

MAGTF Planner's Reference Manual



MAGTF Staff Training Program Division (MSTPD)

Distribution Statement A: Approved for public release: distribution unlimited.

U.S. Marine Corps
11 January 2017

MAGTF Planner's Reference Manual

*This pamphlet supports the academic curricula of the Marine Air Ground Task Force
Staff Training Program Division (MSTPD)*

Distribution Statement A: Approved for public release: distribution unlimited.

U.S. Marine Corps
11 January 2017

UNITED STATES MARINE CORPS
MSTP Division (C467)
Training and Education Command
2042 South Street
Quantico, Virginia 22134-5001

11 January 2017

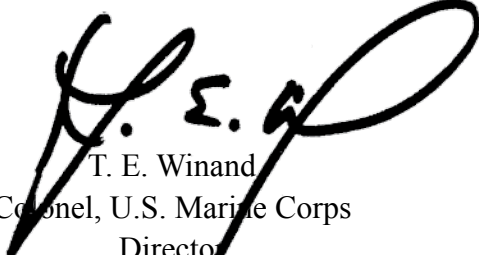
FOREWORD

1. **PURPOSE:** The MAGTF Planner's Reference Manual provides general planning considerations and planning factors that may be helpful to a Marine Air-Ground Task Force (MAGTF) staff during the conduct of planning.
2. **SCOPE:** This manual is intended for use by MAGTF staffs. It is designed to facilitate the planning effort by presenting general planning factors and considerations that may be used in an Operational Planning Team (OPT). The data presented in the manual is intended to be a starting point only and does not negate the need for a careful Mission, Enemy, Terrain and Weather, Troops available, and Time available (METT-T) analysis.
3. **SUPERSESSION:** MSTPD Pamphlet 5-0.3 of 27 November 2012.
4. **CHANGES:** Recommendations for improvements to this pamphlet are encouraged from commands as well as from individuals. The enclosed User Suggestion Form can be reproduced and forwarded to:

Director, MAGTF Staff Training Program Division
2042 South Street
Quantico, Virginia 22134-5001

Recommendations may also be submitted electronically to: MSTP_OPS@usmc.mil

5. **CERTIFICATION.** Reviewed and approved this date.



T. E. Winand
Colonel, U.S. Marine Corps
Director
MAGTF Staff Training Program Division
Marine Corps Combat Development Command
Quantico, Virginia

Throughout this pamphlet, masculine nouns and pronouns are used for the sake of simplicity. Except where otherwise noted, these nouns and pronouns apply to either sex.

Distribution Statement A: Approved for public release: distribution unlimited.

USER SUGGESTION FORM

From:

To: Director, MAGTF Staff Training Program Division, 2042 South Street, Quantico, Virginia 22134-5001

1. In accordance with the foreword, individuals are encouraged to submit suggestions concerning this pamphlet directly to the above addressee

Page _____ Article/Paragraph No. _____

Line No. _____ Figure/Table No. _____

Nature of Change:	Add	Delete
	Change	Correct

2. Proposed Text: (Verbatim, double-spaced; continue on additional pages as necessary).

3. Justification/Source:

NOTE:

1. Only one recommendation per page.
2. Locally reproduced forms may be used for e-mail submissions to: MSTP_OPS@usmc.mil

This page intentionally left blank.

This page intentionally left blank.

Table of Contents

Part I	Organizations	I-1
1001	Marine Expeditionary Force and Major Subordinate Command Locations	I-1
	a. Infantry and Artillery Regiment Locations	I-1
	Figure 1-1: Marine Expeditionary Force and Major Subordinate Command Locations	I-1
	1-2: Infantry and Artillery Regiment Locations	I-1
	b. Air Group Locations	I-2
	Figure 1-3: Air Group Locations	I-2
	c. Marine Corps Combat Logistics Regiments Locations	I-2
	Figure 1-4: Marine Corps Combat Logistics Regiments Locations	I-2
1002	Marine Corps Forces Command Organization	I-3
	Figure 1-5: Marine Corps Forces Command Organization	I-3
1003	Marine Corps Forces Pacific Organization	I-3
	Figure 1-6: Marine Corps Forces Pacific Organization	I-3
1004	I Marine Expeditionary Force Organization (FY17)	I-4
	Figure 1-7: I Marine Expeditionary Force Organization	I-4
	a. 1st Marine Division (FY17)	I-4
	Figure 1-8: 1st Marine Division Organization	I-4
	b. 3rd Marine Aircraft Wing (FY17)	I-5
	Figure 1-9: 3rd Marine Aircraft Wing Organization	I-5
	c. 1st Marine Logistics Group (FY17)	I-5
	Figure 1-10: 1st Marine Logistics Group Organization	I-5
1005	II Marine Expeditionary Force Organization (FY17)	I-6
	Figure 1-11: II Marine Expeditionary Force Organization	I-6
	a. 2nd Marine Division (FY17)	I-6
	Figure 1-12: 2nd Marine Division Organization	I-6
	b. 2nd Marine Aircraft Wing (FY17)	I-7
	Figure 1-13: 2nd Marine Aircraft Wing Organization	I-7
	c. 2nd Marine Logistics Group (FY17)	I-7
	Figure 1-14: 2nd Marine Logistics Group Organization	I-7
1006	III Marine Expeditionary Force Organization (FY17)	I-8
	Figure 1-15: III Marine Expeditionary Force Organization	I-8
	a. 3rd Marine Division (FY17)	I-8
	Figure 1-16: 3rd Marine Division Organization	I-8
	b. 1st Marine Aircraft Wing (FY17)	I-9
	Figure 1-17: 1st Marine Aircraft Wing Organization	I-9
	c. 3rd Marine Logistics Group (FY17)	I-9
	Figure 1-18: 3rd Marine Logistics Group Organization	I-9
1007	Marine Corps Forces Reserve Organization (FY17)	I-10
	Figure 1-19: Marine Corps Forces Reserve Organization	I-10
	a. 4th Marine Division (FY17)	I-10
	Figure 1-20: 4th Marine Division Organization	I-10
	b. 4th Marine Aircraft Wing (FY17)	I-11
	Figure 1-21: 4th Marine Aircraft Wing Organization	I-11
	c. 4th Marine Logistics Group (FY17)	I-11
	Figure 1-22: 4th Marine Logistics Group Organization	I-11
1008	Marine Corps Component Headquarters Locations	I-12
	Figure 1-23: Marine Corps Component Headquarters Locations	I-12

Table of Contents

1009	Maritime Prepositioning Force	I-12
	Figure 1-24: Maritime Prepositioning Ship Squadron Organization.....	I-12
a.	Maritime Prepositioning Locations (MPS Squadrons & MCPP-N).....	I-13
	Figure 1-25: Maritime Strategic Prepositioning Locations Under President’s Budget FY13 (PB-13) MPF Transition	I-13
	1-26: FY15 MPSRON Ship Composition and Capabilities	I-13
	1-27: ESD-LMSR Vehicle Transfer Operations.....	I-14
	1-28: TA-K <i>Bobo</i>	I-14
	1-29: Expeditionary Sea Base (ESB)	I-14
b.	Phases of a Maritime Prepositioning Force Operation.....	I-15
	Figure 1-30: Phases of a Maritime Prepositioning Force Operation	I-15
c.	Naval Amphibious Group 1, 2, and 3 Organizations.....	I-15
	Figure 1-31: Amphibious Groups 1, 2 and 3 Organization	I-15
d.	Maritime Prepositioning Force Ships and Steaming Times (FY15)	I-16
	Table 1-1: Maritime Prepositioning Force Ships and Steaming Times.....	I-16
1010	Notional Marine Expeditionary Unit.....	I-16
	Figure 1-32: Notional Marine Expeditionary Unit (MEU).....	I-16
1011	Baseline Marine Expeditionary Brigade (MEB).....	I-17
	Figure 1-33: Baseline MEB Organization, Showing Command Element (CE) Breakdown.....	I-17
	Table 1-2: Selected Baseline MEB Equipment from Command Element (CE) only	I-17
a.	Baseline MEB Ground Combat Element (GCE).....	I-18
	Figure 1-34: Baseline MEB GCE Organization	I-18
	Table 1-3: Selected Baseline MEB Ground Combat Element (GCE) Equipment	I-18
b.	Baseline MEB Aviation Combat Element (ACE).....	I-19
	Figure 1-35: Baseline MEB ACE Organization.....	I-19
	Table 1-4: Selected Baseline MEB Aviation Combat Element (ACE) Equipment.....	I-19
c.	Baseline MEB Logistics Combat Element (LCE).....	I-20
	Figure 1-36: Baseline MEB LCE Organization.....	I-20
	Table 1-5: Selected Baseline MEB Logistics Element (LCE) Equipment.....	I-20
d.	Infantry Battalion (MEB GCE).....	I-21
	Figure 1-37: Marine Infantry Battalion (MEB GCE).....	I-21
	Table 1-6: Selected Equipment Items, Marine Infantry Battalion (MEB GCE).....	I-21
e.	Field Artillery Battalion, Reinforced (MEB GCE).....	I-22
	Figure 1-38: Marine Field Artillery Battalion, Reinforced (MEB GCE)	I-22
	Table 1-7: Selected Equipment Items, Marine Field Artillery Battalion, Reinforced (MEB GCE)	I-22
f.	Reconnaissance Company, Reconnaissance Battalion Detachment (MEB GCE)	I-23
	Table 1-8: Recon Company, Recon Battalion, Organization and Selected Equipment	I-23
g.	Light Armored Reconnaissance Company, LAR Battalion Detachment (MEB GCE).....	I-23
	Table 1-9: LAR Company, LAR Battalion, Organization and Selected Equipment.....	I-23
h.	Tank Company, Tank Battalion Detachment (MEB GCE).....	I-23
	Table 1-10: Tank Company, Tank Battalion, Organization and Selected Equipment.....	I-23
i.	Assault Amphibian Company, Assault Amphibian Battalion (-) (MEB GCE).....	I-23
	Table 1-11: AAV Company, AAV Battalion, Organization and Selected Equipment.....	I-23
1012	Engineer and Logistics Forces	I-24
a.	Combat Engineer Battalion (FY17).....	I-24
	Figure 1-39: Combat Engineer Battalion Organization	I-24
	Table 1-12: Selected Combat Engineer Battalion Equipment.....	I-24
b.	Engineer Support Battalion (FY17).....	I-25
	Figure 1-40: Engineer Support Battalion Organization.....	I-25
	Table 1-13: Selected Engineer Support Battalion Equipment.....	I-25
c.	Marine Wing Support Squadron (FY17).....	I-26

Figure 1-41: Marine Wing Support Squadron Organization.....	I-26
Table 1-14: Selected Marine Wing Support Squadron Equipment	I-26
d. Naval Mobile Construction Bataillon (FY17).....	I-27
Figure 1-42: Naval Mobile Construction Battalion Organization	I-27
Table 1-15: Selected Naval Mobile Construction Battalion Equipment.....	I-27
e. Direct Support Combat Logistics Battalion (FY17).....	I-28
Figure 1-43: Direct Support Combat Logistics Battalion Organization	I-28
Table 1-16: Selected Direct Support Combat Logistics Battalion (CLB-DS) Equipment (FY17)	I-28
f. Direct Support Combat Logistics Regiment (FY17).....	I-29
Figure 1-44: Direct Support Combat Logistics Regiment Organization	I-29
Table 1-17: Selected Direct Support Combat Logistics Regiment (CLR-DS) Equipment (FY15)	I-29
g. General Support Combat Logistics Regiment (FY17).....	I-30
Figure 1-45: General Support Combat Logistics Regiment (CLR-GS) Organization.....	I-30
Table 1-18: Selected General Support Combat Logistics Regiment (CLR-GS) Equipment (FY15).....	I-30
h. MLG Headquarters Combat Logistics Regiment (FY17)	I-31
Figure 1-46: MLG Headquarters Support Combat Logistics Regiment (CLR-HQ) Organization	I-31
Table 1-19: Selected MLG HQ CLR Equipment Items (FY15)	I-31
1-20: MAGTF Motor Transport Capability Worksheet.....	I-32
Figure 1-47: LVSR-18 with Steel 20-foot Sea Container.....	I-32
1013 US Army Forces	I-33
a. The Modular Army	I-33
b. Armored Brigade Combat Team (ABCT) (New Type).....	I-34
Figure 1-48: Active Army Armored Brigade Combat Team (ABCT) Organization (FY16).....	I-34
Table 1-21: Selected Army Armored Brigade Combat Team (ABCT) New Type - Equipment Items	I-34
c. Infantry Brigade Combat Team (IBCT) (New Type)	I-35
Figure 1-49: Army Infantry Brigade Combat Team (IBCT) Organization (FY16).....	I-35
Table 1-22: Selected Army Infantry Brigade Combat Team (IBCT) New Type - Equipment Items	I-35
d. Stryker Brigade Combat Team (SBCT) (New Type).....	I-36
Figure 1-50: Army Stryker Brigade Combat Team (SBCT) Organization (FY16)	I-36
Table 1-23: Selected Army Stryker Brigade Combat Team (SBCT) New Type - Equipment Items	I-36
e. Army Aviation Units.....	I-37
Table 1-24: Army Aviation Units (except ARSOF and MI aviation) (FY16).....	I-37
f. Army Fires Brigade (FIB)	I-38
Figure 1-51: Army Fires Brigade Organization.....	I-38
Table 1-25: Selected Army High Mobility Artillery Rocket System (HIMARS) Battalion Equipment.....	I-39
1-26: Selected Army 155-mm Towed Howitzer (155T) Battalion Equipment	I-39
g. Military Intelligence Units	I-40
Figure 1-52: Expeditionary Military Intelligence Brigade (E-MIB)	I-40
h. The Army Maneuver Enhancement Brigade (ME Bde).....	I-40
Figure 1-53: Army Maneuver Enhancement Brigade (FY16).....	I-40
i. Army Engineers.....	I-41
Figure 1-54: Army Modular Engineer Battalion Organization.....	I-41
Table 1-27: Summary of Standard Army Engineer Companies	I-41
1-28: Selected US Army Small Engineer Units	I-41
1-29a: Selected Equipment Items Organic to Standard Army Engineer Units.....	I-42
1-29b: Selected Equipment Items Organic to Standard Army Engineer Units (continued).....	I-43
j. The Modular Army Sustainment System	I-44
Table 1-30: Army Combat Service Support Command Echelons.....	I-44
Figure 1-55: Army Sustainment Brigade Organization (typical configuration).....	I-45
Table 1-31: Army Truck Companies.....	I-47
1-32: Army Truck Company Cargo Capabilities.....	I-47

Table of Contents

Figure 1-56: Brigade Support Battalion Organization.....	I-48
k. The Army’s Health Service Support System.....	I-48
l. Army Civil Affairs and Psychological Operations Forces.....	I-48
Table 1-33: Civil Affairs Unit Regional Orientation.....	I-49
Figure 1-57: Civil Affairs Battalion (& CA Brigade HHC), USACAPOC(A) Organization.....	I-49
1-58: Tactical MISO (PSYOP) Battalion, USACAPOC(A) Organization.....	I-50
1-59: ARSOF Civil Affairs and MISO (PSYOPS) Units.....	I-50
1014 Military Police Forces.....	I-51
a. Military Police Organic to the MEF.....	I-51
Figure 1-60: MHG and FHG USMC Military Police Law Enforcement Battalions Organization.....	I-51
Table 1-34: Selected equipment items, MHG Military Police Law Enforcement Battalion.....	I-51
b. Army Military Police.....	I-51
Figure 1-61: Army Combat Support Military Police Co. Organization.....	I-52
1-62: Army MP Law Enforcement Det. Organization.....	I-52
Table 1-35: Selected Equipment Items, Army Combat Support Military Police Company.....	I-52
1-36: MP Detention Unit Capabilities.....	I-53
1015 Special Operations Forces.....	I-53
a. Marine Corps Special Operations Command (MARFORSOC).....	I-53
Figure 1-63: MARFORSOC Organization.....	I-54
1-64: MSOC Organization.....	I-54
b. US Army Special Operations Forces (ARSOF).....	I-55
Figure 1-65: ARSOF Organization.....	I-55
1-66: US Army Special Forces Group (SFG) Organization.....	I-56
Table 1-37: Special Forces Group Regional Orientation.....	I-56
1-38: Special Forces Operational Detachments “A” and “B”.....	I-56
Part II Equipment Capabilities.....	II-1
2001 Ground Weapons.....	II-1
a. Armored Vehicles and Associated Weapon Systems.....	II-1
Table 2-1: Armored Vehicles and Associated Weapon Systems.....	II-2
b. Crew-Served Weapons (towed or portable).....	II-2
Table 2-2: Crew-Served Indirect Fire and Anti-Armor Weapons.....	II-2
2-3: Crew-Served Automatic Weapons.....	II-3
c. Tactical Vehicle Summaries.....	II-3
Table 2-4: The Light Fleet.....	II-3
2-5: Vehicle Armor Kits.....	II-4
2-6: Medium and Heavy Tactical Trucks.....	II-5
Figure 2-1: MTRV Medium Truck Variants.....	II-5
2-2: LVSR Heavy Truck Variants.....	II-5
2-3: Tactical Trailers.....	II-6
Table 2-7: Tactical Trailer Summary.....	II-6
d. Mine Resistant Ambush Protected (MRAP) and Countermine Vehicles.....	II-7
Table 2-8: Mine Resistant Ambush Protected (MRAP) and Countermine Vehicles in Marine Corps Use.....	II-7
Figure 2-4: MRAP Vehicles.....	II-7
2002 Fixed-Wing Aircraft.....	II-8
Figure 2-5: KC-130J Harvest Hawk.....	II-9
Table 2-9: General Fixed-Wing Aircraft Capabilities.....	II-10
2003 Rotary-Wing Aircraft.....	II-10
Figure 2-5: USMC Helicopters.....	II-11
Table 2-10: Rotary-Wing Aircraft Capabilities.....	II-11
2-11: Aviation Glossary.....	II-11
2004 Unmanned Vehicle Systems.....	II-12

a.	Unmanned Aircraft Systems (UAS)	II-12
	Table 2-12: UAS Group Characteristics	II-12
	2-13: Unmanned Aircraft System – RQ-12A <i>Wasp</i> (USMC/USAF/SOCOM)	II-12
	2-14: Unmanned Aircraft System – RQ-11B <i>Raven</i> DDL (USMC/USA/USAF)	II-12
	2-15: Unmanned Aircraft System – <i>Puma</i> AE (USMC/USA)	II-12
	2-16: Unmanned Aircraft System – RQ-21A (USMC/USN/SOCOM)	II-13
	2-17: Unmanned Aircraft System – RQ-7B <i>Shadow</i> (USMC/USA)	II-13
	2-18: Unmanned Aircraft System – MQ-8B <i>Fire Scout</i> (USN/USA)	II-13
	2-19: Unmanned Aircraft System – <i>Predator</i> (USAF/USA/SOCOM)	II-14
	2-20: Unmanned Aircraft System – RQ-4 <i>Global Hawk</i> (USAF/USN)	II-14
	Figure 2-7: <i>Predator</i> Variants	II-14
	2-8: <i>Global Hawk</i> Variants	II-14
	Table 2-21: Unmanned Aircraft System – Glossary	II-15
b.	Unmanned Ground Vehicle Systems	II-15
	Figure 2-9: PackBot -510	II-15
	2-10: SUGV-310	II-15
	2-11: MTRS Mk. 1	II-15
	2-12: MTRS Mk. 2 <i>Talon</i>	II-16
	2-13: <i>Dragon Runner</i> 10	II-16
	2-14: <i>Recon Scout</i> XT	II-16
2005	Marine Air Command and Control System Radars	II-16
	Table 2-22: Marine Air Command and Control System Radars	II-16
2006	Marine Air Defense	II-16
	Table 2-23: Marine Air Defense Capabilities – Weapons	II-16
	2-24: Marine Air Defense Capabilities – Sensors	II-16
	2-25: Marine Air Defense Capabilities – Command and Control	II-17
2007	Communication Equipment	II-17
a.	Ground Single Channel Radio	II-17
	Table 2-26: Ground Single Channel Radio Capabilities	II-17
	Figure 2-15: Ground Radio Configurations	II-17
b.	AN/TRC-170(V)5 Multi-Channel Radio	II-18
	Figure 2-16: AN/TRC-170	II-18
	Table 2-27: AN/TRC-170 Multi-Channel Radio	II-18
c.	AN/MRC-142 Multi-Channel Radio	II-18
	Figure 2-17: AN/MRC-142A UHF Multi-Channel Radio	II-18
	Table 2-28: AN/MRC-142 Multi-Channel Radio	II-18
d.	AN/TSC-191 Wireless Point to Point Link, Version D (WPPL-D)	II-19
	Table 2-29: AN/TSC-191 Wireless Point-To- Point Link, Version D (WPPL-D)	II-19
e.	Lightweight Multi-Band Satellite Terminal (LMST), AN/USC-65(V)1 and (V)2	II-19
	Table 2-30: AN/USC-65(V)1 and (V)2 Lightweight Multi-band Satellite Terminal (LMST)	II-19
	Figure 2-18: LMST 2.5-meter Antenna	II-19
f.	PHOENIX Tactical SHF Satellite Terminal (TSST) AN/TSC-156	II-19
	Figure 2-19: <i>Phoenix</i> TSST	II-19
g.	Global Broadcast Service (GBS) Transportable Ground Receiver Suite (TGRS) AN/TSR-9	II-19
	Figure 2-20: AN/TSR-9 GBS	II-19
h.	Extremely High Frequency Satellite Communications Terminal AN/TSC-154 Secure Mobile Anti-jam Reliable Tac- tical Terminal (SMART-T)	II-20
	Figure 2-21: AN/TSC-154 SMART-T	II-20
	Table 2-31: AN/TSC-154 SMART-T Satellite Communication Terminal (TM 2000-OD/2C Rev D)	II-20
i.	Trojan Special Purpose Intelligence Remote Integrated Terminal (SPIRIT-LITE) AN/TSQ-226(V)1	II-20
	Figure 2-22: TROJAN SPIRIT-LITE	II-20

