our analysis. Key MEB 2015 characteristics include three battalion task forces, (two of which move via surface lift and one by vertical lift), three Joint Strike Fighter (JSF) squadrons, and a brigade service support group. Total manning for this MEB is about 17,000 to 20,000 Marines, with an operational reach of 370 km. Potential MEB tasks span the tactical and operational range, including conducting forcible entry, serving as lead MEF echelon, acting as Marine Corps Service Component, assuming operational/tactical control of Joint or coalition forces, and acting as the nucleus of a Joint Task Force (JTF) headquarters.

We drew on a variety of Marine Corps publications to define MEB training requirements. These included Marine Air Ground Task Force (MAGTF) guidance in Marine Warfighting Publications (MCWP) operations and logistics (MCWP series 3 and 4), as well as future MEB 2015 scenarios. Our extracts from these publications resulted in more than 500 MEB responsibilities. These responsibilities spanned from Marine brigade to company headquarters, and from operational to individual firing units and fire control elements. Additionally, we included Joint integration responsibilities, particularly at the MEB command element level.

We developed an analytic method for translating each piece of MEB guidance into a requirement for the training environment. This

analysis showed that every guidance statement contained a Who, What, and Why: Who is the training audience? What does the training environment need to have to support their training? And, Why do they need to execute the training? The set of 563 MEB guidance statements yielded about 100 requirements for the physical training environment: what operations areas that environment must contain and what supporting assets or actions the area must provide or support.

We analyzed existing training areas in the Continental United States (CONUS) to see how facilities in different areas of the country could support the MEB training range requirements. Our analysis focused on three regions; Southwest CONUS, including Camp Pendleton, Twentynine Palms, and Yuma; the area around Camp Lejeune and Cherry Point, Middle Atlantic Coast (Mid-LANT); and the area around Eglin Major Test Range and Facility Base on the north coast of the Gulf of Mexico (GOMEX). We determined how these facilities, and nearby civilian and military facilities, could support MEB-scale live maneuver and fire-based training. As we considered the facilities, our methodology was to minimize the role of simulations and constructive geography and forces. We then relaxed that constraint and included the potential contributions of simulations and constructive geographies for each range as required to meet MEB training requirements.

Table 1 summarizes the comparison of these three potential training areas. We found that all areas could support some form of MEB training. South West (SW) CONUS was the best match, with a number of options for building a collection of ranges to support CE, GCE, ACE, and CSSE training. However, we found that even a training facility as large as Twentynine Palms cannot meet all MEB training requirements without significant expansion. Smaller training areas such as Camp Lejeune and GOMEX would require extensive computer simulation and the use of constructive forces and terrain to support both operational- and tactical-level MEB training.

Camp Lejeune and GOMEX were found to be better suited for tactically tasked, battalion-scale MEB training, whereas SW CONUS is suitable for operationally tasked, regimental-scale MEB training.

Finally, where simulation and constructive training elements are required, our approach yields a method to define the requirements for the supporting simulations as well as the supporting constructive forces or geography.

Table 1. Comparison of MEB training areas: suitability, problems, and potential remedies

MEB training area	Problems	Potential remedy
<b>SW CONUS<sup>a</sup></b> San Diego, Camp Pendleton, 29 Palms, Yuma	Limited long-exercise duration multi-Bn maneuver areas at 29 Palms	Extend base boundary west to support additional Bn corridor
	Limited ground maneuver curtails fire support in deep area	Use representative forces in deep area as required
	San Clemente NSFS not integrated into maneuver in rear and close battle areas	Use artillery or VAST to simulate integration of NSFS
	Fires in support of port seizure not possible	Use simulated fires to support port seizure
	2015 scenario requires operations from seabase	Amphibs/CVNs as seabase as required
<b>MidLANT<sup>b</sup></b> Morehead City, Cherry Point, Camp Lejeune, Ft. Bragg, Ft AP Hill	Limited short-exercise duration Bn maneuver areas at Camp Lejeune	Start with Bn forces near contact
	Limited multi-Bn maneuver areas at Camp Lejeune	Integrate constructive and representative forces via simulation
	Single impact area for all supporting close fires, Bn and fires area not adjacent	Integrate constructive and representative fires via simulation
	Fires in support of port seizure not possible	Use simulated fires to support port seizure
	2015 scenario requires operations from seabase	Amphibs/CVNs as seabase as required
	Offshore Lejeune	Amphibs as seabase
<b>GOMEX<sup>c</sup></b> Pensacola, Eglin MTRFB, Ft Polk, Avon Park	No mountain terrain	None
	No operational training areas within 200NM of close training area	Staged tactical and support assets at distant bases to simulated operational maneuver and support, Constructive operational environment
	Limited short-exercise duration Bn maneuver areas at Camp Lejeune	Start with Bn forces near contact
	Limited multi-Bn maneuver areas at Camp Lejeune	Integrate constructive and representative forces via simulation
	Single impact area for all supporting close fires, Bn and fires area not adjacent	Integrate constructive and representative fires via simulation
	No NSFS	Use artillery or VAST to simulate integration of NSFS
	Fires in support of port seizure not possible	Use simulated fires to support port seizure
	2015 scenario requires operations from seabase	Amphibs/CVNs as seabase as required
	Offshore Lejeune	Amphibs as seabase
	No mountain terrain	None

a. Green: MEB training supported with real or Co-level representative forces

b. Yellow: MEB training requires constructive tactical forces and/or simulator support

c. Red: MEB training requires constructive operational and tactical forces and/or simulator support

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# Introduction

This report summarizes our analysis of requirements for conducting large-scale MEB training exercises and identifies the resources required to establish these exercises on a recurring basis.

Marine Corps Training and Education Command (TECOM) asked CNA to conduct this analysis to determine the feasibility of establishing a recurring CONUS-based MEB-level exercise, and potentially to support future efforts to acquire additional training areas and resources for this MEB training initiative.

We broke the analysis into three main tasks:

- **Identify MEB training requirements.** Analyze proposed MEB operational missions to identify specified and implied tasks for the MEB commander, MEB staff, and component Marine Corps units.
- **Determine training environment required to support MEB training requirements.** Analyze MEB training requirements to determine the training environment that will support the mission tasks.
- **Assess specific alternative ranges that support the training environment.** Analyze alternative ranges that support the MEB training environment for recurring large-scale training events, including extended battlefield operations.

We documented the analysis and results for the above tasks in [2] and [3]. The CNA Research Memorandum (RM) *Expanded MEB Training Requirements and the Training Environment* [2] details MEB employment responsibilities drawn from Marine Corps MAGTF and MEB training and employment guidance. The RM also presents our analysis of the range size required to support maneuver training for ground units. The Research Memorandum Marine Expeditionary

Brigade Training Areas [3] analyzes the MEB responsibilities and unit training areas to identify specific places and training methods required to support MEB training exercises. RM [3] also details our method for connecting written operational and training guidance to specific range requirements. This method allows trainers to determine what characteristics a range must include to support training specific employment responsibilities, and help identify requirements for constructive elements and simulations required to support training. Appendices to [2] and [3] detail the MEB/MAGTF responsibilities, training audience, and training environment requirements developed and used in this study. This report does not repeat the information in these appendices.