Table of Contents

Table 3-32: Trojan Special Purpose Intelligence Remote Integrated Terminal – Lightweight Integrated Telecommunications Equipment (Trojan SPIRIT-LITE) AN/TSQ-226(V)1	II-20
j. High Bandwidth Special Intelligence - Palletized Terminal (HSSI-PT) AN/TSQ-212.....	II-20
Figure 2-23: HBSI-PT Antenna	II-20
k. Enhanced Position Location and Reporting System (E-PLRS) AN/VSQ-2C.....	II-21
l. Secure Wide Area Network (SWAN)	II-21
m. MAGTF Modular Command and Control Center.....	II-21
Figure 2-24: AN/TSQ-239 COC Configurations.....	II-21
n. AN/TSQ-227 Digital Technical Control (DTC) Van.....	II-22
Figure 2-25: Digital Technical Control (DTC) Van.....	II-22
o. MAGTF Telephone/Message Switches.....	II-22
Table 2-33: MAGTF Telephone/Message System (1991+).....	II-22
p. MAGTF Multiplexers.....	II-22
Table 2-34: MAGTF Multiplexers	II-22
q. MAGTF Data/Messaging	II-22
Table 2-35: MAGTF Data/Messaging Systems	II-22
Table 2-36: Frequency Ranges.....	II-22
2008 Navy Surface Ships	II-23
Table 2-37: Navy Surface Combatants.....	II-23
Figure 2-26: Navy Surface Combatants.....	II-23
2009 Amphibious Ships	II-24
Table 2-38: Amphibious Ships.....	II-24
Figure 2-27: Amphibious Ships.....	II-24
2010 Landing Craft	II-25
Table 2-39: Landing Craft Capabilities.....	II-25
2-40: Landing Craft Air Cushion Capabilities	II-25
Figure 2-28: Landing Craft Examples	II-25
2011 Navy Air Defense	II-26
a. Navy Platform Air Defense	II-26
Table 2-41: Navy Platform Air Defense Capabilities.....	II-26
b. Cooperative Engagement Capability (Example).....	II-26
c. Navy Aviation Air Defense Weapons	II-27
Table 2-42: Navy Aviation Air Defense Weapons.....	II-27
2012 Army Air Defense	II-27
Table 2-43: Army Air Defense Capabilities.....	II-27
2013 Joint Support Systems	II-27
2014 Intelligence Surveillance, and Reconnaissance Assets	II-28
a. Ground Reconnaissance	II-28
Table 2-44: Ground Reconnaissance Units	II-28
Table 2-45: Sniper Units and Equipment.....	II-28
b. Unmanned Aircraft Systems.....	II-28
c. Fixed-Wing ISR Aircraft	II-29
Table 2-46: Fixed-Wing Aircraft Assets.....	II-30
d. Ground Sensors	II-30
Table 2-47: Ground Sensors.....	II-30
e. MAGTF METOC (Meteorological and Oceanographic) Systems.....	II-30
Table 2-48: MAGTF METOC Systems	II-30
Figure 2-29: NITES IV EAWOS	II-31
2-30: METME(R) NEXGEN in Travel Mode.....	II-31
f. Persistent Surveillance Systems	II-31
Figure 2-31: RAID Aerostat	II-31

2-32: Top of a PGST Tower	II-31
2-33: Top of a G-BOSS	II-32
Part III Operational Considerations	III-1
3001 Types of Offensive Operations	III-1
Figure 3-1: Types of Offensive Operations	III-1
a. Movement to Contact	III-1
Figure 3-2: Movement to Contact.....	III-1
b. Attack:	III-1
e. Exploitation:	III-3
d. Pursuit:	III-3
Figure 3-3: Pursuit	III-3
3002 Types of Defense	III-4
a. Mobile Defense	III-4
b. Position Defense	III-4
3003 Notional Defensive Operations Schematic	III-5
Figure 3-4: Notional Defensive Operations Schematic	III-5
3004 Historical Planning Ratios for Array of Friendly Units	III-5
Table 3-1: Planning Ratios for Array of Friendly Units.....	III-5
3005 Opposed Rates of Advance Tables	III-6
Table 3-2: Division Opposed Rates of Advance (km/day).....	III-6
3-3: Brigade and Below Opposed Rates of Advance (km/day).....	III-6
3006 Rear Area Operations	III-6
Figure 3-5: Sample Linear Battle-space	III-7
3-6: Sample Non-Linear Battle-spaces.....	III-7
Table 3-4: Rear Area Threat Levels	III-7
3007 Weather Conditions – Sea States	III-8
3008 Mine Countermeasures Terminology and Responsibilities	III-8
Figure 3-6: Mine Countermeasures Responsibilities.....	III-8
Part IV Staff Planning Factors and Considerations	IV-1
4001 Casualty Rate Estimation	IV-1
4002 Planning for Enemy Prisoner of War, Actual or Suspected Insurgents and/or Civilian Detainees	IV-1
4003 MAGTF Health Service Support	IV-1
a. Basic Concepts	IV-1
Table 4-1: Taxonomy of Care (Army-Air Force Care Levels vs. Navy-Joint Care Levels).....	IV-2
b. HSS within the MAGTF.....	IV-2
Table 4-2: Capabilities of MAGTF HSS Elements.....	IV-3
4-3: Authorized Medical (and Dental) Allowance Lists (AMAL/ADAL).....	IV-4
c. Logistical and Operational Considerations for MAGTF Level Medical Units.....	IV-5
Table 4-4: Capability Comparison between the Army Forward Surgical Team (FST), Air Force Mobile Field Surgical Team (MFST) and Navy/Marine Corps Forward Resuscitative Surgical Team (FRSS).....	IV-6
Figure 4-1: Medical Battalion Organization (FY17).....	IV-7
d. Patient Movement Concept	IV-7
Table 4-5: Tactical MEDEVAC/CASEVAC Aircraft.....	IV-8
e. Medical Regulating (MEDREG) Concept.....	IV-8
Figure 4-2: Initial Medical Regulating Concept.....	IV-8
Figure 4-3: Mature Medical Regulating Concept.....	IV-9
f. The U.S. Army Health Service Support (HSS) System.....	IV-9
Table 4-6: Army Medical Units	IV-10
g. The U.S. Air Force Health Service Support (HSS) System	IV-10

Table of Contents

4004	Return to Duty Estimate Considerations	IV-12
	Figure 4-4: Return to Duty Estimate Considerations.....	IV-12
4005	Human Waste and Solid Waste Planning Factors	IV-12
	Table 4-7: Human and Solid Waste Planning Factors	IV-12
4006	Aviation Forward Operating Base Considerations	IV-12
a.	Forward Operating Bases	IV-12
b.	Forward Operating Base Classifications	IV-12
c.	Refueling Systems	IV-12
	Table 4-8: Refueling System Capabilities.....	IV-12
d.	Maritime Prepositioning Force Support	IV-13
	Table 4-9: Maritime Prepositioning Force Support (Aviation only).....	IV-13
e.	MALSP Support Packages	IV-13
	Table 4-10: MALSP Support Packages.....	IV-13
4007	Aircraft Sortie Rates	IV-13
	Table 4-11: Aircraft Sortie Rates	IV-13
4008	Marine Air Command and Control System	IV-14
a.	Forms of Control	IV-14
	Table 4-12: Forms of Control Exercised by Marine Air Command and Control System Agencies	IV-14
b.	Marine Air Command and Control System Organization	IV-14
	Figure 4-5: Marine Air Command and Control System (MACCS) Organization.....	IV-14
c.	Movement and Set-Up	IV-14
	Table 4-13: Marine Air Command and Control System Agency Planning Factors	IV-14
d.	Theater Air-Ground System (TAGS).....	IV-15
	Figure 4-6: Theater Air-Ground System; from MCRP 3-20.1 (ex-MCRP 3-25F) June 2014	IV-15
e.	Service Function Comparisons	IV-16
	Table 4-14: Service Function Comparisons	IV-16
4009	Artillery Planning Factors and Considerations	IV-16
a.	Artillery Organization for Combat	IV-16
b.	Fundamentals of Organizing for Combat	IV-16
c.	Establishing Command Relationships	IV-16
d.	Tactical Missions (Inherent Responsibilities)	IV-16
	Table 4-15: Artillery Tactical Missions (Inherent Responsibilities)	IV-16
e.	Essential Fire Support Tasks	IV-17
	Table 4-16: Artillery Essential Fire Support Tasks	IV-17
f.	Artillery Cannon and Rocket Characteristics	IV-17
	Table 4-17: Artillery Cannon and Rocket Characteristics	IV-17
	Figure 4-7: Multiple Rocket Launcher Systems.....	IV-17
g.	Artillery Ammunition Basic Load and Daily Allowance	IV-18
	Table 4-18: Cannon Ammunition Requirements (155mm battalion with 18 guns & 6 mortars).....	IV-18
	4-19: Artillery Battalion Mission Equivalents	IV-18
h.	Artillery Ammunition Transportation	IV-19
	Table 4-20: Ordnance Classification and Packaging Data (field artillery weapons).....	IV-19
	Table 4-21: Hazard Class Description (only defines hazard classes found in Table 4-17)	IV-19
i.	Artillery Employment Considerations in Built-Up Areas	IV-20
	Table 4-22: Artillery Employment Considerations in Built-Up Areas.....	IV-20
40010	Scatterable Mines (SCATMINES) and Other Type Mine Information	IV-20
a.	Types of SCATMINE and Self-Destruct Times	IV-20
	Table 4-23: Types of SCATMINE and Self-Destruct Times.....	IV-20
b.	Situational SCATMINE Employment Planning Time	IV-21
	Table 4-24: Situational SCATMINE Employment Planning Times.....	IV-21

Figure 4-8: FASCAM Minelets.....	IV-21
c. Field Artillery SCATMINE (FASCAM) Fire Planning	IV-21
Table 4-25: FASCAM/SCATMINE Minefield Density and Size.....	IV-21
d. SCATMINE Characteristics	IV-21
Table 4-26: SCATMINE Characteristics.....	IV-21
e. SCATMINE Life Cycle	IV-21
f. SCATMINE Limitations	IV-22
4011 Counterfire Radars	IV-22
a. AN/TPS-80 Ground/Air Task Oriented Radar (G/ATOR)	IV-22
Figure 4-9: AN/TPS-80 G/ATOR.....	IV-22
b. AN/TPQ-46 and AN/TPQ-37 Characteristics	IV-22
Table 4-27: AN/TPQ-46 and AN/TPQ-37 Counterfire Radar Characteristics.....	IV-22
c. AN/TPQ-46 Probabilities of Detection	IV-23
Table 4-28: AN/TPQ-46 Probabilities of Detection.....	IV-23
Figure 4-10: AN/TPQ-46 Mortar, Artillery, and Rocket Detection Averages	IV-23
d. AN/TPQ-37 Probabilities of Detection	IV-23
Table 4-29: AN/TPQ-37 Probabilities of Detection.....	IV-23
Figure 4-11: AN/TPQ-37 Mortar, Artillery, and Rocket Detection Averages	IV-23
e. AN/TPQ-53 Counterfire Target Acquisition Radar (enhanced Q-36; US Army).....	IV-24
Figure 4-12: AN/TPQ-53.....	IV-24
f. Lightweight Counter -Mortar Radar (LCMR) System.....	IV-24
Figure 4-13: AN/TPQ-50.....	IV-24
4-14: AN/TPQ-49.....	IV-24
Table 4-30: LCMR Characteristics	IV-24
4012 The Targeting Process	IV-24
Figure 4-15: Marine Corps Targeting Methodology.....	IV-24
a. Decide, Detect, Deliver, and Assess	IV-25
Figure 4-16: Joint Targeting Cycle	IV-26
Table 4-31: Sample Target Selection Standards.....	IV-26
Table 4-32: Sample Attack Guidance Matrix.....	IV-26
b. Joint Targeting Cycle	IV-26
c. Joint Air Tasking Cycle	IV-27
Table 4-33: Actions During the Joint Air Tasking Cycle Phases.....	IV-28
d. Targeting Process Comparison	IV-28
Figure 4-17: Joint Air Tasking Cycle.....	IV-28
4-18: Targeting Process Comparison.....	IV-28
4013 Naval Surface Fire Support Planning Factors	IV-29
Table 4-34: NM-42/MK-45 5-inch/54 Caliber Gun System Capabilities.....	IV-29
4014 NBC Defense Planning Factors and Considerations	IV-29
a. Mission-Oriented Protective Postures	IV-29
Table 4-35: Mission-Oriented Protective Postures.....	IV-29
b. Chemical Agent Persistency According to Ambient Temperatures	IV-29
Table 4-36: Chemical Agent Persistency	IV-29
c. Detailed Equipment/Troop Decontamination Water Requirements	IV-29
Table 4-37: Equipment/Troop Decontamination Water Requirements.....	IV-29
d. NBC Defense First-Aid Equipment	IV-29
Table 4-38: NBC Defense First-Aid Equipment (Individual Issue).....	IV-29
e. NBC Defense Reference Publications	IV-29
4015 Engineer Bridging Considerations	IV-30
Figure 4-19: King's Law of River Crossing	IV-30

Table of Contents

a.	Medium Girder Bridge (MGB)	IV-30
	Figure 4-20: Double Story MGB with LRS in Iraq	IV-30
	Table 4-39: Medium Girder Bridge Capabilities and Assembly Requirements	IV-30
b.	M-18 Dry Support Bridge (DSB) and Rapidly Employed Bridge System (REBS) (US Army only)	IV-31
	Figure 4-21: M-18 Dry Support Bridge System	IV-31
c.	Ribbon/Assault Floating Bridge	IV-31
	Figure 4-22: Ribbon/Assault Floating Bridge in Iraq	IV-31
	Table 4-40: Comparison of Ribbon/Assault Bridge System Capabilities	IV-31
	4-41: Ribbon/Assault Floating Bridge Assembly	IV-32
	4-42: Raft Crossing Capabilities	IV-32
	4-43: Ribbon Raft Capabilities	IV-32
	Figure 4-23: Rafting Methods	IV-33
d.	Bridge Erection Boat (BEB)	IV-33
	Figure 4-24: Bridge Erection Boat (BEB)	IV-33
e.	Armored Vehicle-Launched Bridge (AVLB)	IV-33
	Figure 4-25: Armored Vehicle-Launched Bridge (AVLB)	IV-33
4016	Engineer Breaching Considerations	IV-34
a.	Breaching Sequence	IV-34
	Figure 4-26: Breaching Sequence	IV-34
b.	Breach Complexity	IV-34
	Table 4-44: Breaching Complexity and Time Factors	IV-34
c.	Breaching and Clearing Methods	IV-35
	Table 4-45: Explosive Breaching and Clearing	IV-35
	4-46: Mechanical Breaching and Clearing	IV-35
d.	Breaching and Clearing Equipment	IV-35
	Table 4-47: Breaching and Clearing Equipment in a Marine Division	IV-35
e.	Breaching Fundamentals	IV-35
f.	Breaching Organization	IV-35
	Table 4-48: Force Responsibilities in a Breaching Operation	IV-35
g.	Reverse Planning	IV-36
	Figure 4-27: Obstacle Breaching Reverse Planning Diagram	IV-36
h.	Mass Combat Power	IV-37
i.	Synchronization	IV-37
	Figure 4-28: Assault Breacher Vehicle Firing MICLIC	IV-37
j.	Occupying the Support-By-Fire (SBF) Position	IV-38
k.	Suppressing the Far Side Objective	IV-38
l.	Employing Obscuration	IV-38
m.	Reducing the Obstacle	IV-38
n.	Assaulting the Far Side Objective	IV-38
o.	Consolidating on the Far Side Objective	IV-39
p.	Passage of Follow-on Forces	IV-39
4017	Representative Mine Reduction Equipment	IV-39
a.	Antipersonnel Obstacle Breaching System (AOBS)	IV-39
	Figure 4-29: AOBS	IV-39
b.	Bangalore Torpedo	IV-39
	Figure 4-30: Bangalore Torpedo	IV-39
c.	M1160 Assault Breacher Vehicle (ABV)	IV-39
	Figure 4-31: Assault Breacher Vehicle	IV-39
d.	Mine Clearing Blade (MCB)	IV-40
	Figure 4-32: MCB	IV-40

e.	Mine Clearing Rollers (MCR).....	IV-40
	Figure 4-33: MCR.....	IV-40
f.	Mine Clearing Armor Protection (MCAP) Kit.....	IV-40
	Figure 4-34: D7 Dozer with MCAP.....	IV-40
g.	M9 Armored Combat Earthmover.....	IV-40
	Figure 4-35: M9 ACE.....	IV-40
h.	Mine Clearing Mine Charge (MICLIC).....	IV-40
	Figure 4-36: MICLIC on an M353 trailer.....	IV-40
	4-37: Two MICLIC on an AVLM.....	IV-40
	4-38: AAV with MK-154 MICLIC.....	IV-40
4018	Amphibious Breaching Operations.....	IV-41
	Figure 4-39: The Amphibious Breach.....	IV-41
a.	Amphibious Breaching Operation Fundamentals.....	IV-41
b.	Amphibious Breaching Operation Command and Control.....	IV-42
4019	Engineer Obstacle Considerations.....	IV-42
	Table 4-49: Weapons Ranges to Determine Obstacle Coverage by Fire.....	IV-42
a.	Minefield Design.....	IV-43
	Figure 4-40: Minefield Design.....	IV-43
b.	Row Mining.....	IV-43
	Table 4-50: Characteristics of Standard Row Minefields (hand emplaced).....	IV-43
c.	Demolitions.....	IV-43
	Table 4-51: Destruction of Operational Targets.....	IV-43
4020	Engineer Mounted Route Reconnaissance and Clearing (R2C) Considerations.....	IV-44
	Table 4-52: Engineer Route Reconnaissance and Clearing Equipment Sets.....	IV-44
4021	Engineer Survivability Considerations.....	IV-45
	Table 4-53: Time Required for the M9 ACE or MCT Dozer to Complete a Fighting Position.....	IV-45
4022	Engineer Bulk Fuel Considerations.....	IV-45
	Figure 4-41: Current USMC Tactical Fuel Systems (overview).....	IV-45
a.	Amphibious Assault Fuel System (AAFS).....	IV-46
	Table 4-54: Amphibious Assault Fuel System.....	IV-46
b.	Tactical Airfield Fuel Dispensing System (TAFDS).....	IV-46
c.	Helicopter Expedient Refueling System (HERS).....	IV-46
d.	Expedient Refueling System (ERS).....	IV-46
e.	Hose Reel System (HRS).....	IV-46
f.	SIXCON Fuel Module System and Water Module System.....	IV-46
g.	Ground Expedient Refueling System (GERS).....	IV-46
h.	Bulk Fuel Planning Considerations.....	IV-47
	Table 4-55: Time to Construct Various Tank Farm Configurations.....	IV-47
4023	Engineer Expeditionary Airfield Considerations.....	IV-47
	Table 4-56: Time to Construct Various Expeditionary Airfield Configurations.....	IV-47
	4-57: Time to Construct Expeditionary Airfield Parking Hides for Various Aircraft.....	IV-48
4024	Engineer Water Storage/Production Considerations.....	IV-48
a.	Lightweight Water Purification System (LWPS).....	IV-48
b.	Tactical Water Purification System (TWPS).....	IV-48
	Figure 4-42: TWPS.....	IV-48
	Table 4-58: Comparison of the TWPS and ROWPU Water Purification Systems.....	IV-49
c.	LHS Compatible Water Tank Rack (Hippo).....	IV-49
	Figure 4-43: LHS Water Tank (HIPPO).....	IV-49
d.	Water Supply Support System.....	IV-49
	Table 4-59: Water Supply Support System Allowances.....	IV-49

Table of Contents

4025	Class I (Subsistence, except water) Planning Data	IV-49
a.	Rations	IV-49
	Table 4-60: Army Class I (Subsistence) Planning Data	IV-50
b.	Field Feeding Equipment	IV-50
	Figure 4-44: Expeditionary Field Kitchen (EFK).....	IV-51
	4-45: E-TRHS.....	IV-51
	4-46: TRHS	IV-51
4026	Sea Container Planning Factors.....	IV-51
	Table 4-61: Dimensions and Weights of Typical ISO Sea Containers (steel).....	IV-51
	4-62: 20-foot Container - Breakbulk Load Comparison by Weight and Supply Class	IV-51
4027	Movement Control Planning Factors	IV-52
a.	Concept.....	IV-52
	Figure 4-47: Movement Control Diagram	IV-52
b.	Time-Distance Factors	IV-52
c.	Distance Factors	IV-52
d.	Time Factors	IV-53
e.	Distance, Rate, and Time Calculations	IV-53
	Figure 4-48: Time and Distance Factors.....	IV-53
f.	Finding an Unknown Factor of Distance, Rate, or Time	IV-54
g.	Arrive and Clear Time Calculations	IV-54
	Table 4-63: Example Clear and Arrive Times 1	IV-55
	4-64: Example Clear and Arrive Times 2	IV-55
	4-65: Example Clear and Arrive Times 3	IV-55
4028	Movement Planning Data	IV-55
a.	Unopposed Foot March	IV-55
	Table 4-66: Movement Planning for Unopposed Foot March	IV-55
b.	Unopposed Vehicle Movement Speed	IV-55
	Table 4-67: Movement Planning for Unopposed Vehicle Movement.....	IV-55
c.	Opposed Vehicle Movement Speed (Delaying)	IV-56
	Table 4-68: Movement Planning for Enemy Delaying Vehicle Movement	IV-56
d.	Opposed Vehicle Movement Speed (Defending)	IV-56
	Table 4-69: Movement Planning for Enemy Defending Vehicle Movement.....	IV-56
e.	Typical Pass Times for a Tactical Road March (U.S. Army)	IV-56
	Table 6-70: Typical Pass Times for a Tactical Road March.....	IV-56
f.	Movement Planning	IV-56
	Table 4-71: Movement Planning.....	IV-56
4029	Logistics Concept	IV-57
	Figure 4-49: Logistics Concept Diagram.....	IV-57
4030	Logistics Planning Factors	IV-57
a.	Marine Expeditionary Force Daily Supply Requirements	IV-57
	Table 4-72: Marine Expeditionary Force Daily Supply Requirements.....	IV-57
b.	Class I (Food)	IV-58
	Table 4-73: Class I (Food) Planning Factors for LCAC Cargo Movement	IV-58
c.	Class I (Water)	IV-58
	Table 4-74: Class I (Water) Requirements in Gallons Per Man (GPMD).....	IV-58
	4-75: Marine Corps Water Production & Storage	IV-58
d.	Class II (PMD)	IV-58
e.	Class III (P): 0.51 PMD.....	IV-58
	Table 4-76: Class III (POL) MEF-Level Planning Factors	IV-59
f.	Class IV (PMD).....	IV-59
	Table 4-77: Class IV Requirements (per man day).....	IV-59

g.	Class V (W)	IV-59
	Table 4-78: Class V (W) Usage Example of 1997 Planned vs. 2003 Actual	IV-59
h.	Class VI (PMD) (After D+60)	IV-59
	Table 4-79: Class VI Requirements (After D+60) (per man day).....	IV-59
i.	Class VIII (PMD)	IV-59
	Table 4-80: Class VIII Requirements (per man day)	IV-59
4031	Maritime Prepositioning Force Employment Considerations	IV-59
4032	Maritime Prepositioning Force (Enhanced) Capabilities	IV-60
	a. Expeditionary Airfield	IV-60
	b. Naval Mobile Construction Battalion	IV-60
	c. Expeditionary Medical Facility	IV-60
4033	Maritime Prepositioning Force Engineer Equipment FY15 (Selected Items)	IV-61
	Table 4-81: Maritime Prepositioning Force Engineer Equipment (extract).....	IV-61
4034	Maritime Prepositioning Force Offload Planning Data	IV-62
	a. Time Requirements	IV-62
	Table 4-82: Maritime Prepositioning Force Offload Time Requirements.....	IV-62
	b. Lighterage Characteristics	IV-62
	Table 4-83: Lighterage Characteristics	IV-62
	c. Causeway Ferry Capabilities	IV-62
	Table 4-84: Causeway Ferry Capacities.....	IV-62
	d. Bulk Fluid Offload Times	IV-62
	Table 4-88: Bulk Fluid Offload Times	IV-62
4035	Weather Conditions – Sea States	IV-62
	Table 4-86: Sea States – Beaufort Scale.....	IV-62
4036	Typical Principal End Items on MPSRON to Support a MEB	IV-63
	Table 4-87: Typical Principal End Items aboard a MPSRON to Support a MEB	IV-63
4037	Command, Control, Communications, and Computers Planning Considerations	IV-63
	a. Common Questions	IV-63
	b. Planning Activities	IV-65
	c. Technical Management and Direction, Joint Communications Control Center	IV-66
	d. Other Planning Functions	IV-67
4038	Information Operations Considerations	IV-68
	a. Introduction	IV-68
	b. Definitions	IV-68
	c. DoD IO Policy	IV-69
	d. Military Deception (MILDEC)	IV-70
	e. Military Information Support Operations (or MISO, formerly Psychological Operations).....	IV-70
	f. Electronic Warfare (EW)	IV-71
	g. Physical Destruction	IV-72
	h. Operations Security	IV-72
	i. Special Technical Operations (STO)	IV-73
	j. Civil Affairs	IV-73
	k. Public Affairs	IV-73
	l. Key Leader Engagement	IV-74
	m. Legal Considerations	IV-74
	n. Information Operations Intelligence Integration	IV-74
	o. Language Preparation	IV-74
Part V	Key Terms and Graphics	V-1
5001	Command Relationships	V-1

Table of Contents

Table 5-1: Command Relationships	V-1
a. Combatant Command (Command Authority) (COCOM).....	V-1
b. Operational Control (OPCON).....	V-1
c. Tactical Control (TACON).....	V-2
d. Support	V-2
e. Other Authorities	V-2
5002 Possible Command Relationships for MAGTF Units	V-3
Figure 5-1: Command Relationships for MAGTF Units.....	V-3
5003 Tactical Tasks Definitions	V-3
5004 Selected Key Map Symbology	V-5
Table 5-2: Unit Size and Installation Indicators.....	V-6
a. Unit Symbol Modifiers	V-6
Figure 5-2: Unit, Installation, and Site Symbol Frames	V-6
Table 5-3: Fill Colors	V-6
b. Friendly Unit Symbols	V-6
Figure 5-3: Land Unit Symbols	V-7
c. Tactical Mission Graphics	V-8
Figure 5-4: Tactical Mission Graphics.....	V-8
Appendix A References	A-1
A-1 Useful Web Pages	A-1
A-2 Planning Quick Reference Matrix.....	A-3
A-3 Combat Service Support Considerations in Intelligence Preparation of the Battlefield.....	A-7
A-4 Combat Service Support Considerations in the Problem Framing.....	A-8
A-5 Combat Service Support Considerations in Course of Action Development.....	A-11
A-6 Combat Service Support Considerations in Course of Action Wargaming.....	A-11
A-7 Combat Service Support Considerations in Course of Action Comparison/Decision	A-12
A-8 Comparison of the Marine Corps Planning Process with Other Planning Processes.....	A-12
Figure A-1: Comparison of the Marine Corps Planning Process to Other Planning Processes.....	A-12
A-9 Frequency Bands	A-13
Table A-1: Frequency Bands	A-13
A-10 Customary Metric Conversion Factors.....	A-13
Table A-2: Conversion Factors.....	A-13
A-11 Glossary of Terms Connected With Tactical Control and Fire Support Coordination Measures.....	A-14
Appendix B Abbreviations	B-1
B-1 National Distinguishing Letters.....	B-1
B-2 Abbreviations	B-1
Appendix C Operations Orders Formats (Pull-Out Pages)	C-1
Operation Plan/Order Format	C-3
Guide for the Task Organization Annex	C-4