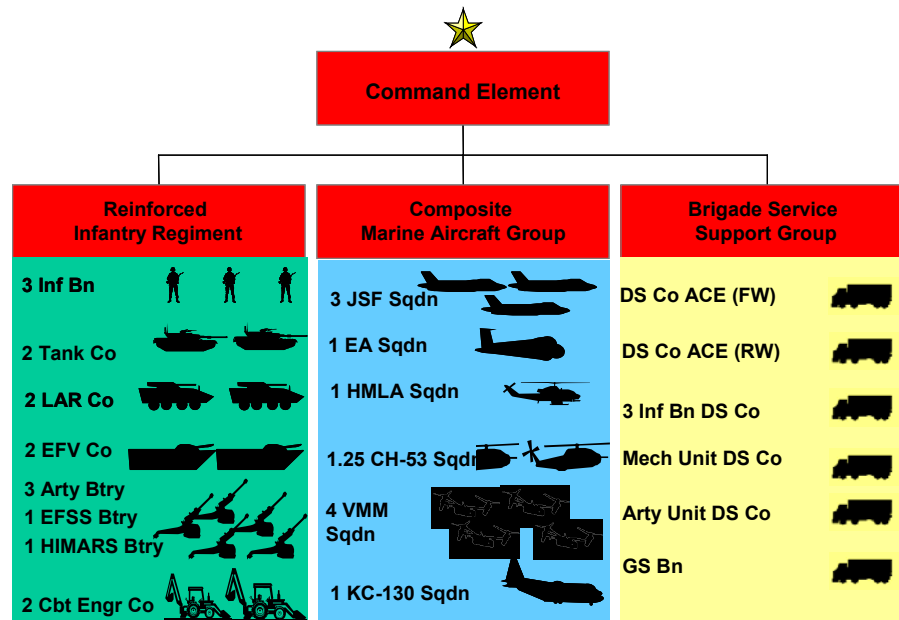
The following sections summarize the above analysis tasks.

# Identification of MEB training requirements

Our identification of MEB training requirements drew on the proposed composition, organization, and employment of the future MEB and current Marine Corps MAGTF doctrine.

The sponsor asked us to use Marine Corps Combat Development Command (MCCDC) MEB 2015 baseline MEB [1] table of organization and helped us choose an appropriate future MEB 2015 employment scenario. Figure 1 shows the major elements of the 2015 MEB; reference [2] details the organization of the 2015 Ground Combat Element (GCE), Air Combat Element (ACE), and Combat Service Support Element (CSSE).

Figure 1. Organization, equipment, and weapons systems of the 2015 baseline MEB



Determining which areas can support tactical MEB training requires identification of the training audience and the tactical functions that the training environment must support. At the tactical level these functions include movement, maneuver, and fires. The operational guidance discussed above includes this information. Table 2 lists the guidance documents we used to extract MEB MAGTF functions.

Table 2. Guidance documents used to extract MEB MAGTF guidance

Publication	Title
MCWP 3-1	<i>Ground Combat Operations</i>
MCWP 3-2	<i>Aviation Operations</i>
MCWP 3-40.1	<i>MAGTF Command and Control</i>
MCWP 4-1	<i>Logistics Operations</i>
MCWP 4-11.3	<i>Transportation Operations</i>
MCWP 4-12	<i>Operational-Level Logistics</i>

Together, the MEB 2015 scenario and table 2 guidance yielded a list of about 563 MEB responsibilities, listed in appendix A of [3] for the Command Element (CE), GCE, ACE, and CSSE.

## Determination of MEB training environment

We developed an analytic method for translating each piece of MEB guidance into a requirement for the training environment. This lexical analysis sought to identify the Who, What, When, Where, and Why from each statement. Every guidance statement contained a Who, What, and Why: Who is the training audience? What does the training environment need to have to support their training? And, why do they need to execute the training? Thus, *every* piece of guidance gives us a piece of the training range requirements.

For example, the guidance:

Command Element assesses shaping actions

requires that the training environment include at least *shaping actions* (what) for the *Command Element* (who) to assess. The “what” exists to

give the training audience the opportunity to practice the task *assess shaping actions* (why). There are many ways to provide this capability—real fires, targets, observers, and tactical communications—and this guidance does not tell us about those methods.

The above method also identifies the training audience, as well as individuals, elements, and commands required to support the training audience. Appendix E of [3] lists the training and supporting audiences derived from the MEB training requirements. An important aspect of both audiences is the lowest level needed to support the training requirements. This will affect the character of the physical MEB training environment. For the GCE, this is the company headquarters for maneuver elements, and Fire Support Team (FIST) (including forward observers) for controlling fires. For the ACE, the guidance requires support from squadrons, aircrew delivering fires for Forward Air Controller (FAC) control, and supporting air movement. For the CSSE, Combat Service Support Detachments (CSSDs) are required to provide direct company and battalion support within the context of the MEB exercise.

The physical training environment that supports the set of guidance statements consists of pairs of environmental objects and requirements. A total of 85 pairs describe the physical MAGTF training environment for the MEB guidance set. Appendix C in [3] lists these pairs and the subset of guidance statements citing each pair. This list of environmental objects and requirements is the minimum set of places, and things that must be located at each place, for the training environment to support MAGTF training.

Our analysis found it useful to divide the environmental requirements into two categories: operational and tactical. The Joint definition of operational-level warfare cites the responsibility to manage multiple battles over large space and time to directly support strategic objectives. The 2015 MEB defining tasks include the possibility of managing Joint, operational-level warfare. However, even without Joint responsibilities, the MEB may have to manage multiple battles over large space and time. We use the term “operational” to label these responsibilities. Marine Corps Warfighting Publication (MCWP) 4-12, *Operational-Level Logistics*, includes good examples of

these responsibilities. Appendix A of [3] includes the maximum warfare level, operational or tactical, for each responsibility.

The set of environmental objects and requirements, along with the training actions each supports, defines the elements the physical MEB training environment must contain, and the reasons for each element's inclusion. Figure 2 shows the notional training environment required to support operational-level responsibilities arranged as a map. The figure shows training areas the environment must include as black text. The figure also shows the capabilities each area must include, white text, based on the extracted MEB MAGTF guidance. For example, figure 2 depicts the "Deep" area as a oval, and indicates that this area must support threat forces, operations, including fire-support, and friendly maneuver elements. The "close" area must include fire-support operations and logistic facilities. The component areas, e.g., deep; close; rear; host nation; all are part of the "theater" as indicated by the green background. Finally the entire training area must support operational MEB-level training over a series of time phases, with each "phase" allowing for managing future events, targets, fire-support maneuver elements and resources.

Figure 3 shows that the tactical MEB training area must include brigade and battalion areas of operation (Bde/Bn AORs). These AORs must include supporting areas, shown in black text, e.g., engagement air maneuver areas, landing zones, inland and mountainous areas. Like figure 2, figure 3 indicates what each area must support, shown in white text. For example, the Expeditionary Airfield (AEAF) must support friendly aircraft, supporting resources, and logistic support elements.