Organizations

1001. Marine Expeditionary Force and Major Subordinate Command Locations

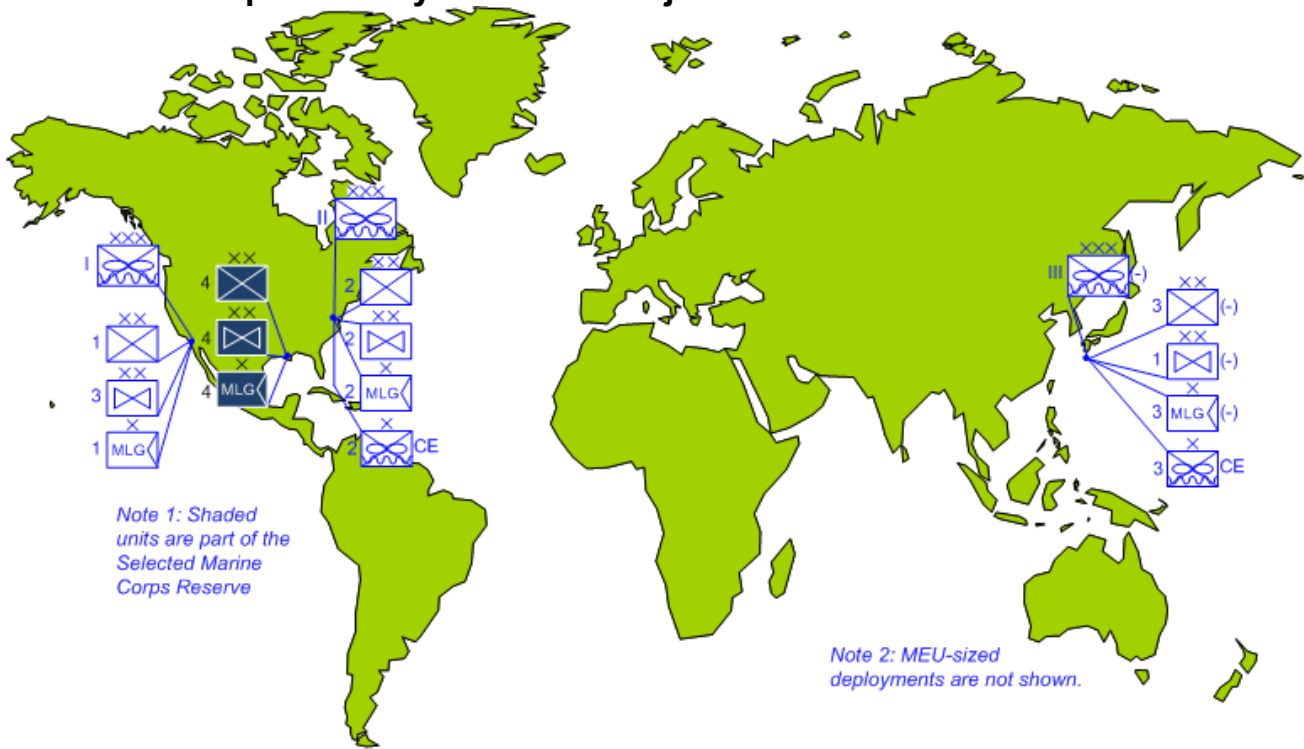


Figure 1-1: Marine Expeditionary Force and Major Subordinate Commands Locations

a. Infantry and Artillery Regiment Locations

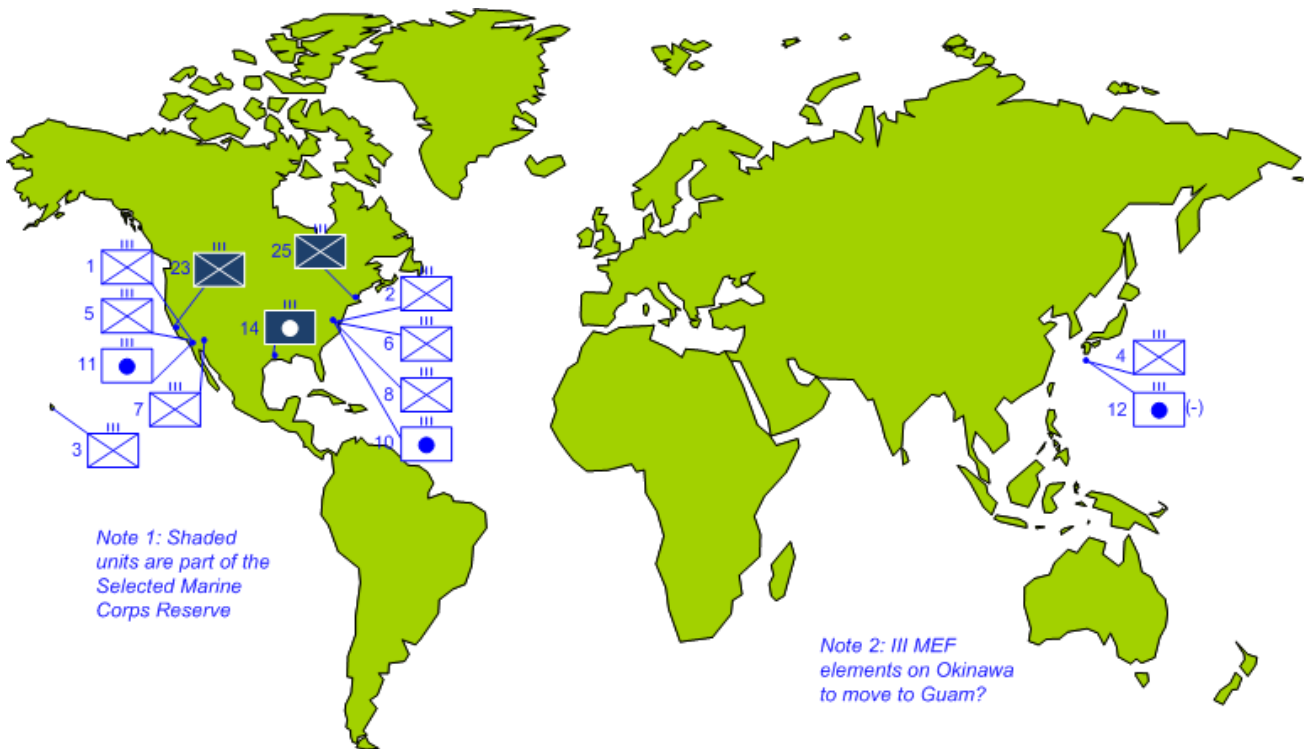


Figure 1-2: Infantry and Artillery Regiment Locations

Organizations

b. Air Group Locations

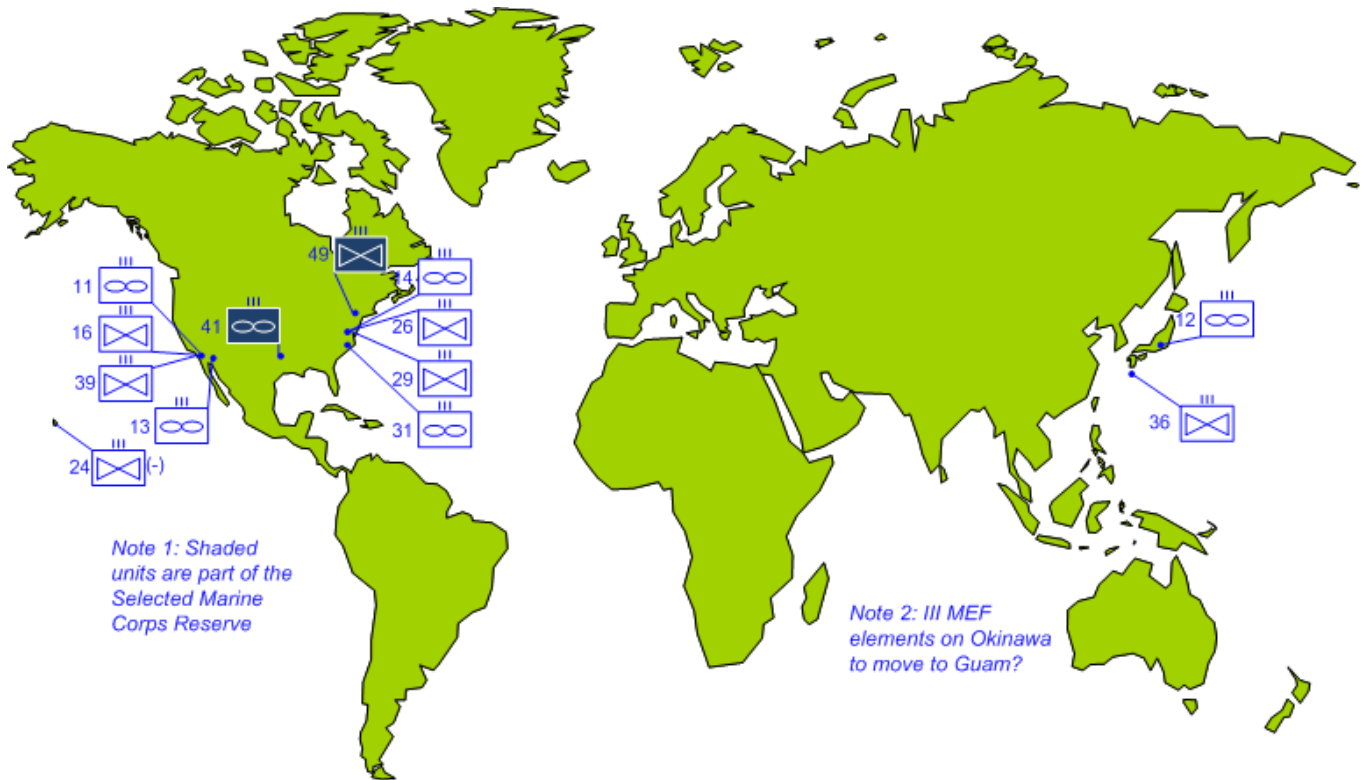


Figure 1-3: Air Group Locations

c. Combat Logistics Regiments Locations

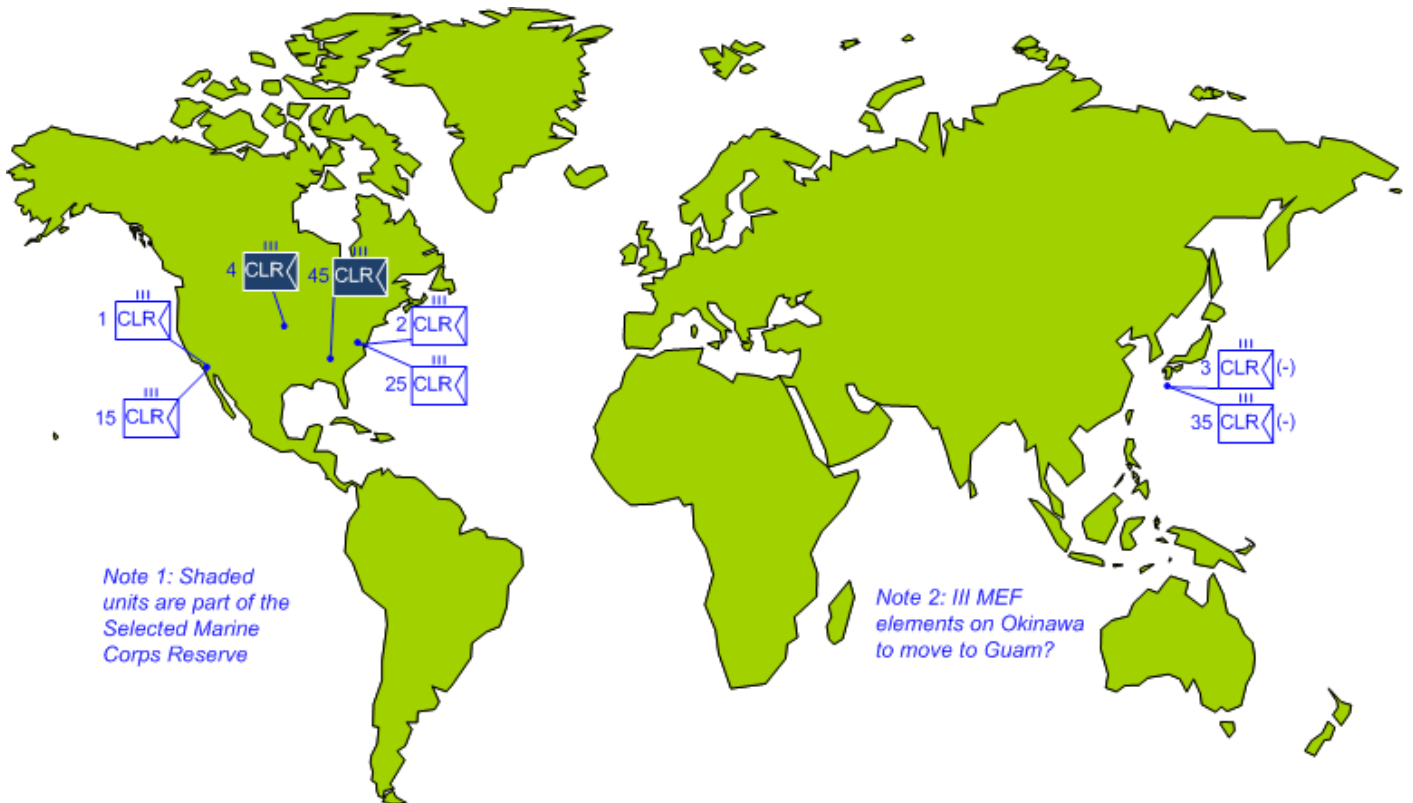


Figure 1-4: Marine Corps Combat Logistics Regiments Locations

1002. Marine Corps Forces Command Organization

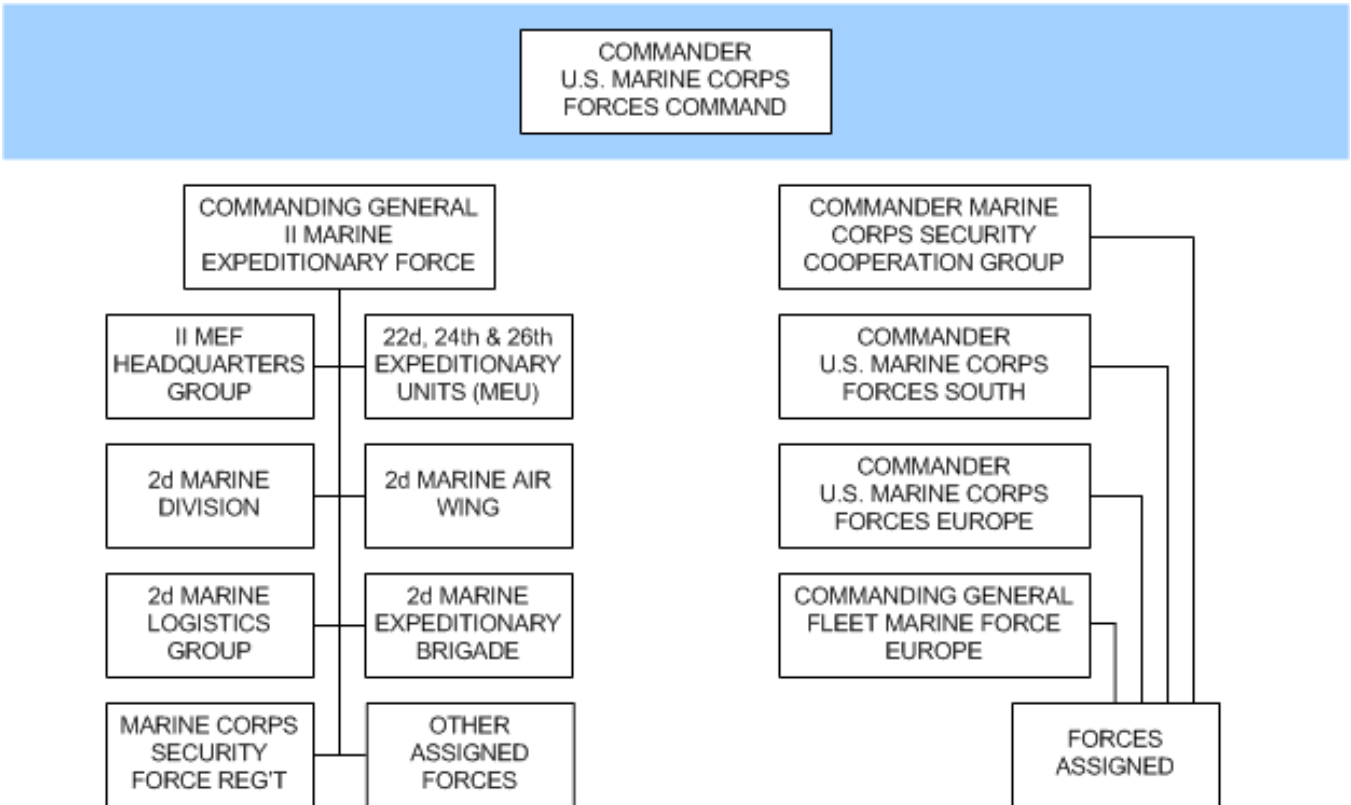


Figure 1-5: Marine Corps Forces Command Organization

1003. Marine Corps Forces Pacific Organization

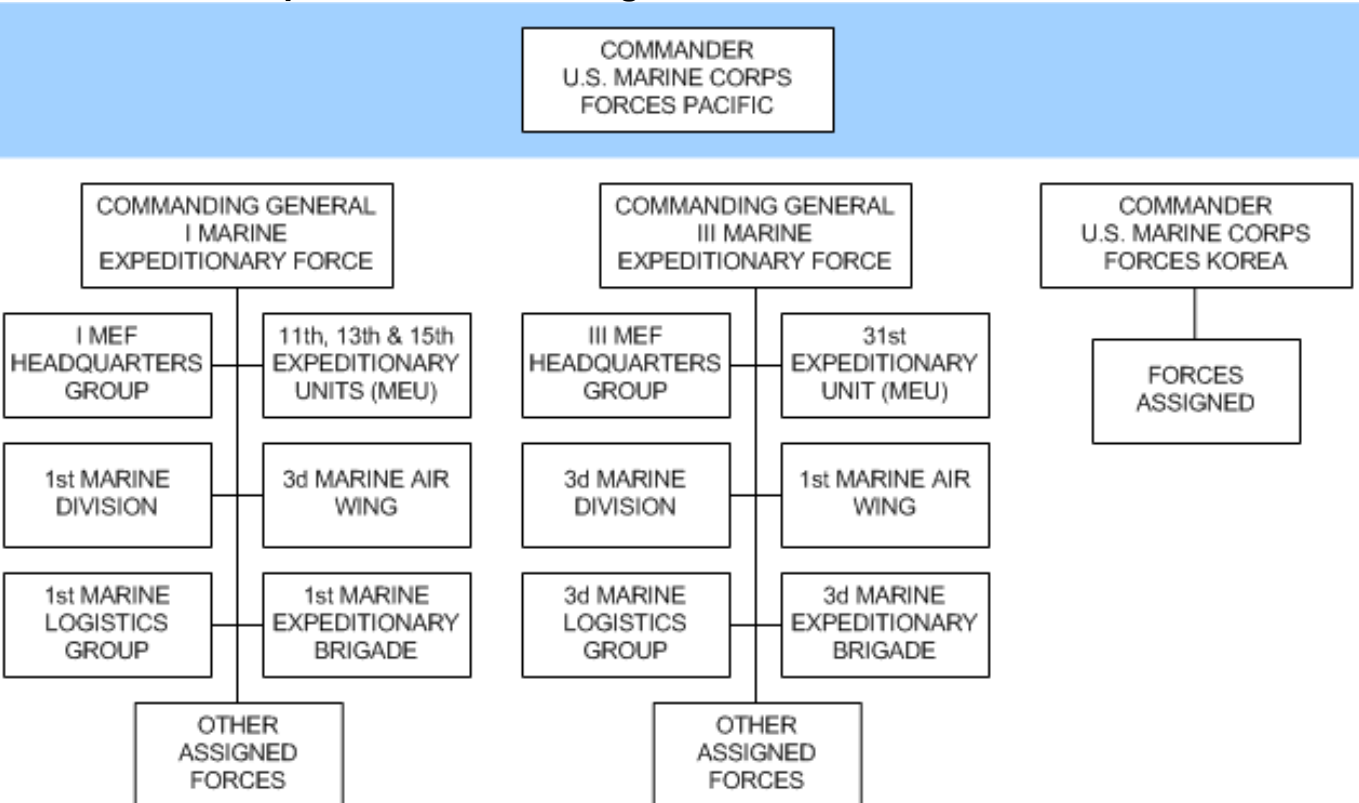


Figure 1-6: Marine Corps Forces Pacific Organization

Organizations

1004. I Marine Expeditionary Force Organization (FY17)

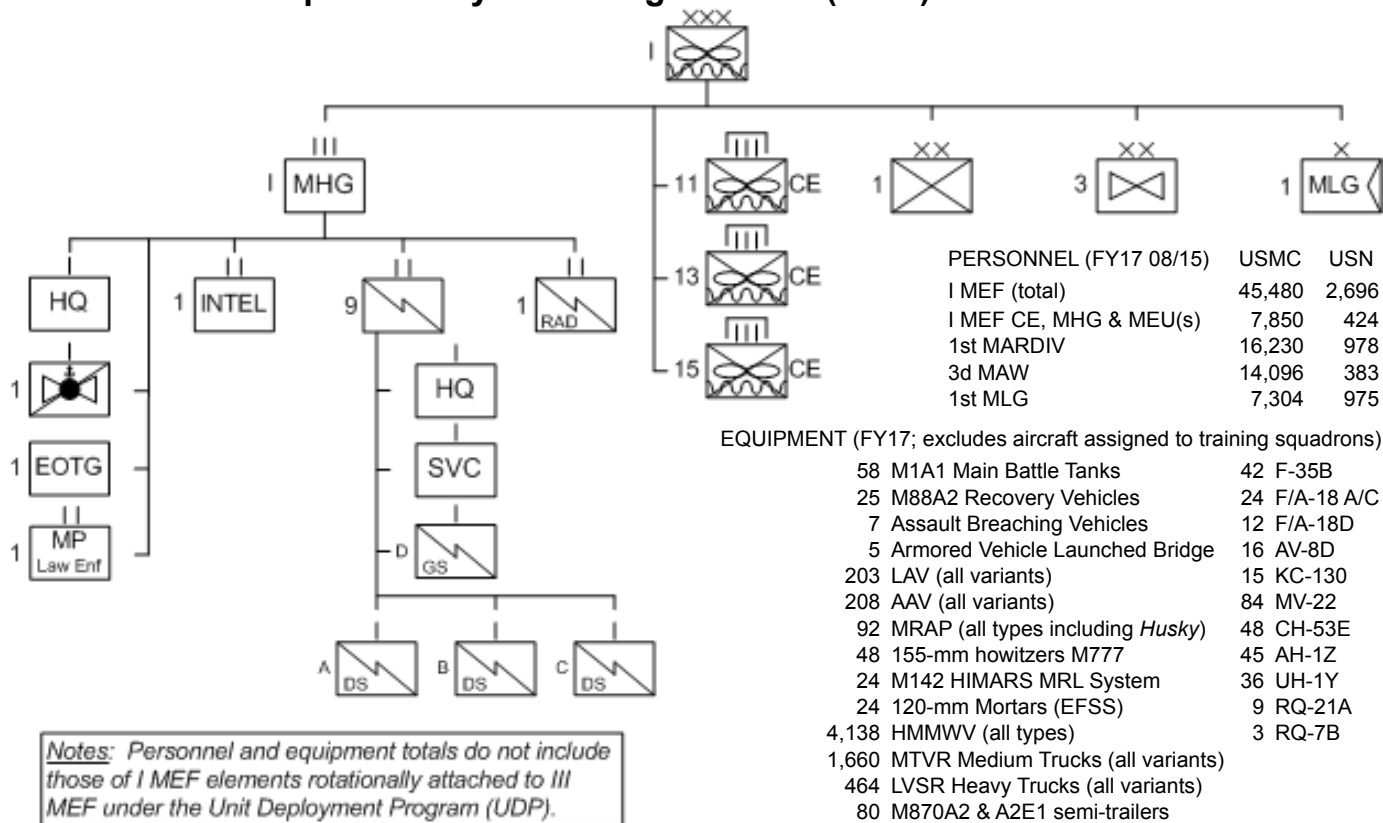


Figure 1-7: I Marine Expeditionary Force Organization

a. 1st Marine Division (FY17)

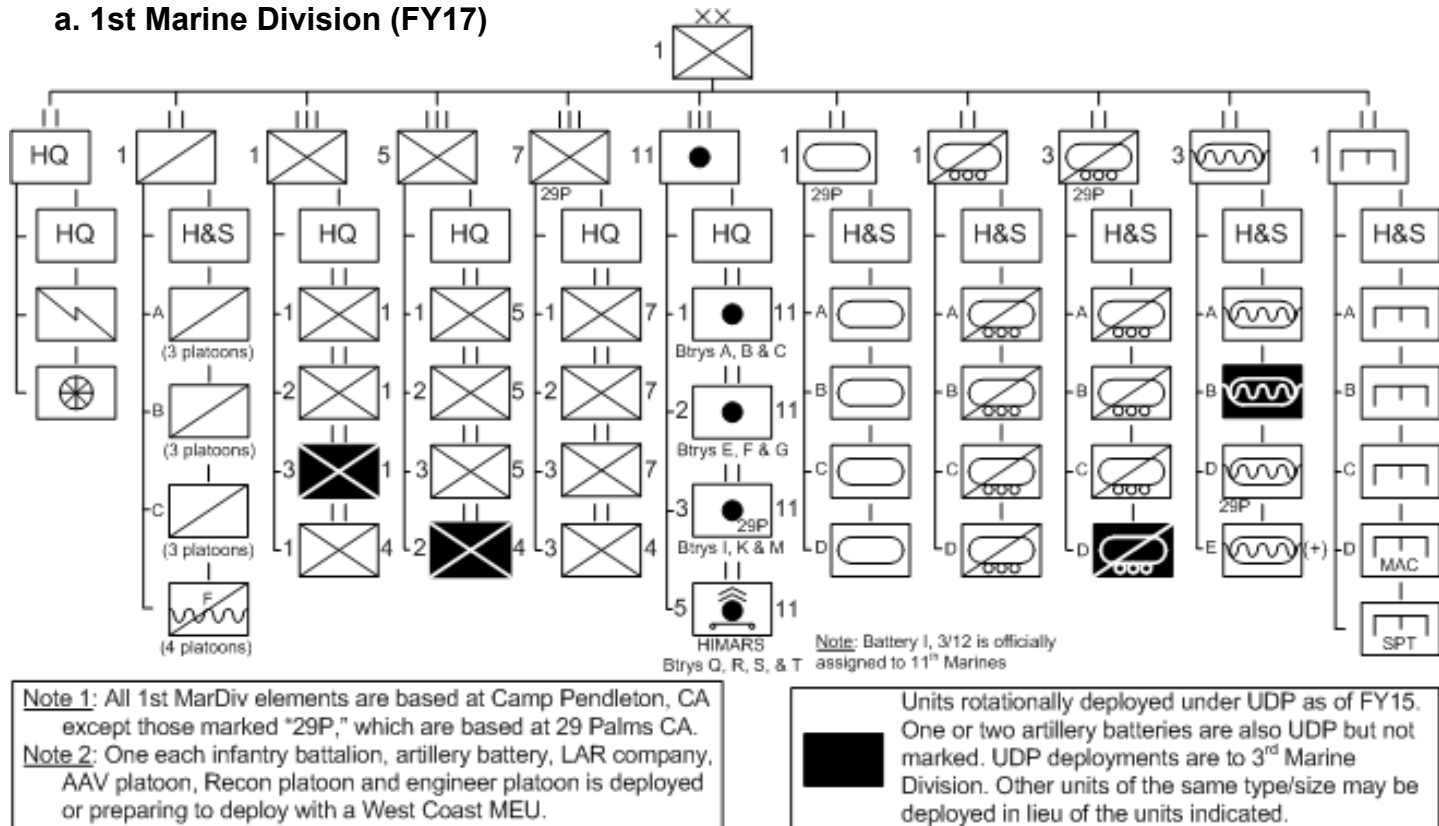


Figure 1-8: 1st Marine Division Organization

b. 3d Marine Aircraft Wing (FY17)

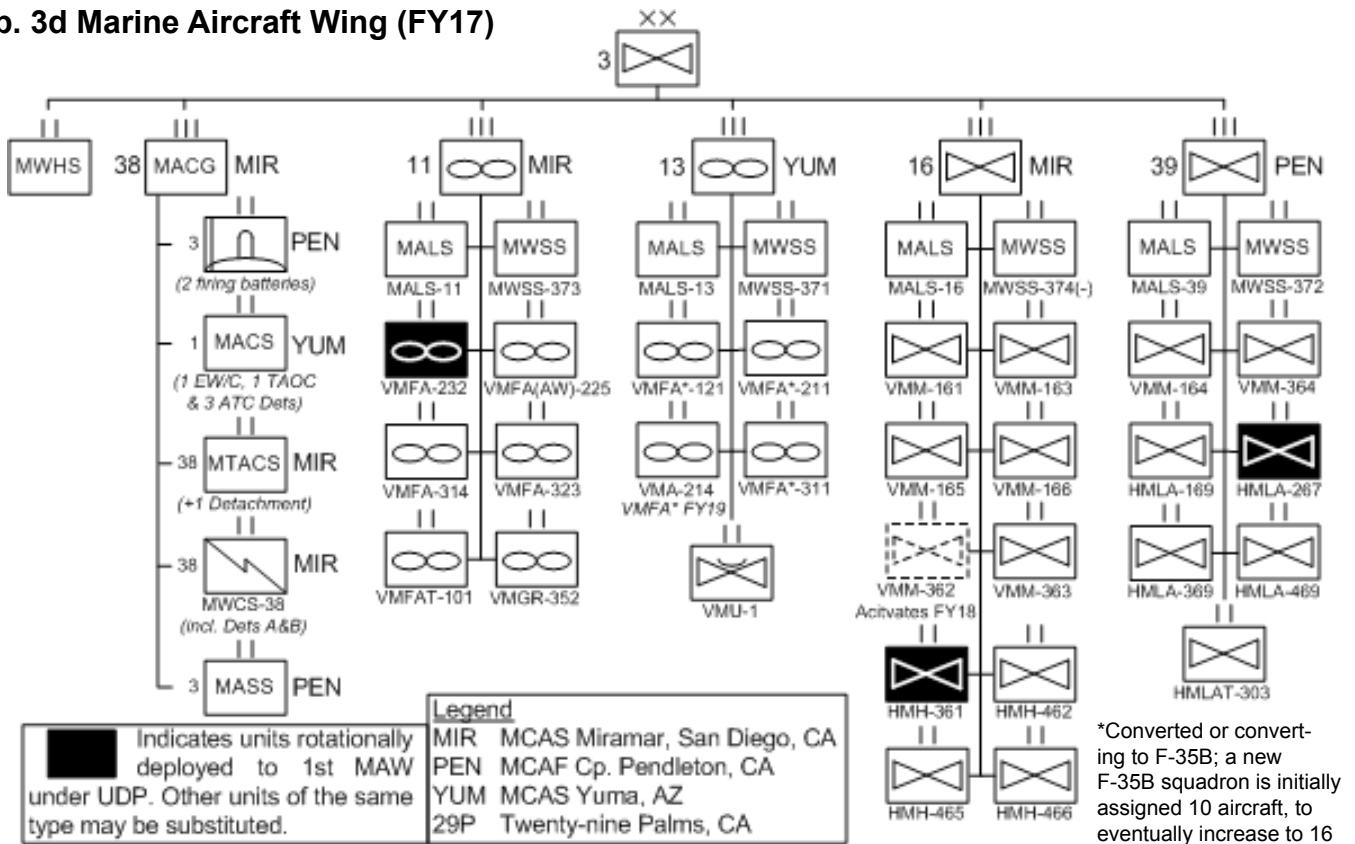


Figure 1-9: 3d Marine Aircraft Wing Organization

c. 1st Marine Logistics Group (FY17)

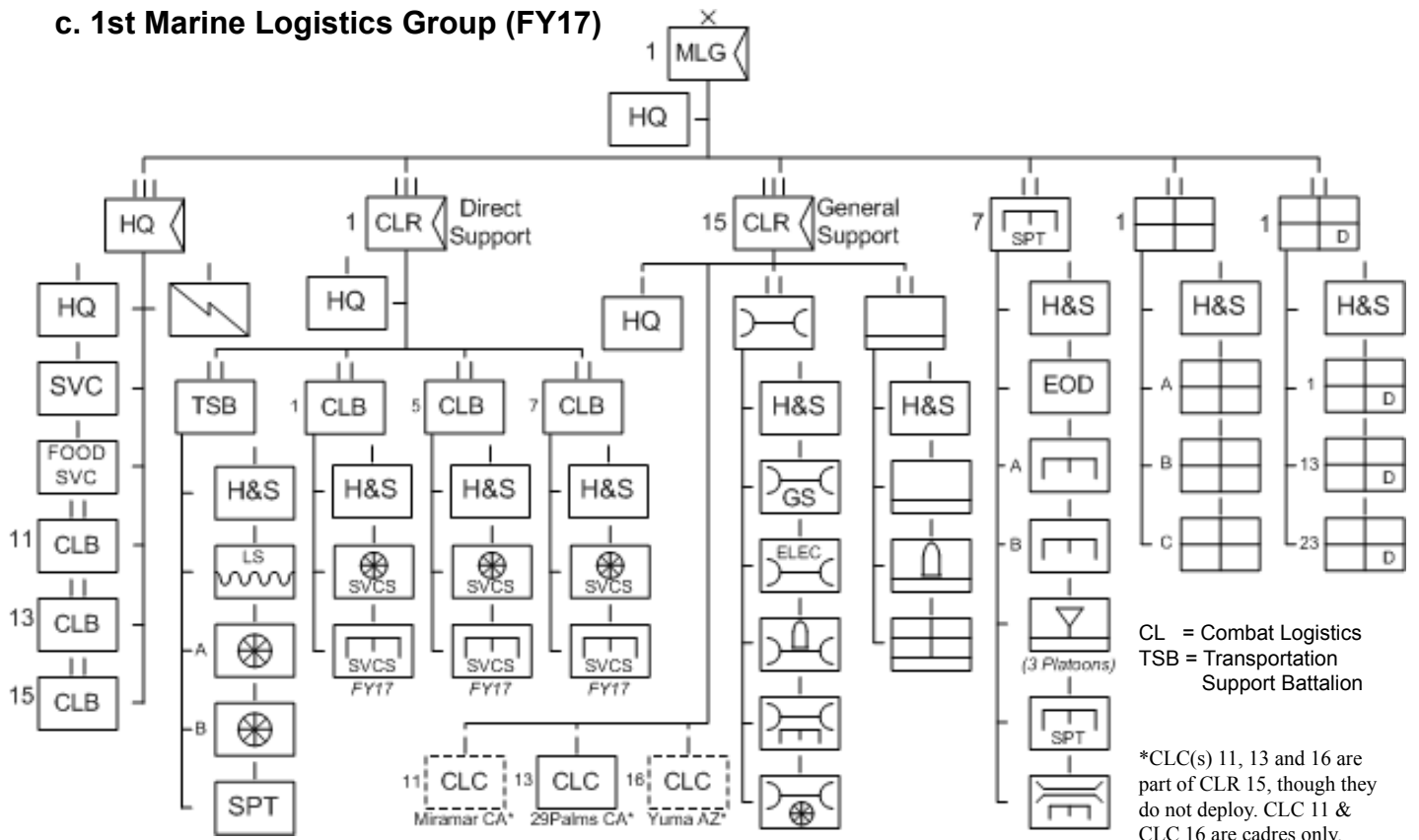


Figure 1-10: 1st Marine Logistics Group Organization

Organizations

1005. II Marine Expeditionary Force Organization (FY17)

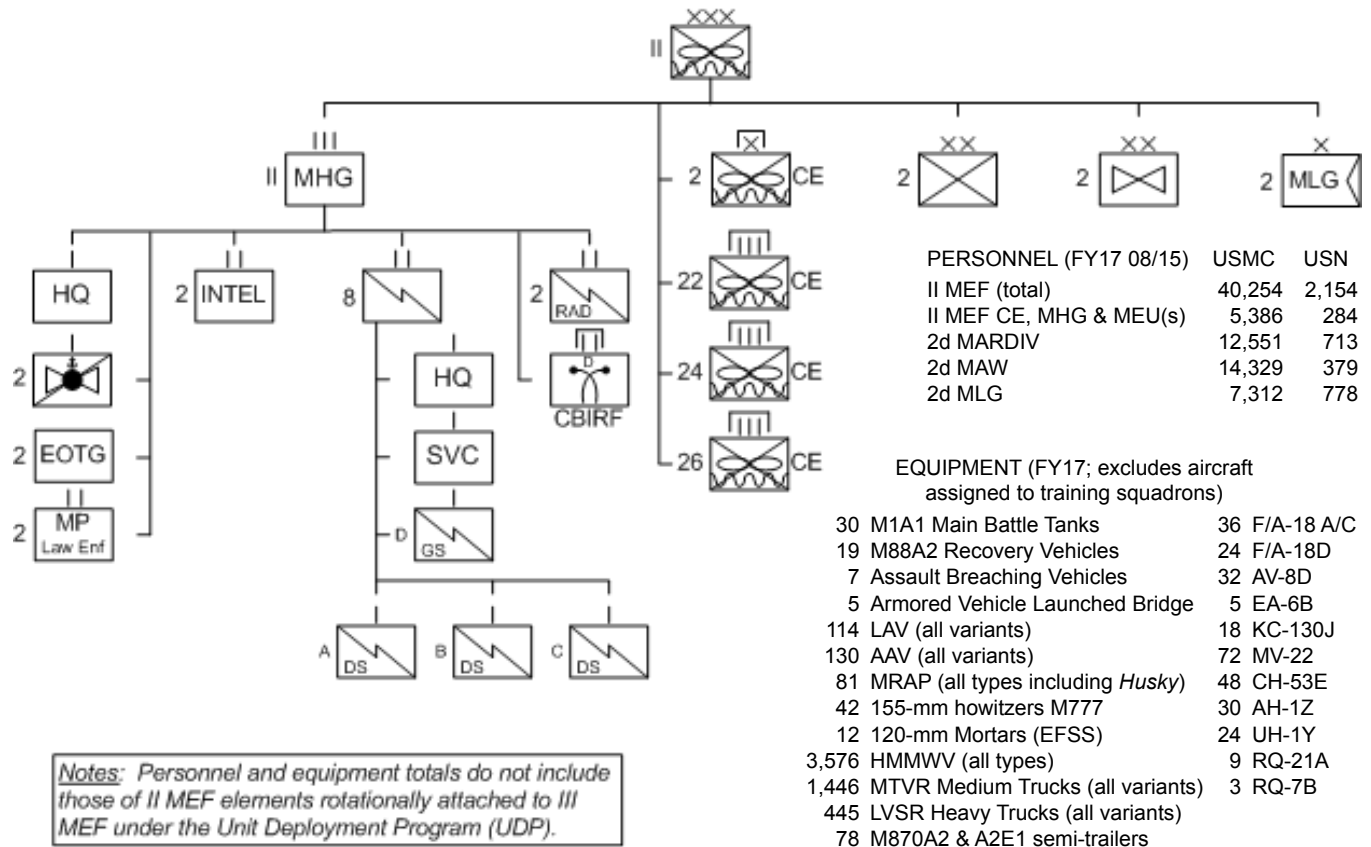


Figure 1-11: II Marine Expeditionary Force Organization

a. 2d Marine Division (FY17)

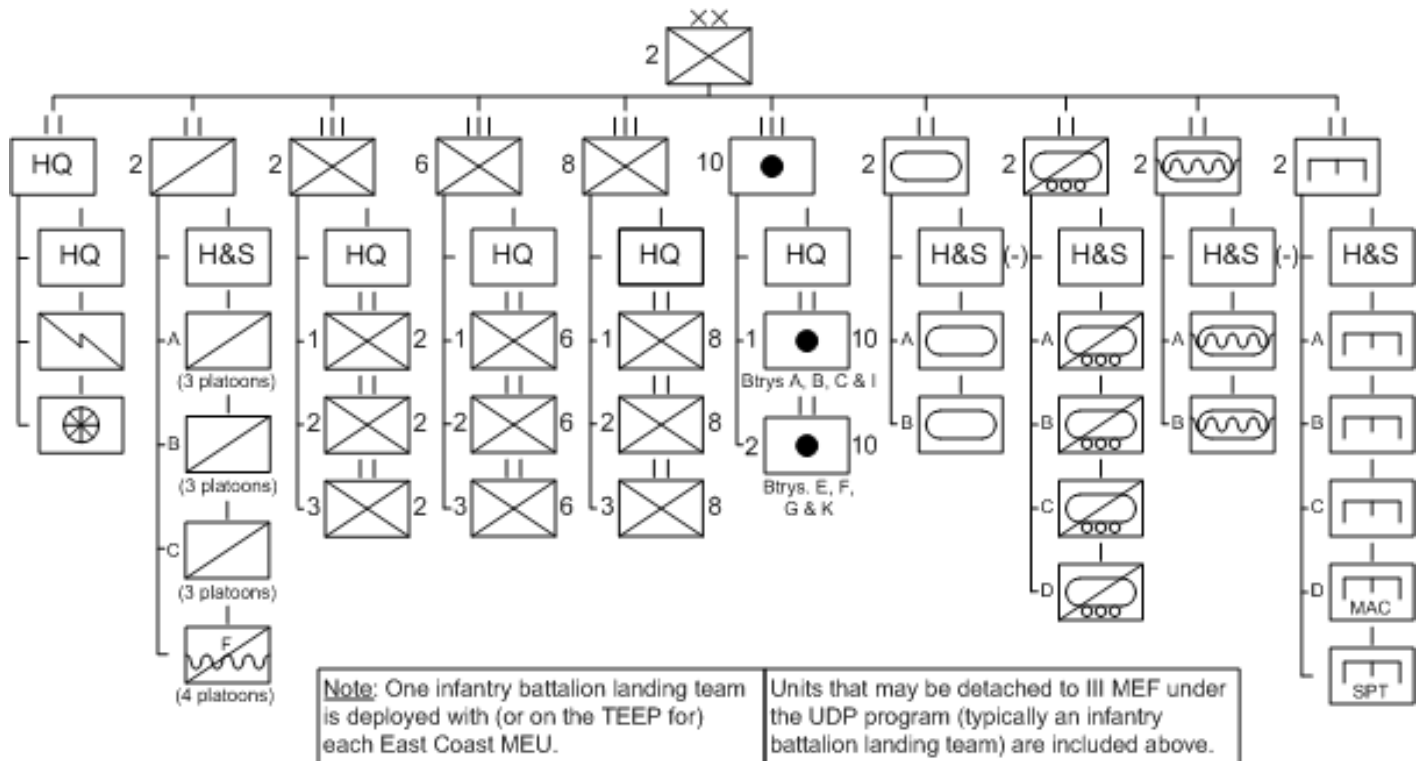


Figure 1-12: 2d Marine Division Organization

b. 2d Marine Aircraft Wing (FY17)

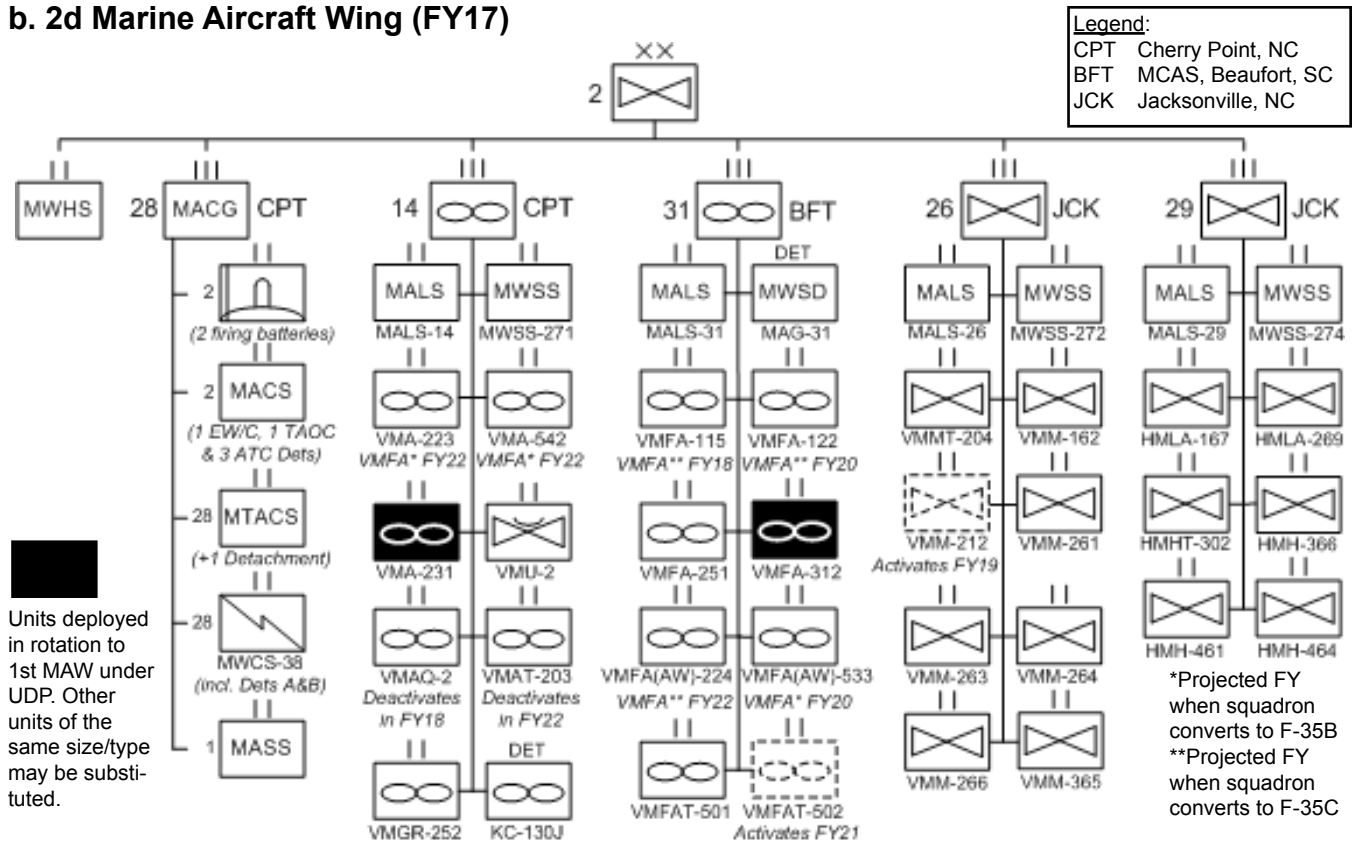


Figure 1-13: 2d Marine Aircraft Wing Organization

c. 2d Marine Logistics Group (FY17)

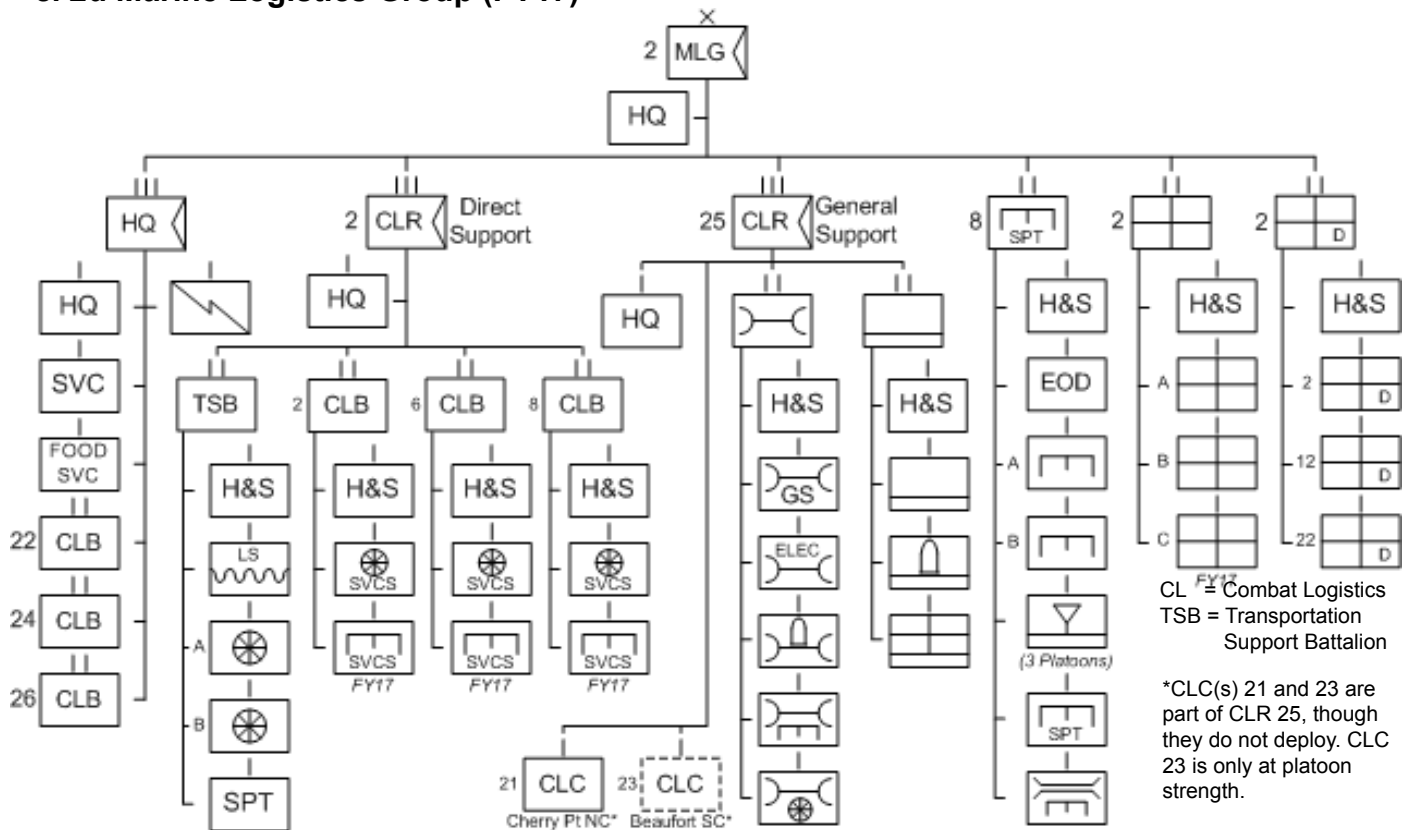


Figure 1-14: 2d Marine Logistics Group Organization

Organizations

1006. III Marine Expeditionary Force Organization (FY17)

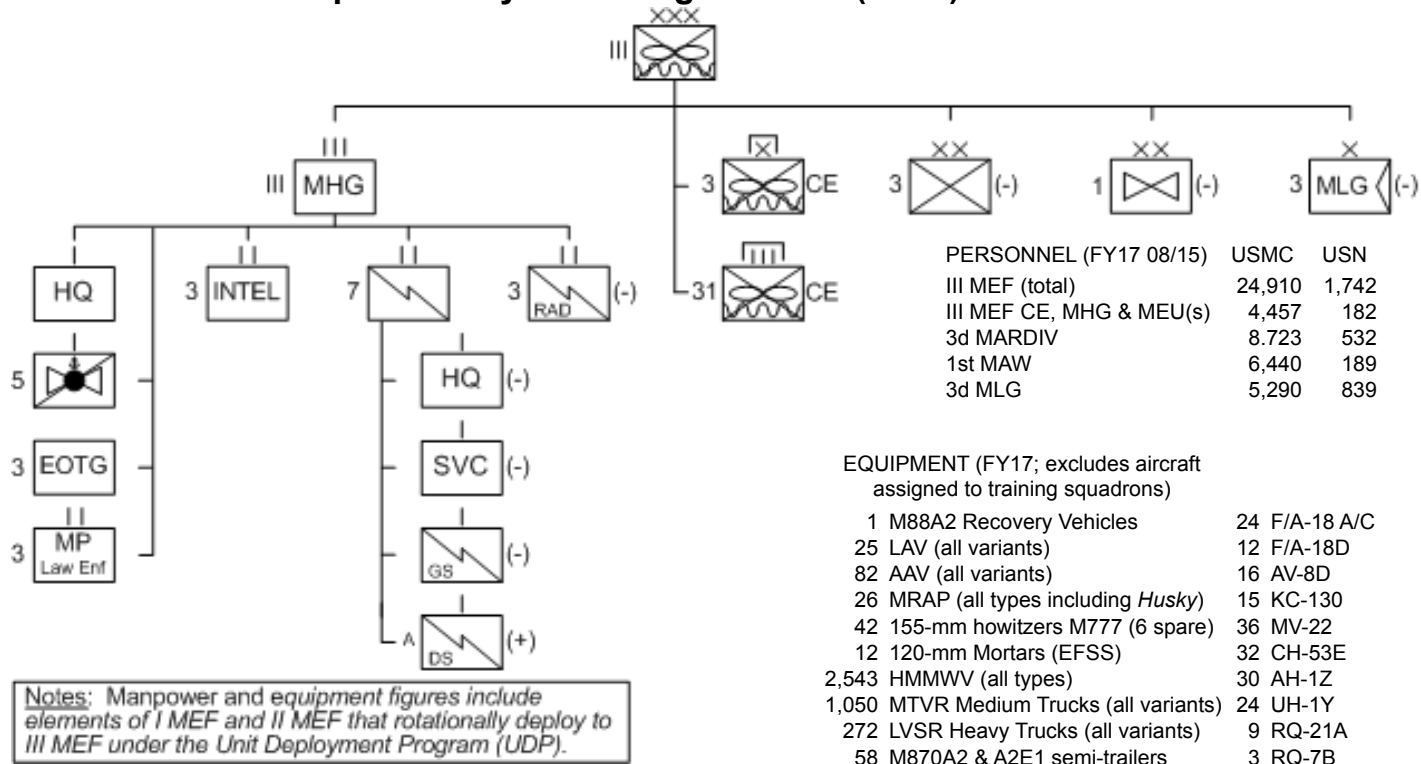


Figure 1-15: III Marine Expeditionary Force Organization

a. 3d Marine Division (FY17)

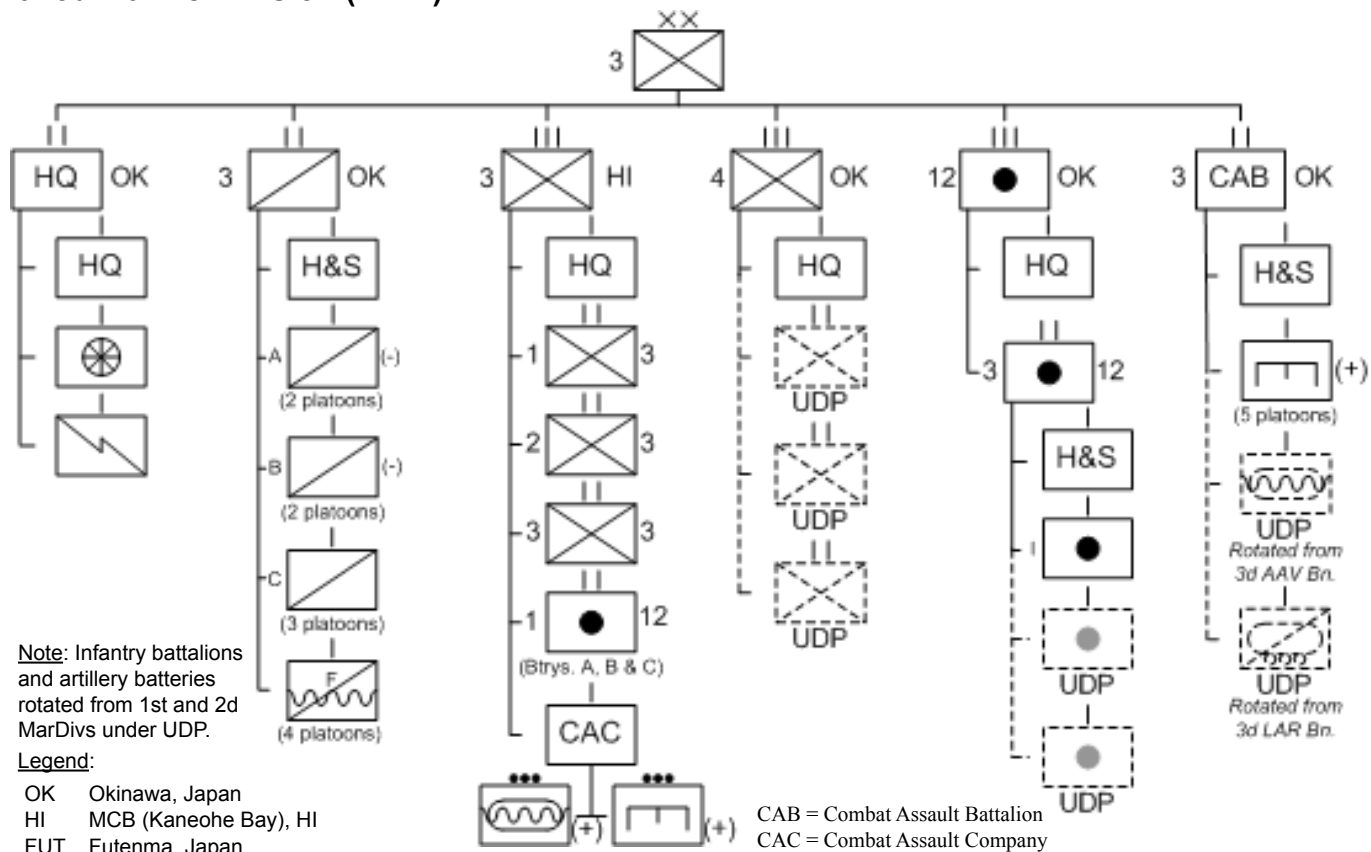


Figure 1-16: 3d Marine Division Organization

b. 1st Marine Aircraft Wing (FY17)