Figure 2. Notional operational-level environmental requirements

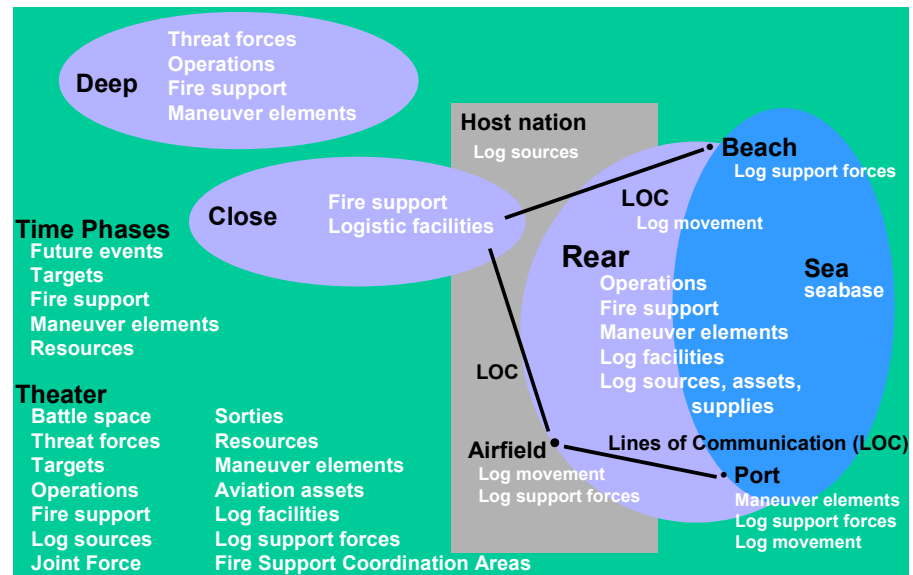
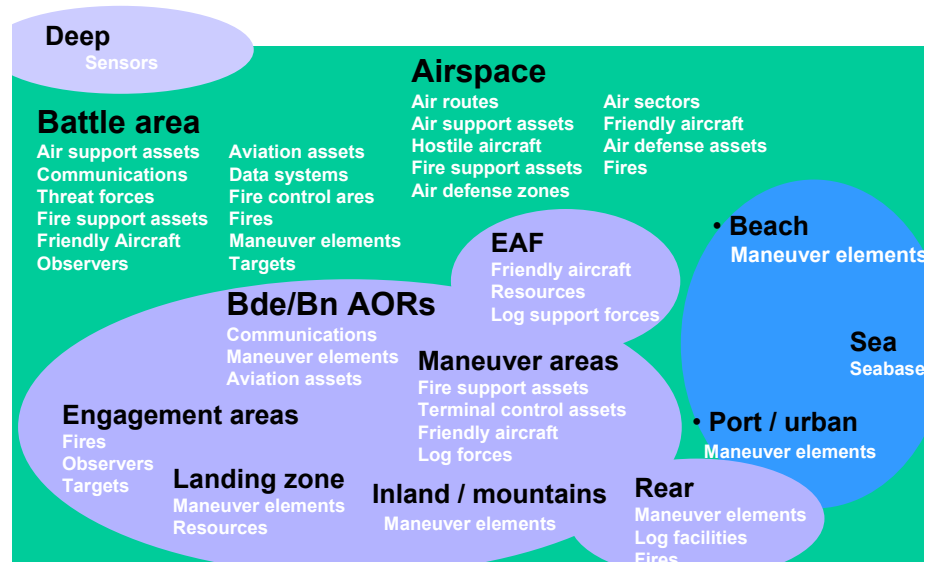


Figure 3. Notional tactical-level MEB training areas



By comparing figures 2 and 3, we can see the difference in the physical training environments that support training the MEB's operational tasks versus those training the tactical tasks. For example, training operational tasks requires a "close" area, which at a minimum includes fire-support and logistics operations. However, training tactical tasks requires that the close area include brigade (Bde) or battalion (Bn) operating areas, an expeditionary airfield, and engagement, maneuver, and landing areas, with each of these areas including specific assets, operations, and training support.

Determining the specific characteristics of tactical MEB training areas requires identification of the training audience and the tactical functions that the training environment must support. At the tactical level these functions include movement, maneuver, and fires. The MEB guidance discussed above includes this information.

Our analysis showed that the lowest level of the training support elements defines the level of detail that MEB training exercises and training environments must support. For the GCE, this is the company level, specifically, company maneuver elements, FIST, and firing units. For the ACE, the guidance requires support from squadrons, aircrew employing fires for FAC control, and supporting air movement. For the CSSE, CSSDs are required to provide direct company and battalion support within the context of the MEB exercise.

Thus, the MEB training environment must support company-level maneuver, and indirect and air fires. While the MAGTF guidance extracts do not detail the company and below maneuver elements, the elements required to support MEB fires training are: FIST control of air, mortar, artillery, and naval fires for each company in the MEB's battalions. Therefore, MEB training can be supported by FIST-level combined arms training executed over a sequence of integrated multibattalion battles. For FIST-level combined arms training, fires must be supported at the forward observer, fire controller, and firing unit level. For the MEB responsibilities analyzed here, representative elements at the company level and below can support MEB tactical maneuver training, as long as the represented company maneuvers in a manner consistent with appropriate unit and terrain constraints.

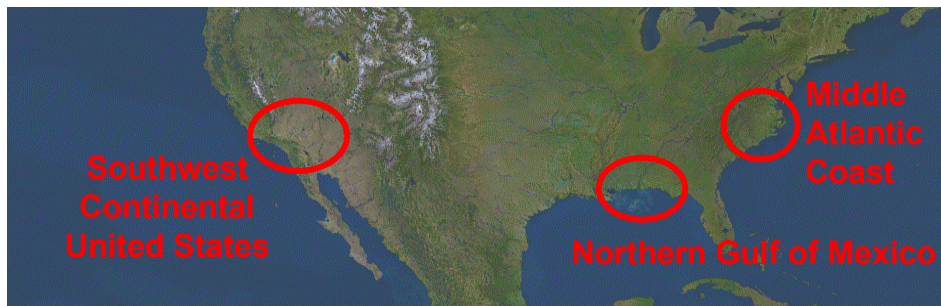
The next section identifies specific places in the U.S. that would support the MEB operational and tactical training environment.



## Assessment of specific MEB training areas

The list of 85 pairs of environmental objects and requirements, discussed in the previous section, was the starting point for the analysis of potential MEB training areas. For each of the three major training areas considered, we went through the list of environmental pairs and tried to find a specific facility that included the environmental object, allowed the inclusion of the environmental requirement, *and* supported the guidance statements citing the pair. We started with the operational level to ensure that the major elements of the physical training environment supported the training requirements. Figure 4 shows the candidate areas.

Figure 4. Candidate MEB training areas



We used the same process to find suitable environments to meet the MEB tactical training requirements. We added the requirement that the tactical and operational solutions be consistent—both supporting the same notional scenario. In some cases, this constraint led to choosing between only one of two possible, acceptable, operational configurations. Appendix D of reference [3] lists the local training areas associated with each environmental object and requirement in each of the three major MEB training areas considered. Appendix D

[3] also includes the training requirement supported by each local training area.