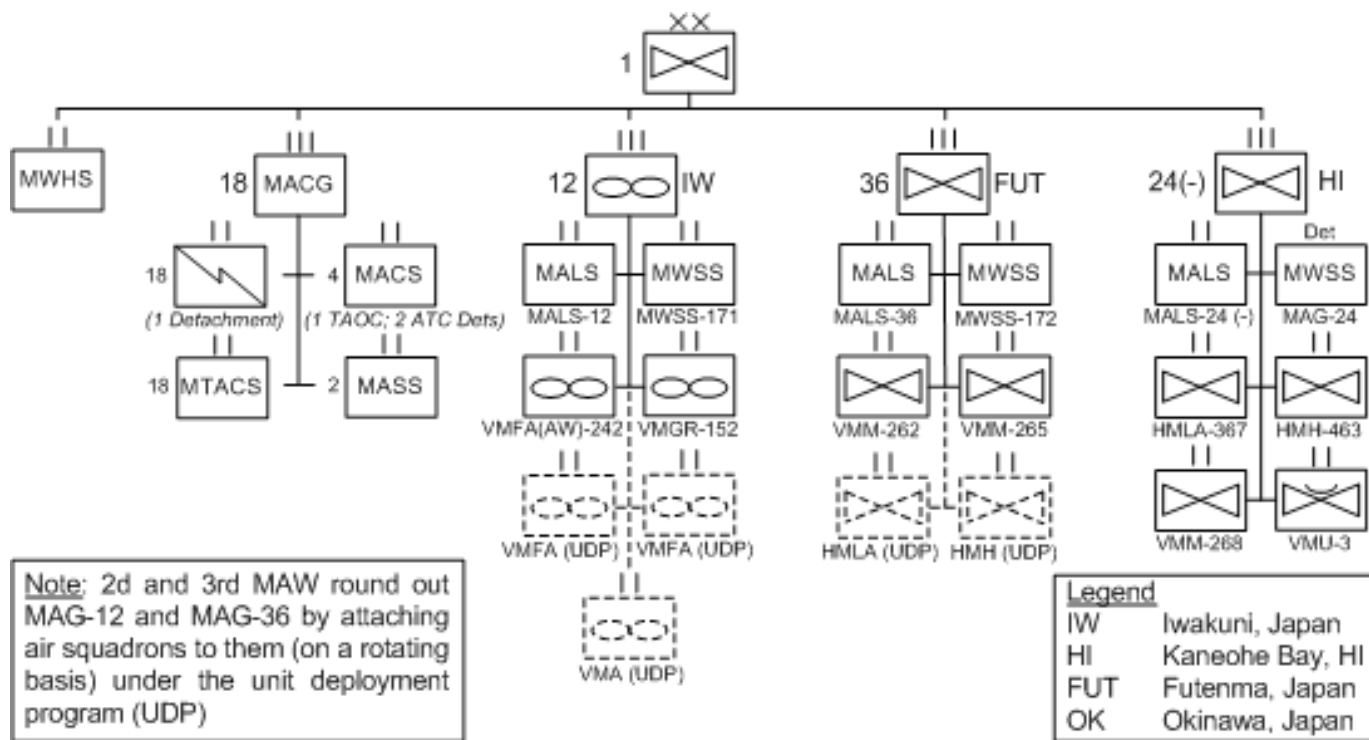


Figure 1-17: 1st Marine Aircraft Wing Organization

c. 3d Marine Logistics Group (FY17)

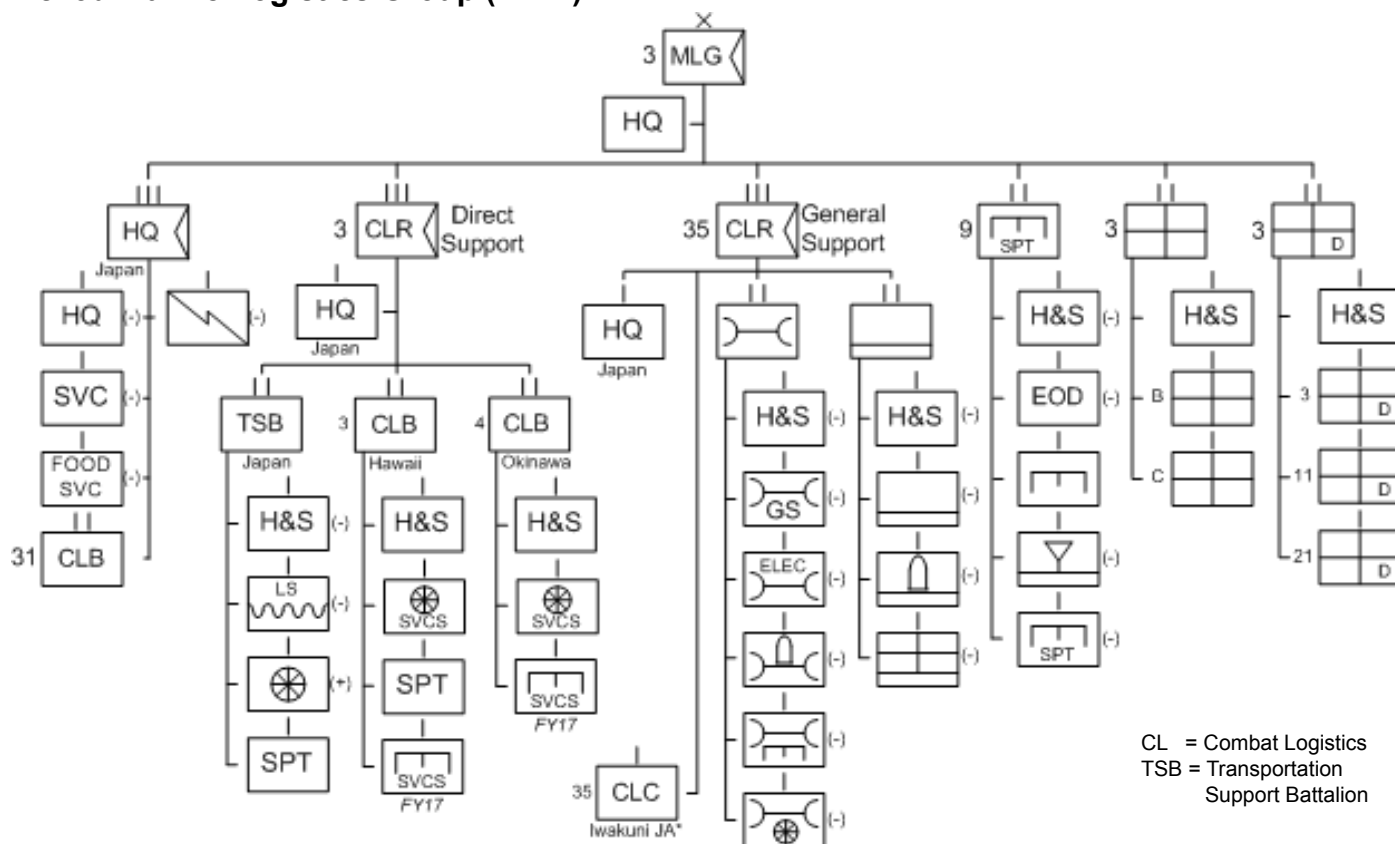


Figure 1-18: 3d Marine Logistics Group Organization

Organizations

1007. Marine Forces Reserve Organization (FY17)

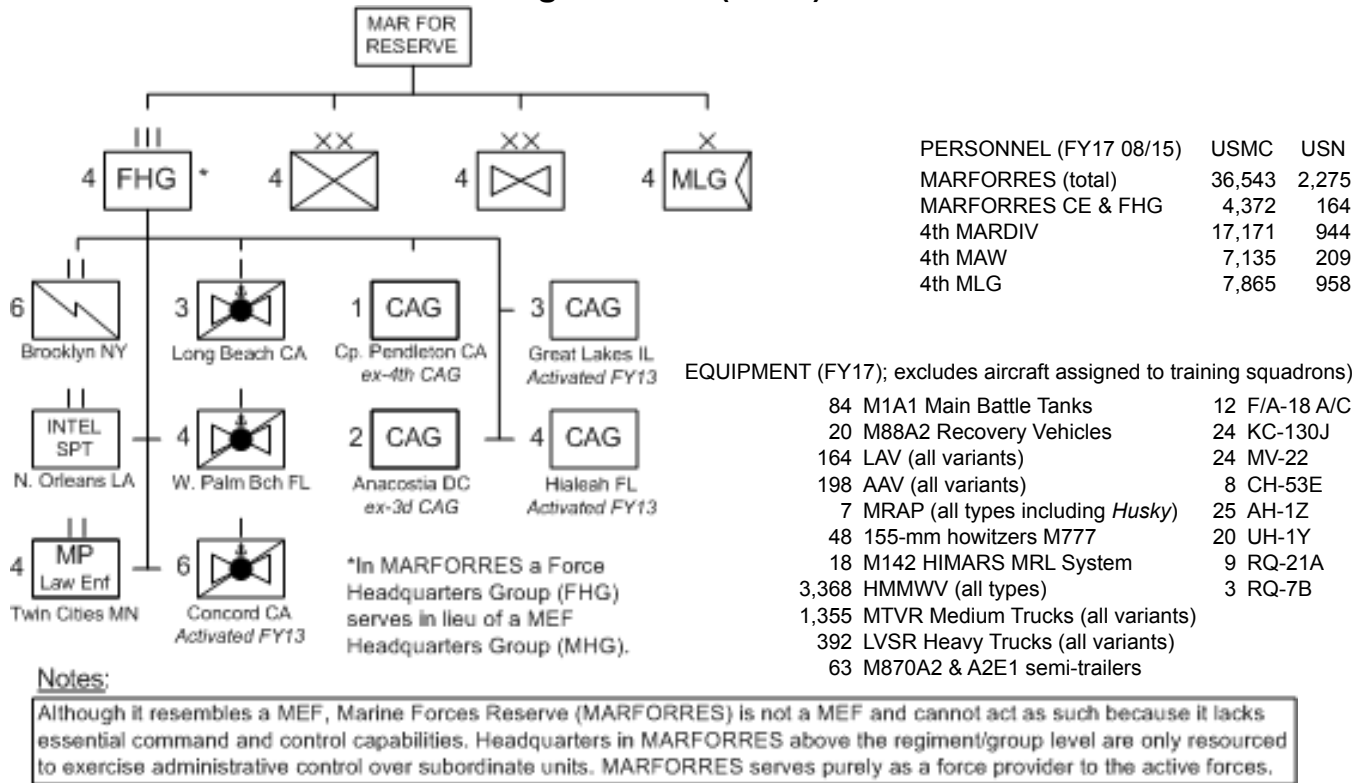


Figure 1-19: Marine Forces Reserve Organization

a. 4th Marine Division (FY17)

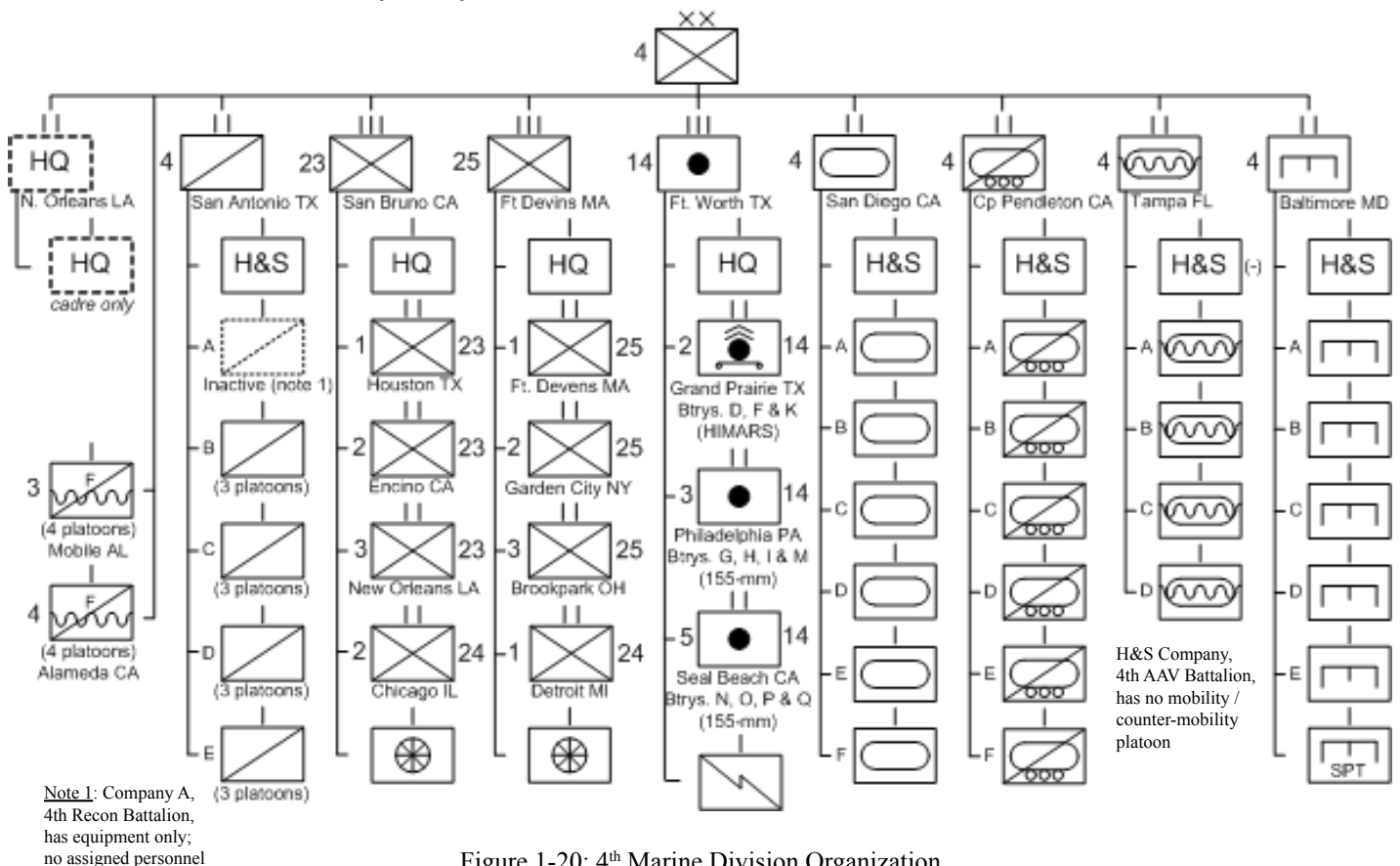


Figure 1-20: 4th Marine Division Organization

b. 4th Marine Aircraft Wing (FY17)

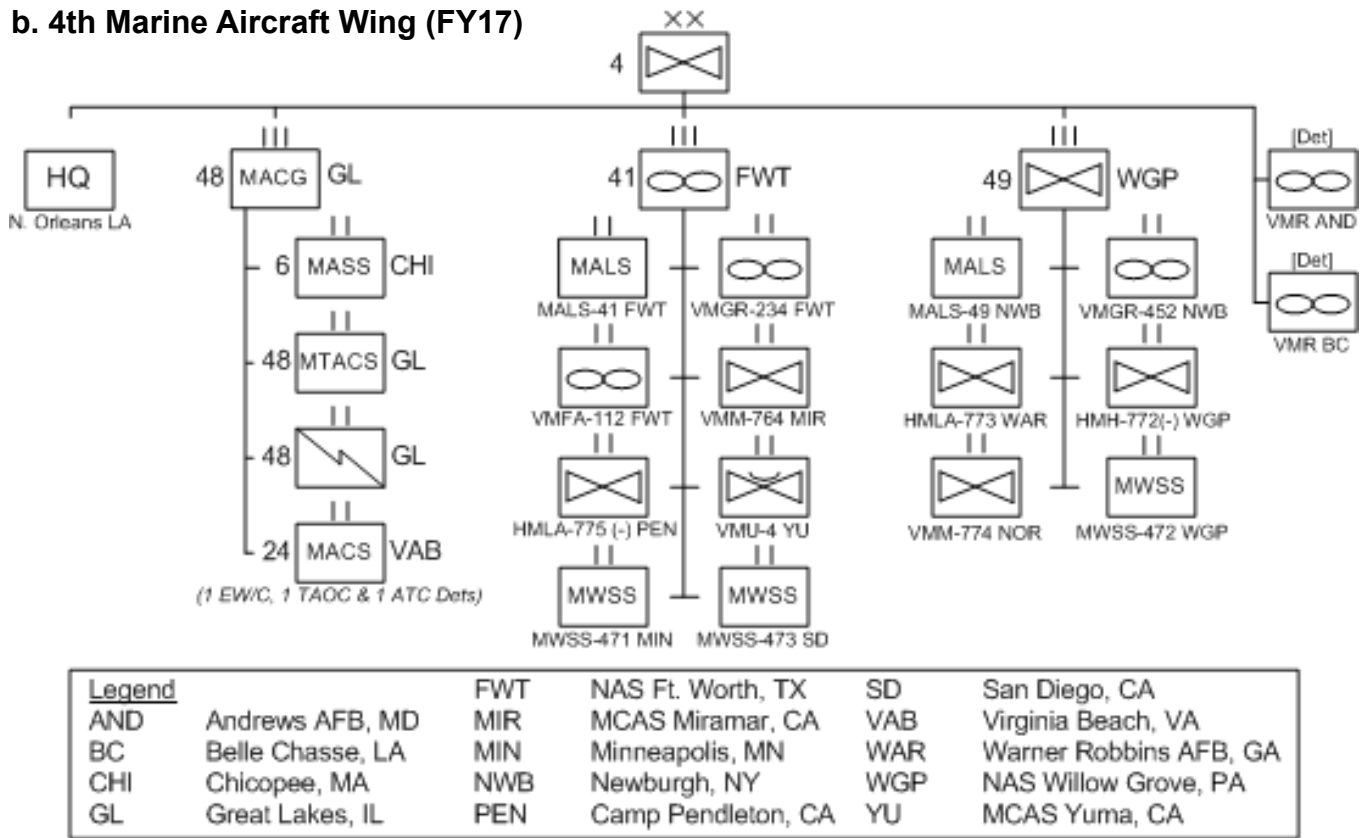


Figure 1-21: 4th Marine Aircraft Wing Organization

c. 4th Marine Logistics Group (FY17)