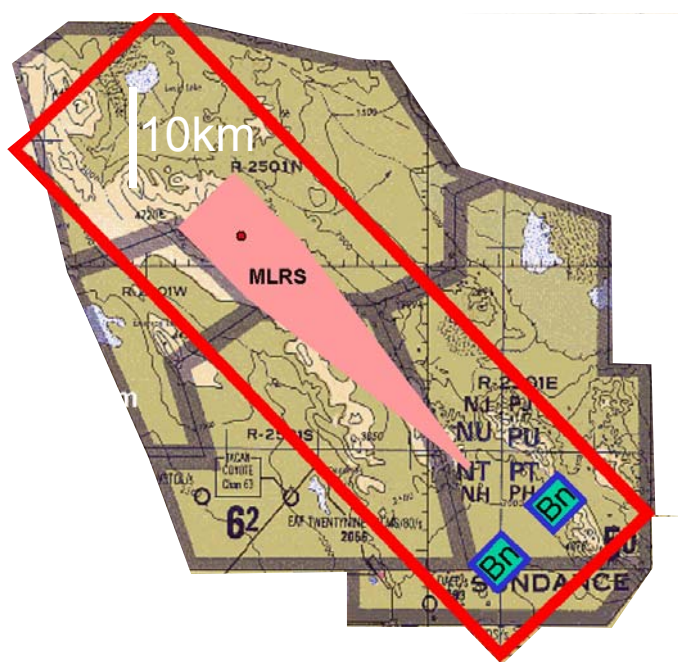
Reference [2] analyzed the size required to support company (Co), battalion, and brigade training. This analysis drew together sometimes-conflicting intelligence, operational, and training guidance for Marine Corps and U.S. Army units. This analysis showed that the U.S. Army training Circular TC 25-1, *Training Land*, gives reasonable estimates for the maximum areal size required to support training for Bde and below. The training circular includes estimates for both contiguous and non-contiguous operations and training. While TC 25-1 does not detail how the size of each training area was derived, analysis of the operational guidance allowed us to deduce the elements of intelligence, movement, maneuver, and fires that Army analysts used to set the scale of training areas.

The training area is sensitive to the duration of the training and level of threat; for example, area required to support Bn-level training on restricted terrain against a hasty threat defense, inclusive of CSSE support increases from 9- x 12-km for a 12 hour exercise to 9- x 70-km for a 24 hour training exercise. TC 25-1, appendix C, discusses the increase in range requirements for “free-flowing” scenarios without breaks between movement to contact, offensive, defensive, and retrograde training. In this case, the Bn’s box increases in size, from 8- x 17-km to 16- x 40-km. For non-contiguous operations, TC 25-1 expands these training corridors to radii of action—citing an area of about 60-km diameter to support training a Bde-scale unit. As the training circular points out, the training areas resulting from these calculations exceed the size of any U.S. training area for division and above training. TC-25-1 comments that even regimental training exceeding 24 hours in duration taxes the largest Army and Marine training areas.

As a consequence of the large training areas required to support MEB tactical and operational training, our analysis included the potential of distributed training. This is consistent with the current U.S. Army approach, as discussed in TC 25-1. Army trainers argue that distributed training also better supports training for distributed operations, which they see as a significant feature of future conflicts.

The problems of finding Marine Corps training areas that can support multiple-battalion training can be seen by laying the Bn-size training areas discussed above on a small-scale map of Marine Corps Base Twentynine Palms. Figure 5 shows the area recommended to train two Bns, conducting movement to contact and offensive operations for a 24 hour period. The figure also shows the surface danger zone for a High Mobility Rocket System (HIMARS)-launched Multiple Launch Rocket System (MLRS) M26 rocket with a 32-km range to target. The figure illustrates the large areas required for even two-Bn maneuver training.

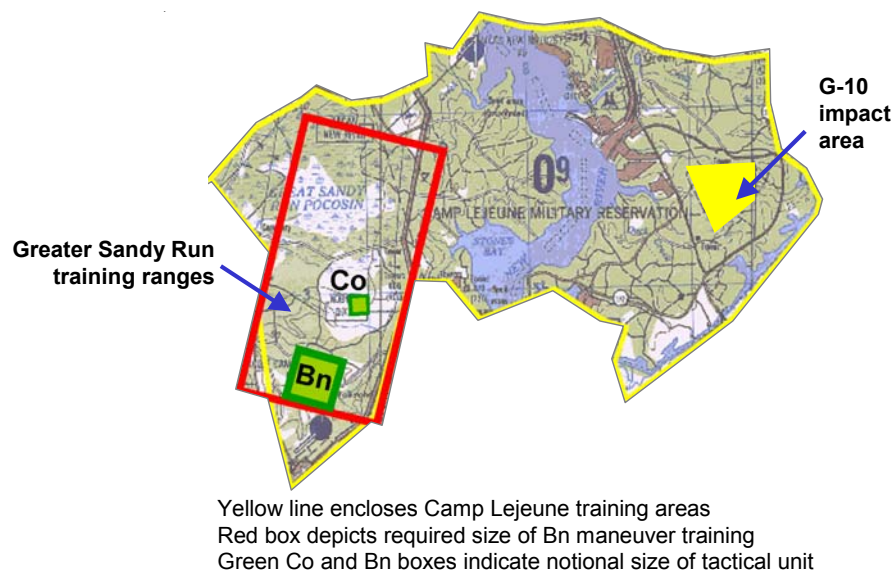
Figure 5. Scale comparison of a 2-battalion, 18- x 60-km, movement to contact and offensive operations training area, HIMARS M26 SDZ, nominal Bn area of operation, and MCB Twentynine Palms



Middle Atlantic (MidLant) and Gulf of Mexico-based (GOMEX) MEB trainers face greater challenges supporting tactical, Bn-level, training. Figure 6 illustrates these challenges. While the 9- x 18-km single-Bn offensive tactical maneuver training area roughly fits within

the Greater Sandy Run training area, at Camp Lejeune much of the terrain within the red box in the figure is no-go, swamp, terrain. Additionally, Surface Danger Zones (SDZs) at the end of the maneuver area would extend outside the base boundaries. Finally, unlike at Twentynine Palms, Lejeune's indirect fire impact area, G-10, is located on part of the base where the maneuver area is much smaller than the notional Bn maneuver box. This does not mean that Camp Lejeune cannot support Bn training—in the past, it has been used to support regimental-scale maneuver training. However, the maneuver training will be constrained. MEB training will likely not be supported by live-fire or require that G-10 live-fires be translated into tactical effects on troops maneuvering in the Greater Sandy Run area, the western half of Camp Lejeune.

Figure 6. Scale comparison of Camp Lejeune, a 9- x 18-km Bn offensive operations training area, and nominal Bn and Co areas of operation



We analyzed the potential use of the Major Test Range and Facilities Base near Eglin Air Force Base for the MEB training. We found that this facility can support multibattalion maneuver-fire training but

requires a significant increase in supporting training instrumentation and simulations [3].

These comparisons, discussed in detail in [3], illustrate that all Marine Corps ranges have problems supporting brigade live-fire tactical maneuver training. The specifics of the problems vary from range to range vary, including the constraints on the size of battalion maneuver areas at Twentynine Palms, to the limited tactical maneuver and displaced live-fire at Camp Lejeune.

These constraints have two important effects on the MEB training: use of a distributed MEB training environment, and use of representative forces augmented by simulation for MEB tactical-level maneuver-fire training. The need to use a distributed training environment arises from the lack of a single CONUS facility capable of supporting all the physical requirements shown in figure 2. This conclusion is similar to that found in Army TC 25-1 for brigade and above live training. The need for use of representative forces augmented by simulation rises from the lack of any facility to fully support multibattalion maneuver-fire training. The degree of simulation is discussed below; however, in general, the dependence on representation and/or simulation will increase with decreasing size of the usable maneuver range and increasing separation between the maneuver and live-fire impact areas.

Table 3 gives an overview of the potential use of CONUS facilities to support MEB training. The table shows how we distributed MEB training range requirements in each of the three areas considered: SW CONUS, Mid-LANT, and GOMEX. The first column in the table lists the kind of environmental object—e.g., theater of operation, close area, or phase of operation. The table lists specific locations in each of the three major areas that could serve as the specified environmental object. For example, the close area could be Twentynine Palms in SW CONUS, Camp Lejeune in Mid-LANT, and the Eglin Major Test Range Facility base (MTRFB) in GOMEX. Appendix D in [3] lists the detailed pairing between the 94 training environment requirements and specific facilities in each of the three potential MEB training areas.

Table 3. Potential support of MEB training requirements in three CONUS training areas

Environment object	Max warfare level	SW CONUS	Mid-LANT	GOMEX
Phase	Operational	Time: At least two sequential Bn-scale battles for operational, one for tactical	Time: At least two sequential Bn-scale battles for operational, one for tactical	Time: At least two sequential Bn-scale battles for operational, one for tactical
Theater	Operational	Pendleton-North Island-29 Palms-Yuma	Savannah GA-Eastern, NC, Southeastern VA	Greater Eglin area
Host nation	Operational	San Diego County, CA	Savannah GA and Beaufort County SC	Pensacola, FL
Sea area	Operational and Tactical	SOCAL OPAREA	VACAPES OPAREA	GOMEX OPAREA
Deep	Operational and Tactical	Yuma	Ft AP Hill	Ft Polk U.S. Army JRTC
Close	Operational	29 Palms	Camp Lejeune	Eglin MTRFB
Rear	Operational and Tactical	Camp Pendleton	MCAS Beaufort	NAS Pensacola
Port	Operational and Tactical	San Diego (SPOE)	Morehead City, NC (SPOE) or Savannah GA	Port of Pensacola
Beach	Operational and Tactical	Camp Pendleton	Camp Lejeune	Eglin MTRFB
Airfield	Operational	Camp Pendleton	MCAS Beaufort	NAS Pensacola
LOCs	Operational	Pendleton-North Island-29 Palms-Yuma	Savannah- MCAS Beaufort - Lejeune	Pensacola-Eglin-Polk or Avon Park
Battle area	Tactical	Pendleton, 29 Palms	Camp Lejeune - AP Hill	Eglin MTRFB, Ft Polk or Avon Park
Maneuver areas	Tactical	Pendleton, 29 Palms	Camp Lejeune - AP Hill	Eglin MTRFB, Ft Polk or Avon Park
Engagement areas	Tactical	Pendleton, 29 Palms, San Clemente	Camp Lejeune-G-10, AP Hill	Eglin MTRFB, Ft Polk or Avon Park
Landing zone	Tactical	Pendleton, 29 Palms	Camp Lejeune - AP Hill	Eglin MTRFB, Ft Polk or Avon Park
Airfield	Tactical	29 Palms	MCAS Beaufort	Eglin MTRFB
Mountainous area	Tactical	Camp Pendleton, 29 Palms	None	None
Inland area	Tactical	29 Palms	AP Hill	Ft Polk
Urban	Tactical	Yuma (aviation), Pendleton (ground)	Camp Lejeune	Eglin MTRFB, Ft Polk or Avon Park
Bde AOR	Tactical	Pendleton, 29 Palms	AP Hill	Eglin MTRFB, Ft Polk or Avon Park
Bn AOR	Tactical	Pendleton, 29 Palms	Camp Lejeune, Ft Pickett, Ft AP Hill	Eglin MTRFB
Forward air supply area	Tactical	29 Palms	MCALF Bogue	Eglin MTRFB
Airspace	Tactical	Pendleton, 29 Palms, Yuma	R3506, Cherry Point TACTS	R29xx, W151
Air defense zones	Tactical	Yuma R2301	Lejeune R3506, Ft Bragg R5311, plus integrated special use airspace	W151
Air routes	Tactical	Pendleton-29 Palms	MCAS Beaufort-Lejeune-AP Hill	Pensacola-Eglin-Ft Polk or Avon Park

# Character of MEB training for each training area

This section captures the character of MEB training in SW CONUS, GOMEX, and Mid-LANT training areas.

## Southwest Continental United States

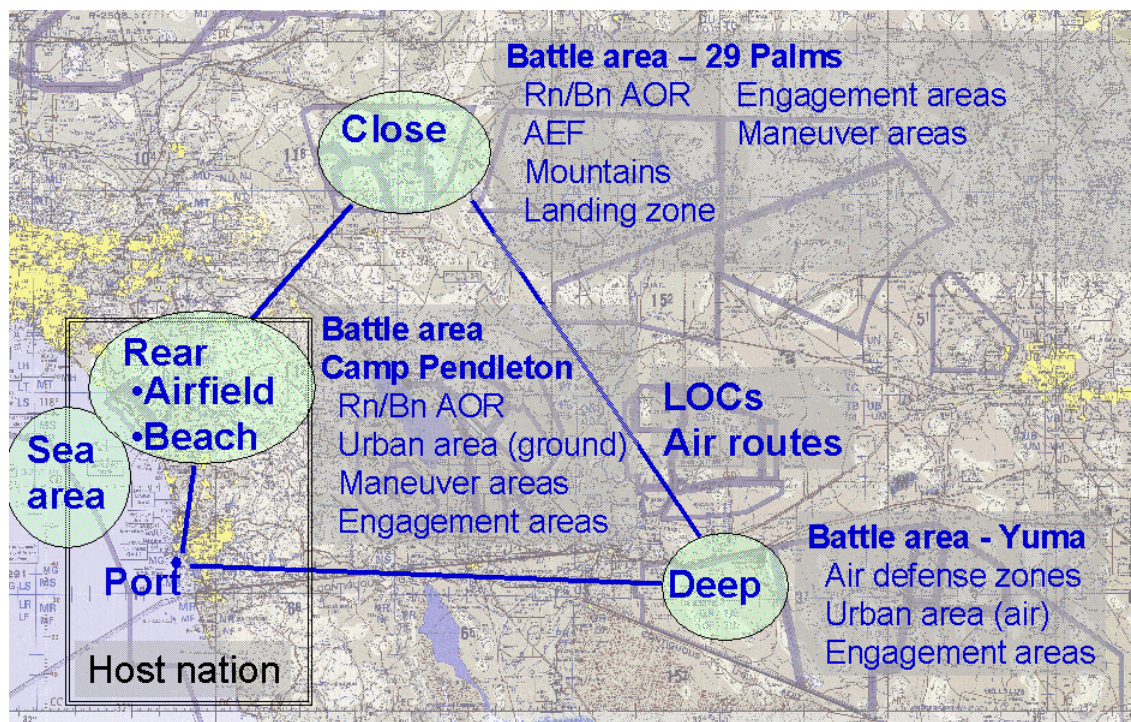
This area is a training range-rich environment. Given the capability of Marine facilities in the area, we constructed a few alternative solutions to many of the MEB training requirements.