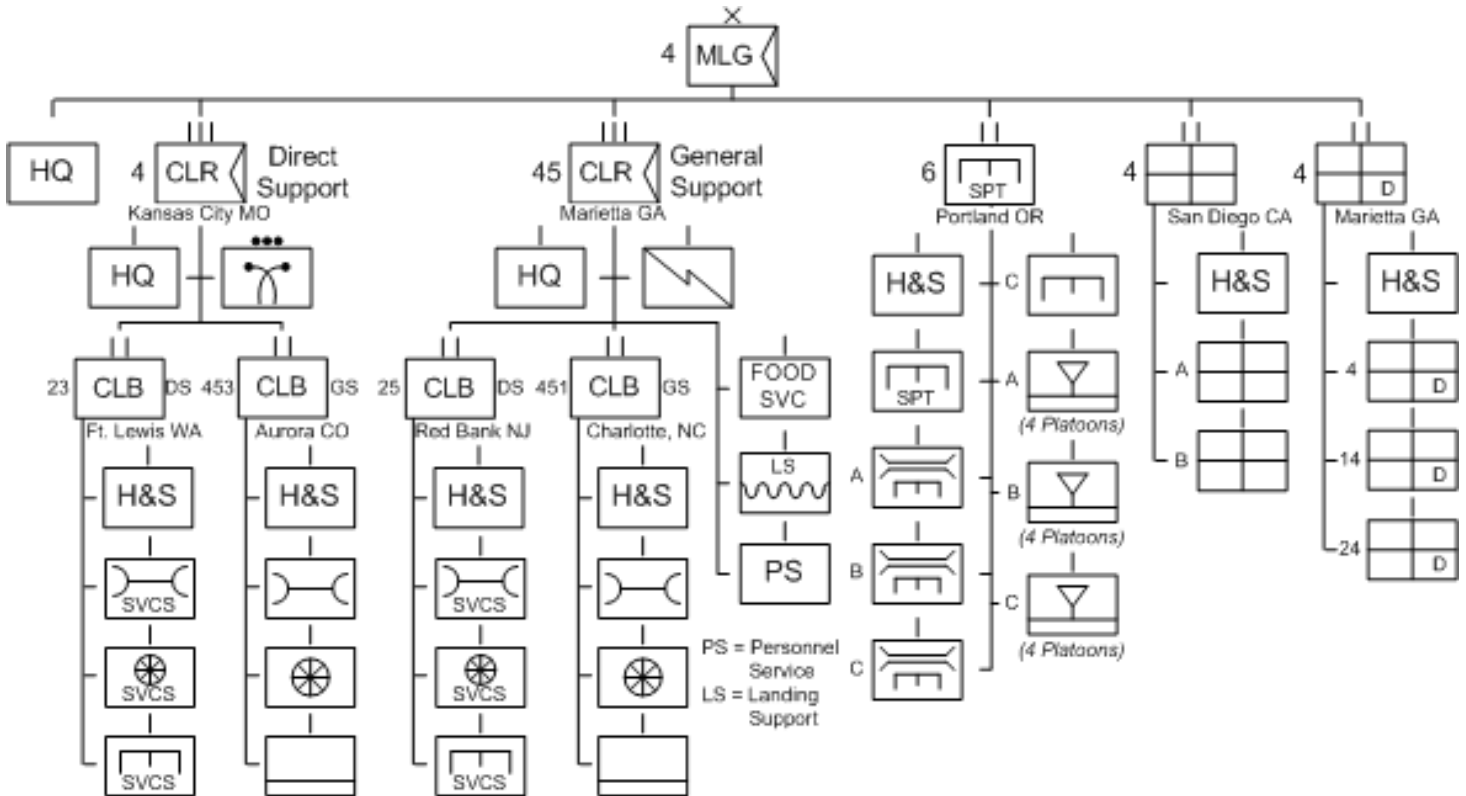


Figure 1-22: 4th Marine Logistics Group Organization

Organizations

1008. Marine Corps Component Headquarters Locations

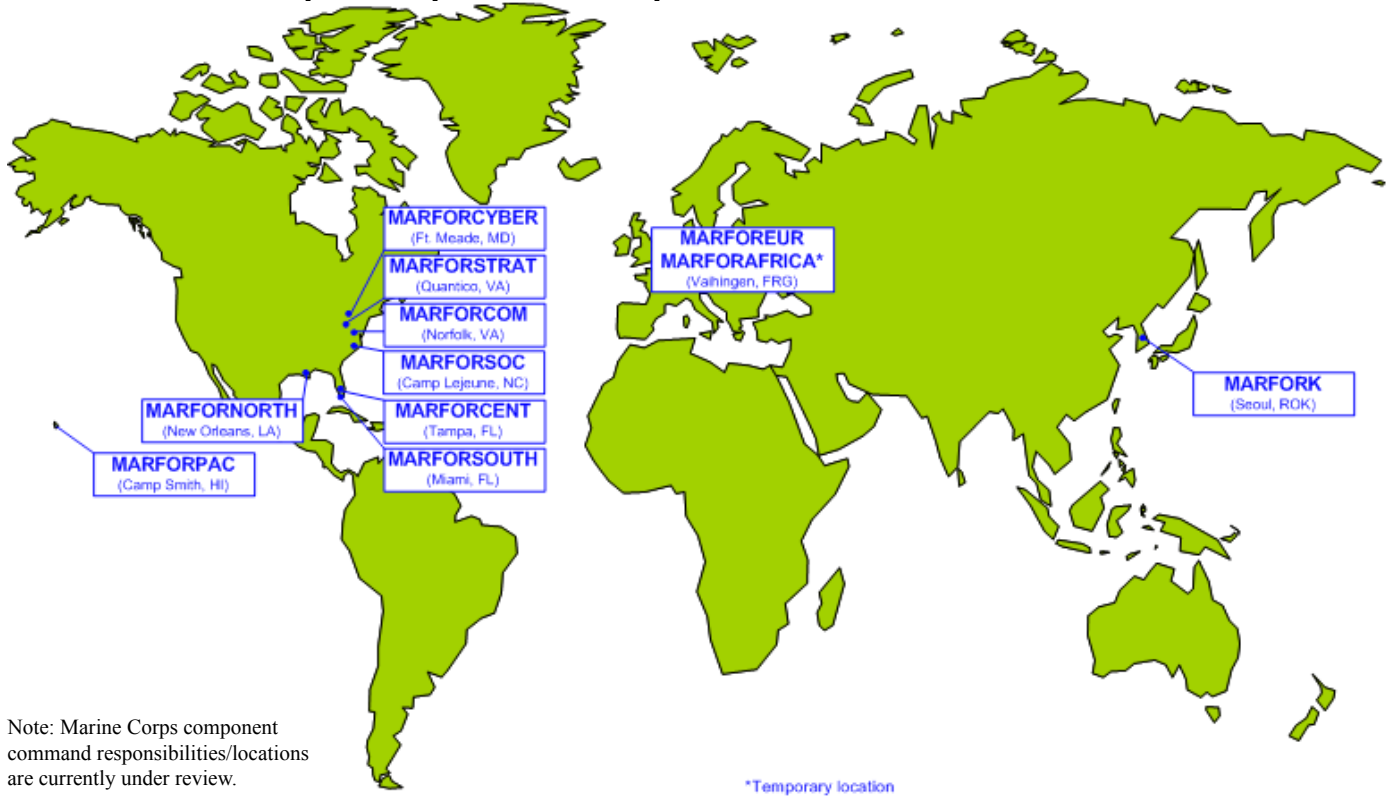


Figure 1-23: Marine Corps Component Headquarters Locations

1009. Maritime Prepositioning Force

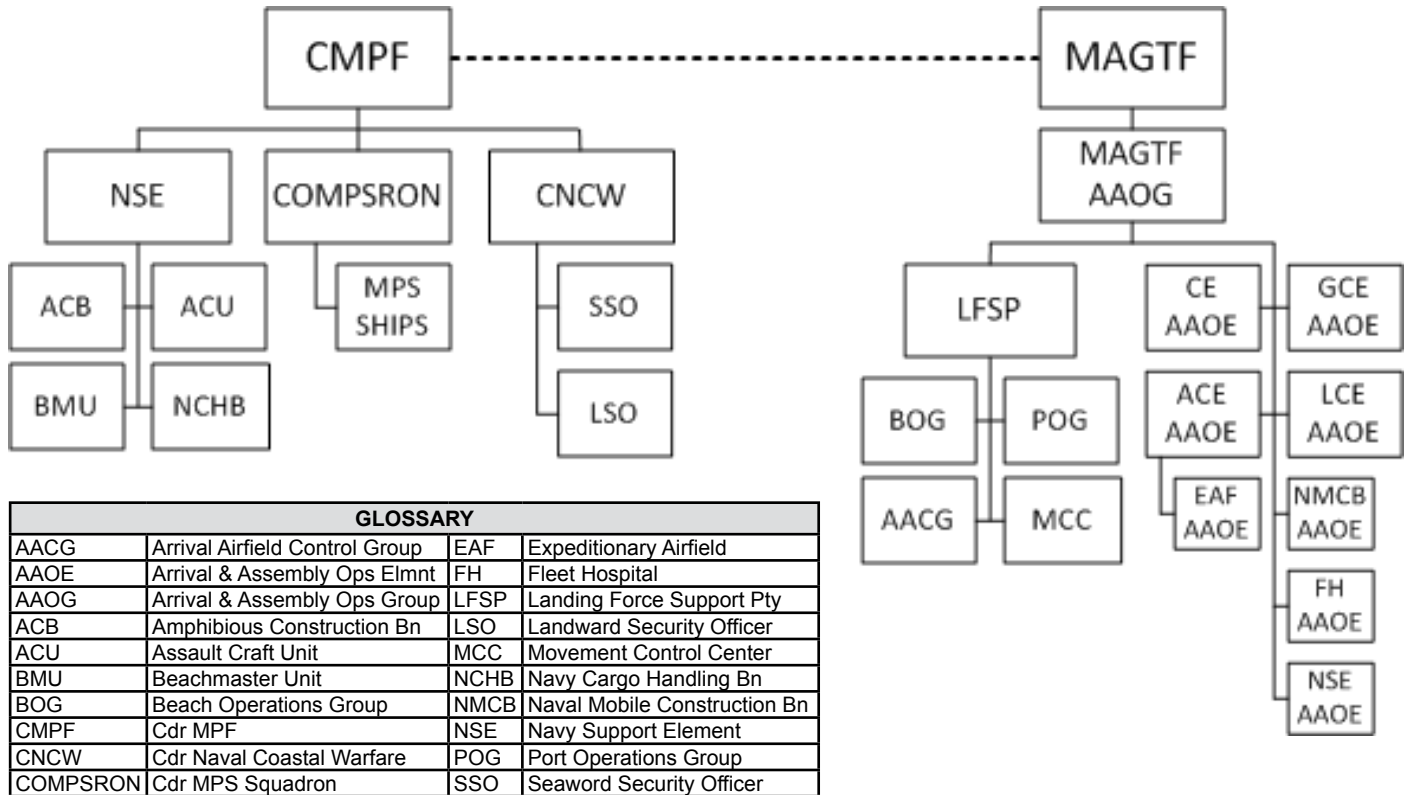


Figure 1-24: Maritime Prepositioning Ship Squadron Organization

a. Maritime Strategic Pre-positioning Locations (MPS Squadrons & MCPP-N)

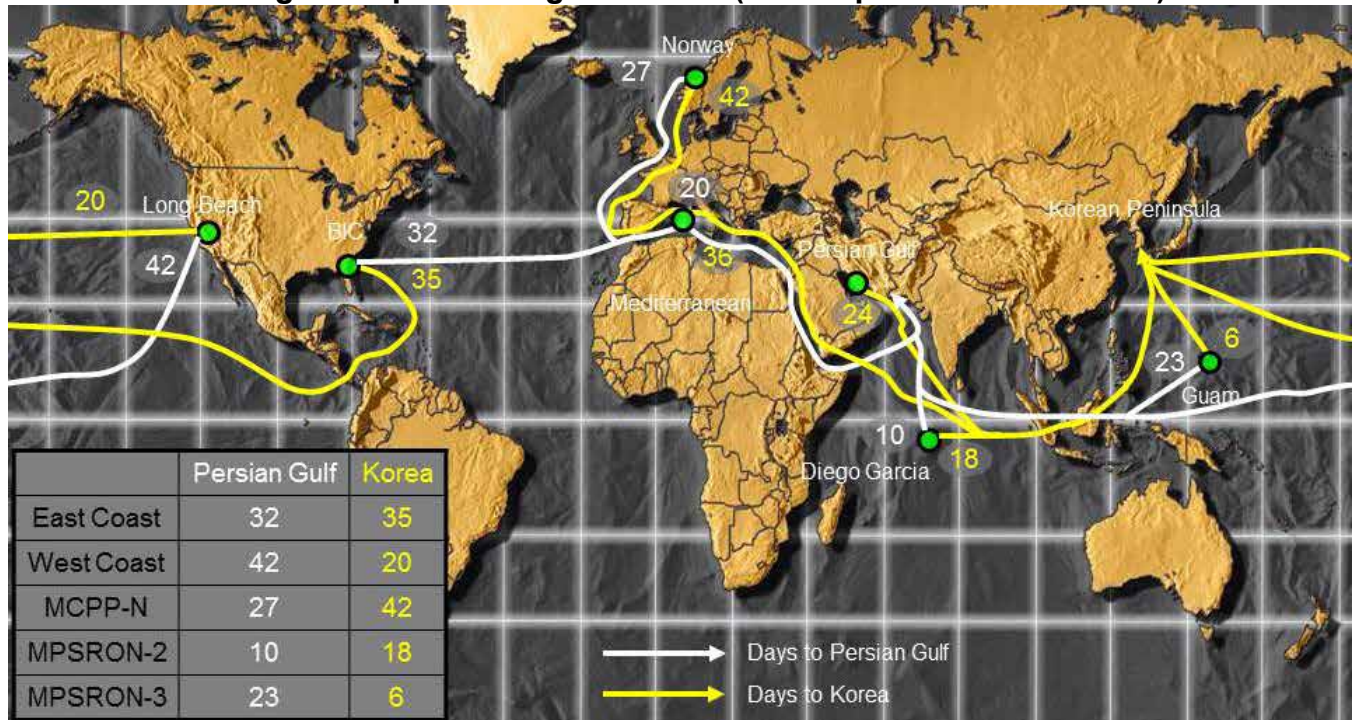


Figure 1-25: Maritime Strategic Pre-positioning Locations under President's Budget FY13 (PB-13) MPF Transition

MPS-2					MPS-3				
Ship	TEU	SqFt	POL	H2O	Ship	TEU	SqFt	POL	H2O
Sisler LMSR	300	319K	N/A	70.6k	DAHL LMSR	300	319K	N/A	70.6k
Seay LMSR	278	317k	N/A	55k	Piililau LMSR	278	317k	N/A	55k
Stockham LMSR	545	218k	N/A	160k	Bobo T-AK	546	152k	1.4m	98.9k
Button T-AK	546	152k	1.4m	98.9K	Williams T-AK	546	152k	1.4m	98.9k
Lopez T-AK	546	152k	1.4m	98.9K	Lummus T-AK	546	152k	1.4m	98.9k
Lewis & Clark T-AKE	572	N/A	1.1m	1.4k	Sacagawea T-AKE	572	N/A	1.1m	1.4k
Montford Point MLP	N/A	N/A	0.38m	100k	John Glenn MLP	N/A	N/A	0.38m	100k
TOTAL MPS-2	2,787	1,158k	4.28m	585.8k	TOTAL MPS-3	2,788	1,092k	5.68m	523.7k

Figure 1-26: FY15 MPSRON Ship Composition and Capabilities (load data should be used for exercise purposes only)

Notes: TEU = ship's container carrying capacity expressed in twenty-foot (ISO container) equivalent units; SqFt = square feet of deck space useable for vehicle stowage; POL/H2O = fuel/water stowage expressed in millions/thousands of gallons.

Organizations

Ship Types:

LMSR (T-AKR): Large Medium Speed RO/RO (Roll on/Roll off) ship; RO/RO ships are so named because they are designed to carry motor vehicles and use ramps to enable them to drive on board or off. On an ordinary RO/RO ship vehicles can only drive on or off only at “low” speed. On an LMSR they can drive at “medium” speed, accelerating the loading/unloading process. An LMSR also makes fresh water. The *Stockham* produces 30,000 gallons per day (gpd); the *Seay* and *Pililaau* 20,000 gpd each and the *Sisler* and *Dahl* 16,000 gpd each.

T-AK (RO/RO) or Auxiliary (T-A) Cargo (K) ships: These are smaller, slower and more conventional RO/RO ships (see Figure 1-28). They carry fuel as well as vehicles and ISO containers. One T-AK produces 36,000 gpd of fresh water.

T-AKE or Auxiliary (T-A) Cargo (K) Ammunition (E) ships: These are dry cargo and ammunition carriers designed for the Navy as underway replenishment ships. They lack RO/RO capabilities and do not normally carry vehicles (no RO/RO capability). One T-AKE produces 30,000 gpd of fresh water.

ESD (Expeditionary Transfer (Ship?) Dock): Built on a commercial oil tanker hull, an ESD is a self-propelled floating pier and cargo transfer point. MPS ships discharge their cargo of vehicles, via a ramp, onto the ESD’s semi-submersible well deck. From there the vehicles can drive onto landing craft (only LCAC(s) have been tested so far) for movement to the beach. Cargo transfer operations are possible up to 25 miles off shore and in 1.25m (4-ft) waves. An ESD produces 25,000 gpd of fresh water. ESD’s were known as Mobile Landing Platforms (MLP) until SECNAV redesignated them in August 2015.



Figure 1-27: ESD-LMSR Vehicle Transfer Operations

ESB (Expeditionary Sea Base): The ESB is an ESD variant built for a very different mission. The *Lewis B. Puller* (ESB-1; Figure 1-29) is the first unit. It was delivered to Military Sealift Command in June 2015 as an AFSB



Figure 1-28: TA-K Bobo

(Afloat Forward Staging Base). SECNAV redesignated it an ESB in August. The Navy wants two more units, the first (named the *Hershel “Woody” Williams*) is for delivery in FY18. Construction of the *Puller* as a standard ESD began in November 2013. The Navy added a flight deck with landing spots for two MH-53 or MH-60 helicopters plus deck and hanger space for two more. The Navy will likely certify the ship for V-22 *Osprey* operations as well but its flight deck cannot withstand the exhaust from an F-35B. The ship’s berthing, magazine, cargo and repair spaces support up to 298 military personnel (including a landing party of 250) plus a civilian crew of 34. The ship also carries four Mk-105 hydrofoil minesweeping sleds. In future, it may carry landing craft. It retains the ballasting capability of an ESD and could (in theory) support LCAC operations, though this has never been tested and is not currently a designated mission. In FY17 the *Puller* replaces the *USS Ponce* (LPD-15), which has been serving as an interim ESB in the Persian Gulf. Conceptually, the ESB is a cheaper substitute for “gray hull” amphibious ships (LHD, LPD, LSD, etc.). As such, it would take over secondary missions such as training, theater security cooperation, and maritime security, thus freeing more “gray hulls” for service in amphibious squadrons. At present, pending further testing, the ESB will mainly support mine countermeasures operations by boats and aircraft. If testing is successful it may also serve as a special operations platform or even carry a small special purpose MAGTF.

Figure 1-29: Expeditionary Sea Base (ESB)



Organizations

d. Maritime Prepositioning Force Ships and Steaming Times (FY15)

	MPSRON-1	MPSRON-2	MPSRON-3
Flag Ship(s)	Deactivated in FY13	USNS BUTTON (T-AK)	USNS LUMMUS (T-AK)
Alternate Flag Ship(s)		USNS LOPEZ (T-AK)	USNS BOBO (T-AK)
Other Ships Assigned		USNS STOCKHAM (LMSR) USNS SEAY (LMSR) USNS SISLER (LMSR) USNS LEWIS AND CLARK (T-AKE)	USNS WILLIAMS (T-AK) USNS DAHL (LMSR) USNS PILILAAU (LMSR) USNS SACAGAWEA (T-AKE)
MLP		USNS MONTFORD POINT (MLP)	USNS JOHN GLENN (MLP)
Time to Al Jubail		6 days	15 days
Time to Korea		11 days	4 days

Note: Steaming times are at economical speed (13-kts.); Ships are capable of 17-20-kts; T-AK = RO/RO; T-AKE = Ammo/Dry Cargo

Table 1-1: Maritime Prepositioning Force (MPF) Ships and Steaming Times

Note: For MPF employment considerations and capabilities, see Sections 4030 to 4034, pp. IV-58 to IV-61.

1010. Notional Marine Expeditionary Unit (MEU)

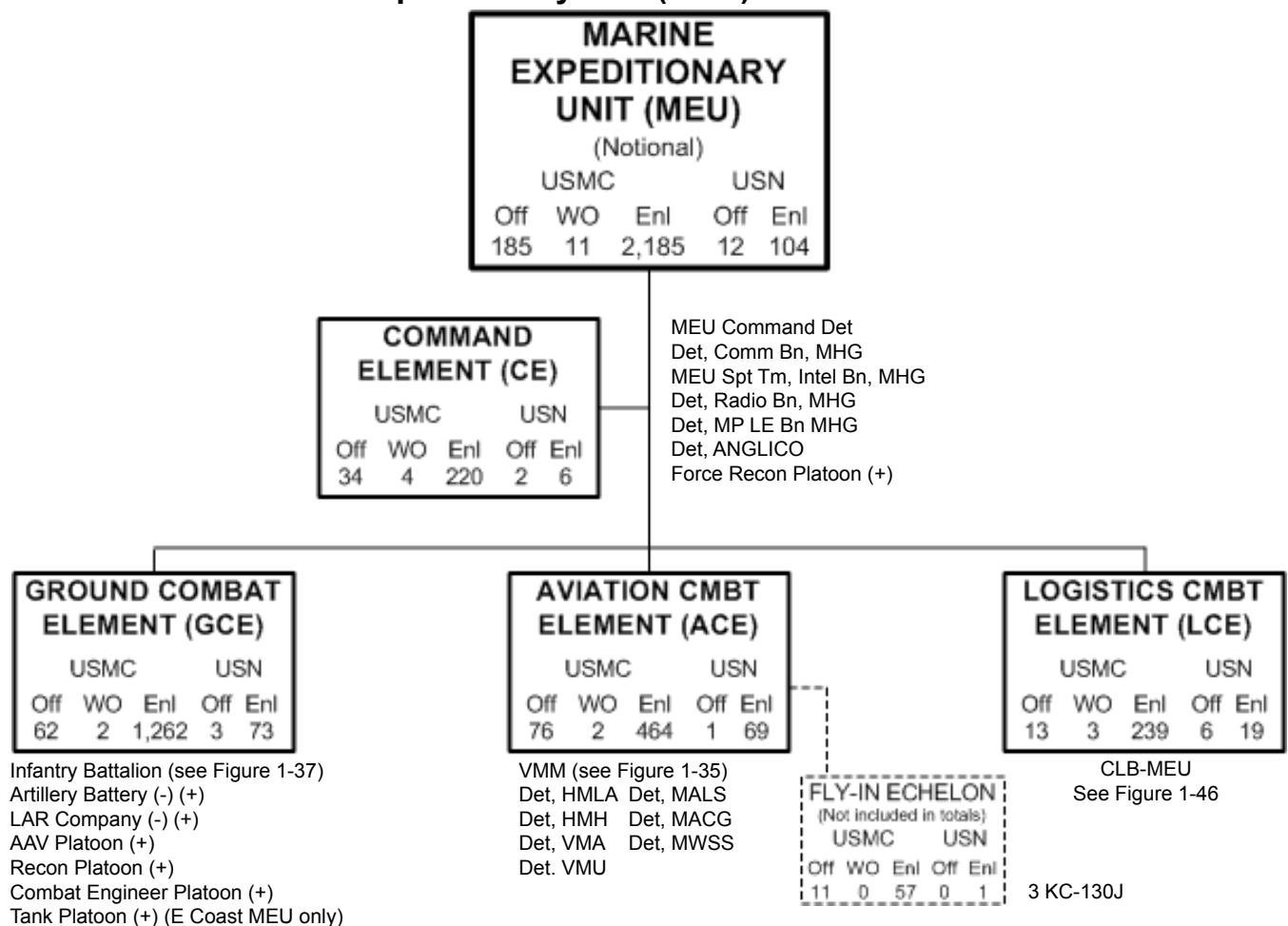


Figure 1-32: Notional Marine Expeditionary Unit (MEU)

Major MEU equipment end items: (aviation) 6 F-35B *Lightning* strike fighters, 12 MV-22 Osprey tilt rotor aircraft, 4 CH-53E heavy lift helicopters, 4 AH-1Z attack helicopters, 3 UH-1Y utility helicopters, 1 RQ-21A drone system; (ground combat equipment - excluding infantry battalion) 4 M1A1 main battle tanks and 1 M88A2 heavy recovery vehicles (22, 24 & 26 MEU only), 15 assault amphibian vehicles (13 AAV-7P, 2 AAV-7C and 1 AAV-7R), 21 Light Armored Vehicles (10 LAV-25, 2 LAV-M, 4 LAV-AT, 1 LAV-C2, 3 LAV-L, 1 LAV-R), 1 MEWSS electronic warfare vehicle, 4 M777 155-mm towed howitzers, 4 M327 120-mm towed mortars; one modified Route Clearing Platoon (RCP) equipment set; 3 LVSR heavy trucks, 38 MTRV medium trucks (all variants), 109 HMMWV (all types); and 13 Internally Transported Vehicles (all types).