Starting from the operational level, the MEB must allocate ground, air, and combat support between multiple, sequential battles in support of exercise strategic objectives, over large spaces and long times. For the MEB, we use “large spaces” to mean separate brigade-sized battle areas, and “long time” to mean enough time for at least two battalion-scale battles. The MAGTF and MEB 2015 guidance specify the operational-level sources and destination of the ground, air, and support forces: sea areas, port, airfield, beach for sources, and rear, close, and deep for application of the MEB force. Each area requires integration of all three MAGTF elements within that area, and the right allocation of forces between the areas to accomplish the MEB mission.

We found that SW CONUS can provide close and rear areas capable of supporting distributed-brigade and multiple-battalion ground operations. The areas—Camp Pendleton for rear, and Twentynine Palms for close—are separated by about 200 km, making it difficult to shift forces and support assets from battles in one to those in the other—stressing the planning and allocation training requirements as intended. Figure 7 shows these areas, and the supporting environmental objects in each.



Figure 7. Candidate identity and linkage of SW CONUS MEB training environment



Yuma serves as a deep battle area, and serves to support air defense and deep strike capabilities. However, Yuma has limited ground maneuver areas. All three areas are supported by movement from the amphibious force or seabase: Maritime Pre-positioning Force (MPF) offloads at the Sea Port of Embarkation (SPOE) in San Diego, and are connected by ground and air lines of communication (LOCs) for moving the support.

The guidance specifies that the tactical level, that is, a single battle, must potentially include two coordinated and one independent, supporting but simultaneous, battalion engagements. These battles fight using the ground, fire, and support assets allocated and transported to the battle areas. Both Camp Pendleton and Twentynine Palms can support the tactical capabilities required for the rear and close areas, respectively. However, Twentynine Palms geography channelizes individual and separates multibattalion movement and maneuver. Additionally, battalion-level forces will have to reposition after 12 to 24



hours of training due to the length of the battalion training corridors. Together, the 5- to 10-km corridors, and the need to reset forces for a MEB duration exercise, may realistically result in the use of representational forces at the company level for maneuver elements, while retaining the full-scale firing and fire control elements. Finally, acquisition of impact areas to the west of the current range would allow development of a western live-fire battalion-scale training corridor.

Figure 8 lists the capabilities required at Twentynine Palms to support the close area training.

Figure 8. Twentynine Palms support of operational and tactical requirements

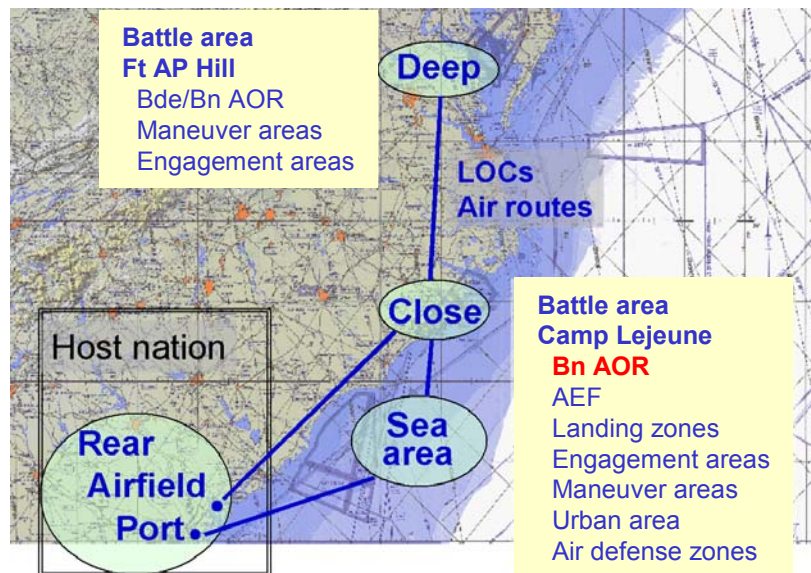


SW CONUS still could not meet all the MEB training requirements. As discussed in the last section, this area had problems meeting the guidance-driven training environment requirements for seabasing, port combat operations, and rear fire support coordination. Nevertheless, as the next sections show, the SW CONUS area is the strongest of the three considered to support MEB training.

## Middle Atlantic coast

We analyzed how facilities in the vicinity of Camp Lejeune can support the MEB training requirements discussed in the last section and detailed in appendix D of [3]. Table 3 and figure 9 illustrate one way to meet the MEB training environment requirements. Figure 9 shows that the area can support the requirements for sea, rear, close, and deep host nation areas, and can provide an airfield, an MPF port, and lines of communication. It is also important to see that the deep MEB training area is a U.S. Army-owned training range, Ft. AP Hill. The SW CONUS area relies on Marine-controlled ranges only. To support the MEB training requirements, Ft. AP Hill will have to host at least battalion- and possibly brigade-scale fire and maneuver training.

Figure 9. Potential use of Mid-LANT training areas for MEB operational-level training.



Camp Lejeune has difficulties supporting tactical-level MEB live-fire training. Reference [3] analyzed coordinating battalion and regimental level fires and maneuver at Camp Lejeune. A full battalion might be able to exercise at Camp Lejeune, using the Greater Sandy Run ranges, the K-2 impact range, the Company Battle Course, and the G-10 impact area. However, the tactical integration of these company units and single-artillery/fixed-wing/Naval Surface Fire Support (NSFS) fires would require heavy instructor support and coordination, likely assisted by instrumentation and computer simulation. The instructor's role would be to monitor tactical actions in each area and translate the tactical effects of those actions to the non-adjacent areas. The role of the simulation would be to help the instructors with the integration of the multiple company-level actions into a single battle problem.

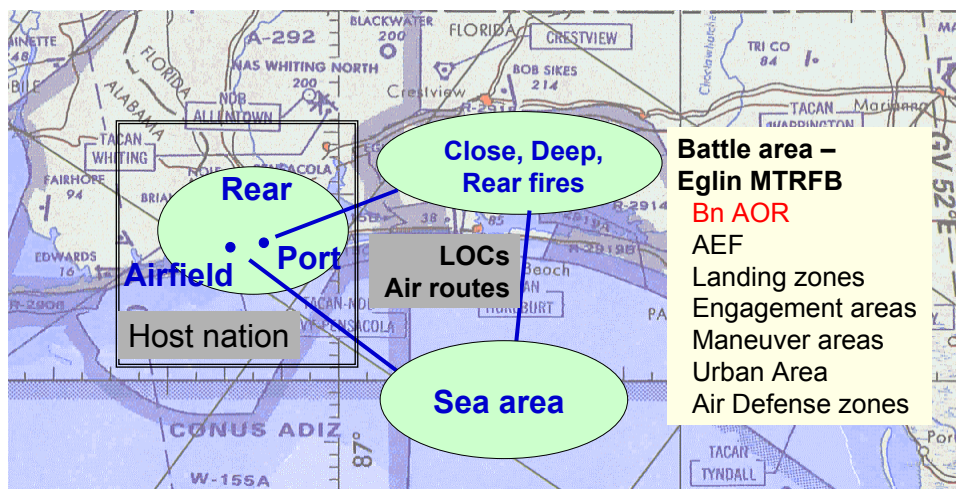
Camp Lejeune as currently configured is not large enough to support brigade live-fire training. While the base has hosted full-scale regimental training in the past, figure 6 shows that these forces begin training nearly in contact if existing maneuver ranges are used. For example, if the company sized unit on one Greater Sandy Run (GSR) maneuver range in figure 6 was a Bn sized unit, they would start nearly in contact with the second Bn sized unit on a nearby GSR maneuver range. Given the small maneuver areas at Camp Lejeune, and restrictions to tactical maneuver off ranges, it may be more effective to use company and battalion headquarters command representative forces, with combat and service support forces scaled accordingly. Again, the tactical outcomes of battle engagements would require simulation support. The Army has developed training methods and programs using mixes of constructive and real forces supported with simulators, but force instrumentation and lack of small-unit combat friction are the prices paid for this approach. Ultimately, the lack of friction at the tactical level makes solving operational-level planning, assessment, and asset allocation problems too easy.

## **Northern Gulf of Mexico**

The northern Gulf of Mexico, GOMEX, has training areas that can support elements of operational- and tactical-level MEB training.

However, the MEB training will rely heavily on simulation and use of constructive forces and geography. One way to use these facilities is to use the Pensacola area, including the Port of Pensacola and Naval Air Station (NAS) Pensacola, as the rear area; Eglin Major Test Range Facility Base, MTRFB, for the close area; and Ft. Polk for the deep area. Eglin MTRFB includes proven amphibious landing beaches and inland fire and maneuver ranges. Figure 10 shows the operational-level use of the GOMEX area.

Figure 10. Potential operational role of GOMEX MEB training areas



In the GOMEX operational area the same pool of assets can support both the close and rear problems. One solution to this problem is modifying the scenario and exercise play to insert constructive distance between NAS Pensacola and Eglin MTRFB. The shifting of assets between areas must be consistent with that unit's transit speed over the constructive geography. Likewise, helicopter-borne transport would have to be committed honoring the constructive, not the actual, distance. Historically, training audiences and trainers have found honoring these kinds of constructive constraints on assets and time problematic in practice.

Figure 10 shows that use of GOMEX requires collapse of the rear and close areas, with their impact on operational-level asset allocation training. There is also a tactical problem with exercising rear-area fire support operations. NAS Pensacola cannot support tactical fires training. This means that Eglin fire ranges would have to support rear-area fire support training, again requiring integration of displaced fires and rear-area support operations. This effectively collapses the close and rear engagement areas, or requires simulation-supported rear-area fire support training. Thus, MEB support, movement and fires are all collapsed to a single area.

The best candidates for battalion-level deep maneuver fire training are Ft. Polk, Louisiana, and Avon Park, Florida. Both are approximately 650 km from NAS Pensacola, well outside the 370-km 2015 MEB operational range. If this distance makes the deep area impractical for training, Pensacola will have to support all MEB fire and maneuver training: deep, close, and rear. Small, representative maneuver units integrated using constructive geography and simulations at the operational level are likely the best way to support MEB training.

Eglin's tactical maneuver and impact areas are larger than those of Camp Lejeune [4]. Recently, 22<sup>nd</sup> Marine Expeditionary Unit (MEU) showed that existing ranges easily supported company-level maneuver-fire exercises. However, the tactical integration of these maneuver areas, as well as all maneuver with supporting fires, requires the same kind of approach as that used at Camp Lejeune.

Finally, none of the required ranges belongs to Marine commands, and the Eglin MTRFB obeys Office of Secretary Defense (OSD) test and evaluation rules for both costing and use. In addition to the effort and expense for supporting tactical integration (which also applies to use of Camp Lejeune for MEB-level training), Eglin MEB training requires payment of a usage fee and large travel costs.

## **Summary of candidate MEB training areas**

We have seen that all three areas, SW CONUS, Mid-LANT, and GOMEX, can support operational and tactical MEB training. Each contains sea, shore, port, and land maneuver areas, and supports

live-fire combined-arms training. Table 4, (included in the executive summary as in table 1) summarizes the comparison of these areas.

The areas require different levels of operational and tactical simulation support. The SW CONUS battalion and brigade maneuver fire areas are far enough apart to support operational planning and decision-making training. The MEB Mid-LANT area supports operational training, but tactical training requires simulation to support battalion-level training. Mid-LANT brigade training will likely require representative units supported by tactical engagement simulation of constructive forces to support operational and tactical training. GOMEX will collapse the operational into the tactical training environment; due to the lack of nearby training areas for battalions and above, operational-level simulations will likely be needed, to allow different areas in the Eglin MTRFB to simulate rear, close, and deep operating areas. The simulations will be required to support integration of representative and constructive forces.

Thus, while all areas support MEB training using fielded forces and live fire, they will also need simulation support. SW CONUS will need the least; Camp Lejeune, the next-least; and GOMEX the most. They also will likely need the use of constructive and representative tactical forces. Our methodology details what training requirements these training aids support, but it cannot assess how the increasing use of constructive forces and simulated engagements affects the value of MEB training.

Table 4. Comparison of MEB training areas; suitability, problems, and potential remedies

MEB training area	Problems	Potential remedy
<b>SW CONUS<sup>a</sup></b> San Diego, Camp Pendleton, 29 Palms, Yuma	Limited long-exercise duration multi-Bn maneuver areas at 29 Palms	Extend base boundary west to support additional Bn corridor
	Limited ground maneuver curtails fire support in deep area	Use representative forces in deep area as required
	San Clemente NSFS not integrated into maneuver in rear and close battle areas	Use artillery or VAST to simulate integration of NSFS
	Fires in support of port seizure not possible	Use simulated fires to support port seizure
	2015 scenario requires operations from seabase	Amphibs/CVNs as seabase as required
<b>MidLANT<sup>b</sup></b> Morehead City, Cherry Point, Camp Lejeune, Ft. Bragg, Ft AP Hill	Limited short-exercise duration Bn maneuver areas at Camp Lejeune	Start with Bn forces near contact
	Limited multi-Bn maneuver areas at Camp Lejeune	Integrate constructive and representative forces via simulation
	Single impact area for all supporting close fires, Bn and fires area not adjacent	Integrate constructive and representative fires via simulation
	Fires in support of port seizure not possible	Use simulated fires to support port seizure
	2015 scenario requires operations from seabase	Amphibs/CVNs as seabase as required
	Offshore Lejeune	Amphibs as seabase
<b>GOMEX<sup>c</sup></b> Pensacola, Eglin MTRFB, Ft Polk, Avon Park	No mountain terrain	None
	No operational training areas within 200NM of close training area	Staged tactical and support assets at distant bases to simulated operational maneuver and support, Constructive operational environment
	Limited short-exercise duration Bn maneuver areas at Camp Lejeune	Start with Bn forces near contact
	Limited multi-Bn maneuver areas at Camp Lejeune	Integrate constructive and representative forces via simulation
	Single impact area for all supporting close fires, Bn and fires area not adjacent	Integrate constructive and representative fires via simulation
	No NSFS	Use artillery or VAST to simulate integration of NSFS
	Fires in support of port seizure not possible	Use simulated fires to support port seizure
	2015 scenario requires operations from seabase	Amphibs/CVNs as seabase as required
	Offshore Lejeune	Amphibs as seabase
	No mountain terrain	None

a. Green: MEB training supported with real or Co-level representative forces

b. Yellow: MEB training requires constructive tactical forces and/or simulator support

c. Red: MEB training requires constructive operational and tactical forces and/or simulator support



## Shared problems supporting MEB training requirements

There are problems with the details of some of the specific training environments listed in table 4. All areas have problems with:

- Ports
- Seabase
- Fires and fire support coordination.

The MEB requirements call for execution of fire support at the port (MAGTF guidance) and port seizure (MEB 2015 scenario). Other port logistics requirements need the use of actual port facilities to support MPF and logistics operations. MEB trainers will likely have to employ constructive fire support and port seizure.

Seabase issues are not surprising, as the current operating environment lacks a seabase. But it is worth listing the 2015 MEB seabase functions to see future seabase training requirements:

- Operate from the seabase (CE, GCE, ACE, CSSE)
- Direct MEB operations from the seabase (CE)
- Coordinate with seabased support elements (CE)
- Coordinate with seabase and seabased battalions (GCE)
- Support maneuver elements from the seabase (ACE)
- Conduct at-sea arrival and assembly (CSSE)
- Coordinate with seabase and maneuver elements ashore (CSSE).

Unlike port and seabase problems, problems with fire support coordination reflect the individual character of the major MEB training areas. For SW CONUS the issue involves integrating NSFS into the GCE's scheme of maneuver. While San Clement can support NSFS fires, additional training instrumentation is required to integrate these real fires into maneuver-fire training. Eglin faces a similar problem: integration of sea-impact fires into the maneuver-fire training requires existing instrumentation (Virtual At-Sea Trainer) and



changes to current fires training procedures [4]. Camp Lejeune has only one air-artillery-NSFS impact area, making integrated fire support with independent battalion tactical maneuver elements difficult.

Non-NSFS fire support coordination is an issue for other reasons at Eglin and Camp Lejeune. At Eglin, the direct-fire maneuver ranges are located over 10 n.mi from the indirect-fires impact ranges [4] at Pendleton, Twentynine Palms, and Lejeune. Company maneuver and fire ranges are contiguous, making it possible for visual observers to assess the timing and accuracy of the fires and translate the tactical effects of the fires into the progress of tactical maneuver execution.

Fixing this problem requires either establishing maneuver ranges near Eglin indirect-fire impact ranges, or developing training instrumentation to translate the fire's tactical effects into the maneuver training. New Eglin maneuver areas require the Marines' environmental approvals and investment in range construction. Because no instrumentation exists to translate the fires into the maneuver area, funding would be required to develop a new instrumentation.

Camp Lejeune has a similar problem integrating indirect fires and battalion-level maneuver. Only the Company Battle Course is adjacent to Camp Lejeune's G-10 impact area. Battalion-level maneuver-fire training would require linking other company-level maneuver areas on the base to the fire effects achieved in G-10. Building company-level maneuver ranges near G-10 requires major changes to the base infrastructure, as well as environmental permissions. Like Eglin, instrumentation linking maneuver-fire training is a potential solution. Unlike Eglin, it is unlikely that the base can support multiple-battalion maneuver training.

The bottom line is that, in the absence of significant range development, East Coast battalion and regimental maneuver-fire training requires instrumentation that integrates non-adjacent fire and maneuver ranges. Like the use of instrumentation to integrate sea-impact NSFS fires into company-level combined arms training, instrumentation-based maneuver-fire training requires a change in fundamental Marine Corps training values. Marines will have to assess whether this change in values is worth the gain of achieving some level of East Coast maneuver-fire training for battalions and above.

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## Summary and conclusions

This memorandum documents our analysis of the MEB training environment. We presented a method for determining the required environmental characteristics to support MEB training. This method shows that each statement of MEB responsibility was also a statement about an element of the training environment required to support training that responsibility. Thus, the set of all MEB responsibilities defines the minimum requirements for the supporting MEB training environment. We presented a method for identifying the subset of required characteristics of the physical training environment. Finally, we showed how the set of physical characteristics can help configure both a notional and actual training environment. The remainder of the memorandum detailed the results of our comparison of MEB training in southwestern continental U.S., the mid-Atlantic coast, and the northern Gulf of Mexico coast.

The following bullets capture the study's significant results.

- MEB live-fire and maneuver training exercises are possible using CONUS ranges.

All three candidate CONUS MEB training areas, SW CONUS; Mid-Atlantic coast; and Gulf of Mexico coast, support some form of MEB-level live-fire and maneuver training.

- Scale of MEB and training area constraints conflict with current MC unit (Bn and below) training approach.

No single MC owned range supports MEB training. All require expansion or use of distributed, representational force, and simulation supported training methods. U.S. Army trainers have come to the same conclusion for brigade and above force-level training.

- Of all US MC ranges, Southwest CONUS ranges best support MEB training requirements.

The collection of MC SW CONUS ranges are within the planned MEB operational reach, and two MC SW CONUS ranges have large ground maneuver and fire areas. However, MEB training using SW CONUS ranges requires distributed training methods. Additionally, without expansion, Twentynine Palms cannot support realistic full-unit ground and fires training for the required three battalion MEB force. Use of representational units, augmented with simulator support, will allow Twentynine Palms to support MEB fires and maneuver training.

- MEB training on Mid-Atlantic and Gulf of Mexico ranges require significant use of non-MC ranges, representational forces, and simulation support.

Mid-Atlantic ranges, including US Army ranges, support distributed MEB training, but the small size of these ranges and associated impact areas require significant use of representational/constructive forces and simulator supported integration of unit fires and maneuver training. Distances between battalion-level Gulf of Mexico ranges exceeds planned MEB span of control. This constraint requires either simulator-supported distributed training on ranges separated by greater than 300NM or simulator-supported constructive maneuver of representational units combined with simulator supported maneuver-fires training on a single range.

- In situations where simulation and constructive training elements are required, the guidance-environment approach used in this study yields a method for defining the requirements for the supporting simulations and the supporting constructive forces or geography.

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