Landing craft carried in amphibious shipping for one MEU are five Landing Craft Air Cushion (LCAC) and two Landing Craft Utility (LCU).

1011. Baseline Marine Expeditionary Brigade (MEB)

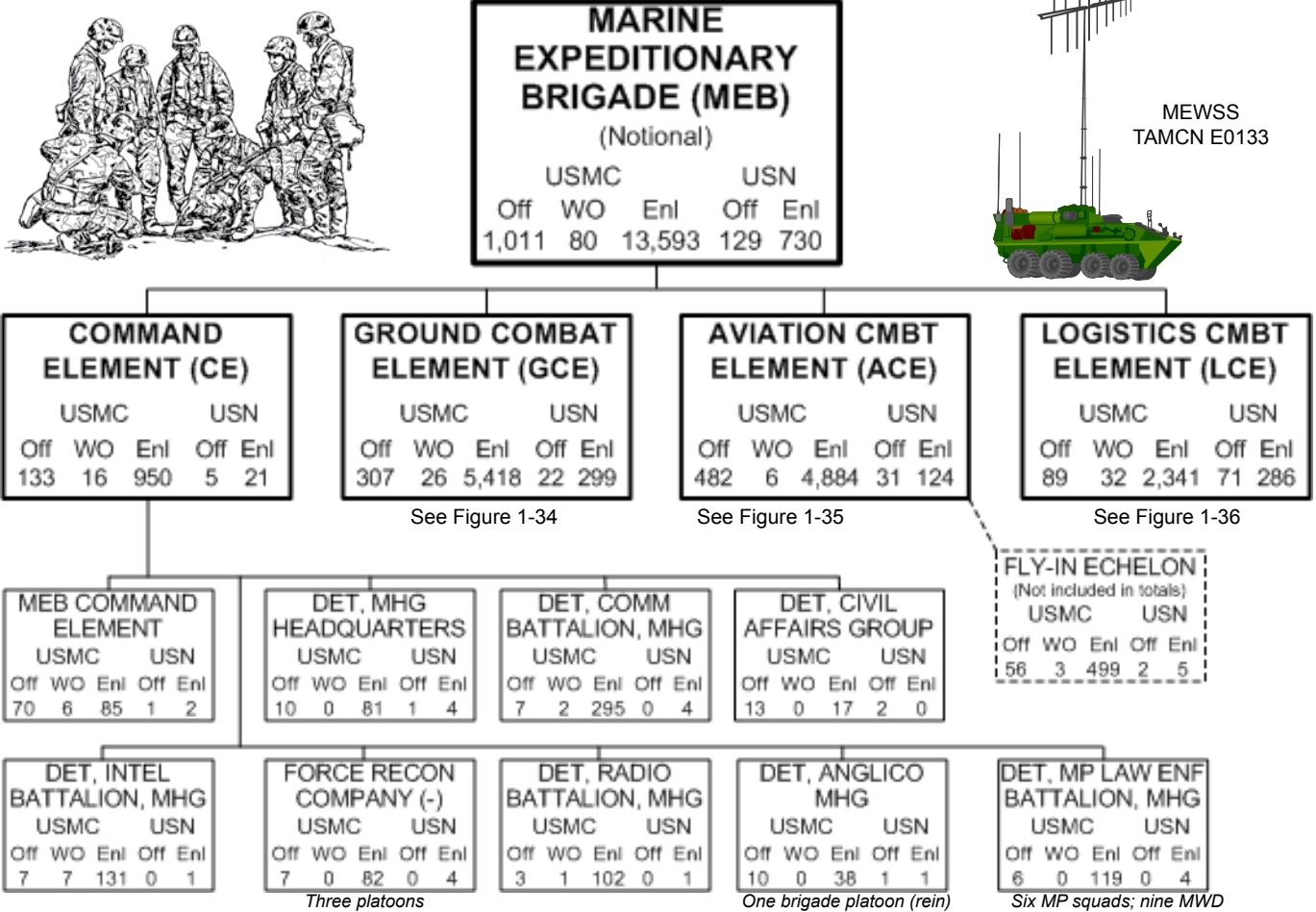


Figure 1-33: Baseline MEB Organization Showing Command Element (CE) Breakdown

TAMCN	DESCRIPTION	QUANTITY	TAMCN	DESCRIPTION	QUANTITY
A0122	AN/TSC-156C Phoenix SHF Satellite Terminal	2	B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	8
A0153	AN/MRC-142C Digital Wideband Transmit System	7	B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	5
A0170	AN/TSQ-226(V)3 Trojan SPIRIT LITE SI Comm Sys.	1	B2085	Storage Tank Module, Fuel (SIXCON)	4
A0321	UAS Raven DDL (Drone system)	1	B2561	Truck, Forklift, Variable Reach, Tier II	2
A0398	Wasp IV (Drone system)	2	C5901	Raiding Craft Combat, Rubber (CRRC) F470	12
A0806	AN/USC-65(v)1 & (v)2 (A0807) Satellite Terminal	2	C6621	Ration Heating System	2
A0886	AN/TSQ-231A Jt Enhanced Core Com Sys (JECCS)	2	D0003/0198	AMK/MK-23A1 Truck, Cargo 7 ton (AMK=Armored)	27
A1954	AN/MRC-142B Digital Wideband Trans Sys (S to S)	2	D0005/1062	AMK/MK-27A1 Truck, XLWB 7 ton (AMK=Armored)	7
A2179	AN/TRC-170(v)5 Radio Terminal Set	3	D0016/17*	M1102 Cargo/Chassis ttrs (1.5-ton) for HMMWV	67
A3232	AN/TSC-154 Tactical SATCOM SMART-T	2	D0022/33*	M1152/(A1) Truck 4x4, Utility EC 2-dr 11,500gvw	44
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	2	D0027	MRAP Cat II 6x6 electronic atk system (Radio Bn)	1
B0049	Refrigeration System (half an ISO container)	1	D0030	M1151A1 Truck 4x4 Armt Carrier EC 4-door	31
B0055	Portable Bath Unit	1	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	24
B0075	Small Field Refrigeration System	2	D0081	MK-353 4-ton chassis trailer	11
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz (750#)	2	D0862	MK-593 Trailer, Cargo, MTRV	8
B0078	Grader, Motorized, Road, 120M	2	D0882	MK-149 Trailer, Water	5
B0395	Air Compressor, 260, P260WIRMIL (trailer mtd?)	1	D1001/1002	M997A2/M1035 4 litter/2 litter Ambulance	2
B0730*	Generator Set MEP831A Skid Mtd 3Kw/60Hz	19	D1158*	M1123 Truck, Utility Cargo/Trp carrier 1.25T	70
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	14	E0103/1475	M110 7.62mm / M107 0.50-cal Sniper Sys (12 ea)	24
B0930	Generator Set MMG-25 25Kw (commercial type)	9	E0133	LAV Electronic Warfare Variant (MEWSS)	2
B0953*	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	9	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (28 M240)	61
B0980*	Generator Set MEP531A Lt Wt Man Portable	22	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (14 M2, 13 Mk19)	27

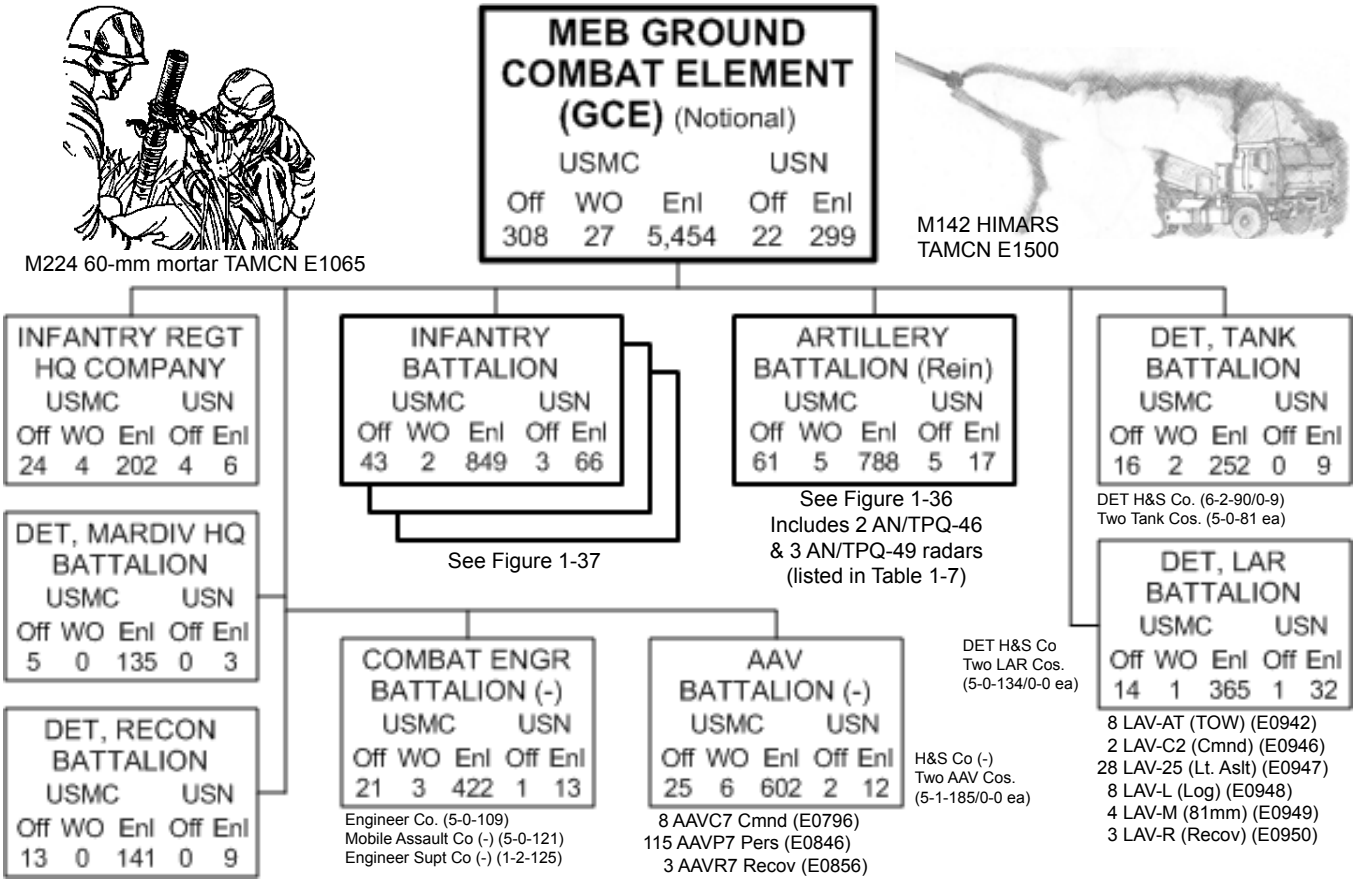
Table 1-2: Selected Baseline MEB Equipment; from Command Element (CE) Only

This Marine Expeditionary Brigade (MEB) organization is purely notional and intended for use only for training or exercises. It is not intended to represent an MPF MEB. Each standing MEF includes a permanent skeletal MEB headquarters. In theory I MEF and II MEF could each organize two MEB(s) from their assigned assets while III MEF could organize one.

*Includes items that may be part of other TAMCN(s)

Organizations

a. Baseline MEB Ground Combat Element (GCE)



DET H&S Co. (7-51/0-4)
Recon Company (6-90/0-5)

Figure 1-34: Baseline MEB GCE Organization

TAMCN	DESCRIPTION	QUANTITY	TAMCN	DESCRIPTION	QUANTITY
A0153	AN/MRC-142C Digital Wideband Transmit System	6	C5901	Raiding Craft Combat, Rubber (CRRC) F470	12
A0254/55	AN/TSQ-239 (V)3/(V)4 Regt/Gp or Bn/Sqdn COC	7	C6621	Ration Heating System	20
A0279	AN/TSQ-267 Target Processing Center	1	D0003/0198	AMK/MK-23A1/AMK37A1 Truck, Cargo 7 ton	178
A0321	UAS Raven DDL (Drone system)	9	D0005/1062	AMK/MK-27A1 Armored Truck, XLWB Cargo 7 ton	5
A0398/0414	Wasp IV (6)/ Puma AE (4) Drone Aircraft systems	10	D0007/1073	AMK/MK-29A1 Truck, Dump 7 ton (AMK=Armored)	4
A3232	AN/TSC-154 Tactical SATCOM SMART-T	1	D0015	AMK-36A1 Truck, Armored Wrecker 7 ton w/w	6
B0035	Buffalo A2 MRAP Cat III MPCV	3	D0016/17*	M1102 Cargo/Chassis tlrs (1.5-ton) for HMMWV	225
B0036/37	Grnd. Expedient Refuel Sys. (GERS) 8 sml./8 mdm	16	D0022/33*	M1152/(A1) Truck 4x4, Utility EC 2-dr 11,500gww	195
B0040	Multi-Terrain Loader 277C	12	D0025/51	MRAP Cougar Cat II 6x6 (6 w/route clearing eqpt)	12
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	8	D0030	M1151A1 Truck 4x4 Armt Carrier EC 4-door	159
B0060	Mdm Crawler Tractor MCT (John Deere) 850-JR	3	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	68
B0063	Tractor/Scoop Loader, RT, 624K TRAM	7	D0032	M1167A1 Truck 4x4 TOW Carrier EC 4-dr w/TOW	24
B0075	Small Field Refrigeration System	4	D0081	MK-353 4-ton chassis trailer	30
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz	12	D0862/0882	MK593/MK38 Cargo (67) /MK149 (31) Water Tlrs	98
B0078	Grader, Motorized, Road, 120M	1	D0886/0035	LVSR MKR-18 Truck, Cargo 22.5 T 10x10/PLS Tlr	17
B0093	VMMD System (including Husky counter mine veh)	6	D0887/0235	LVSR MKR-16 Tractor w/M870A2 semi-trailer 40 T	7
B0160	M1160 Assault Breacher Vehicle (ABV)	6	D1001/1002	M997A2/M1035 4 litter (13)/2 litter (11) Ambulance	24
B0395	Air Compressor, 260, P260WIRMIL (trailer mtd?)	3	D1063/0861	AMK-37A1 Truck w/MK-38 trlr, HIMARS Resupply	12
B0589	M9 Armored Combat Earth Mover (ACE)	8	D1158*	M1123 Truck, Utility Cargo/Trp carrier 1.25T	119
B0730*	Generator Set MEP831A Skid Mtd 3Kw/60Hz	54	D1214	LVSR MKR-15 Truck, Wrecker 10x10	2
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	24	E0103/1475	M110 7.62mm/M107 .50-cal Sniper Sys (30 M110)	56
B0930	Generator Set MMG-25 25Kw (commercial type)	10	E0671	M777A2 Lightweight Towed 155-mm howitzer	18
B0953*	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	31	E0796-0856	AAVC7/AAVP7/AAVR7 (see Tables 1-11 & 2-1)	126
B0980*	Generator Set MEP531A Lt Wt Man Portable	19	E0942-0950	LAV-AT/C2/LAV25/LAV/L AVM/LAVR (see Fig 1-34)	53
B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	10	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (336 M240)	828
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	1	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (93 Mk19)	225
B1315	Launcher, Clearing Mine MK-154 w/M353 trailer	32	E1065/1095	27 M224 60mm/28 M252 81mm Mortars	55
B2085/2086	SIXCON Fuel/Water Modules (39 Fuel, 11 Water)	50	E1378	M88A2 Recovery Vehicle, Heavy FT	8
B2483	Loader, Backhoe, (BHL) 420E IT	8	E1500	M142 High Mobility Arty Rkt Sys (HIMARS)	6
B2561/2566	Forklift, Variable Rch/LRTF RT Lt capability (3+9)	12	E1888	M1A1 Tank, Combat, FT, 120-mm gun	28

Table 1-3: Selected Baseline MEB Ground Combat Element (GCE) Equipment

*Includes units that may be part of other TAMCN(s)

b. Baseline MEB Aviation Combat Element (ACE)

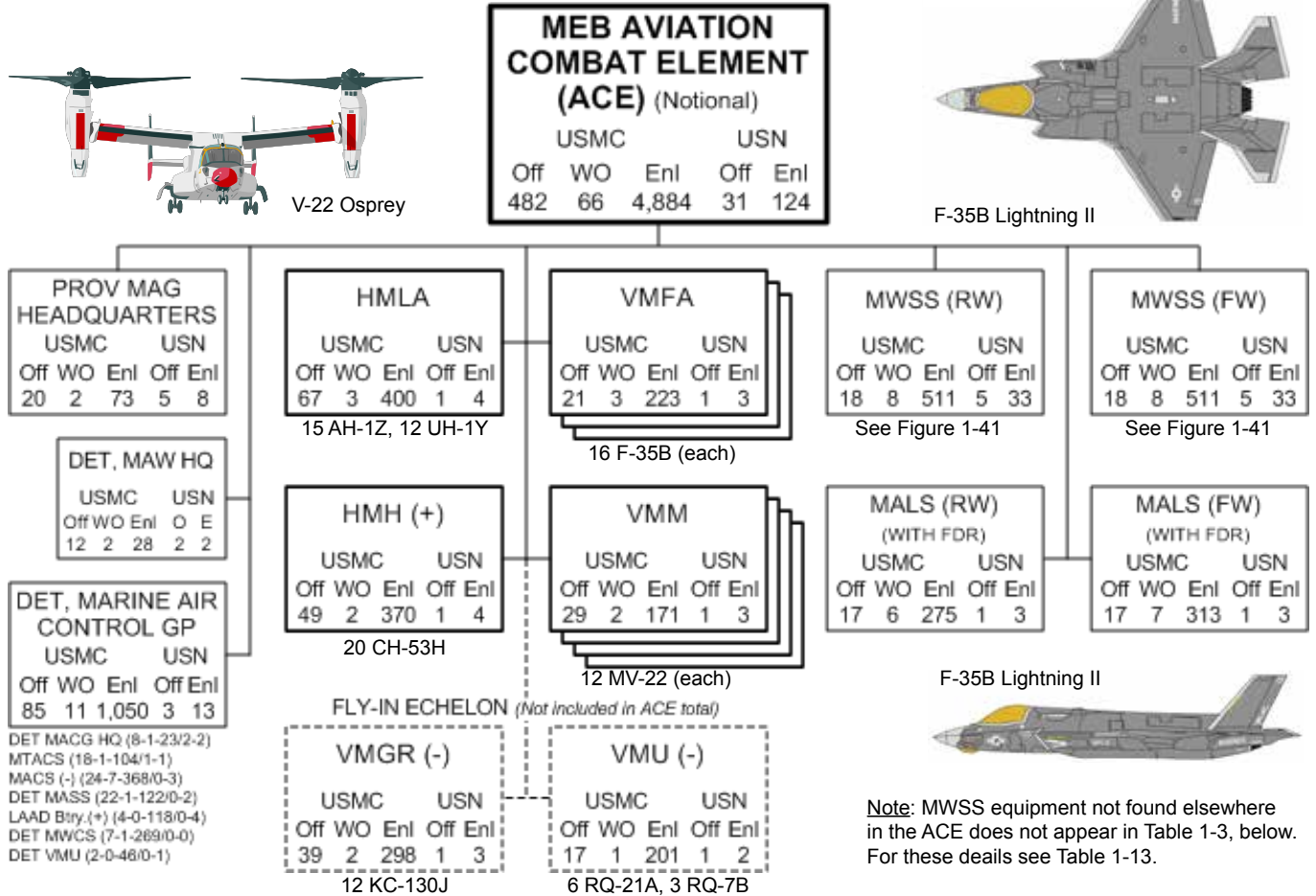


Figure 1-35: Baseline MEB ACE Organization

TAMCN	DESCRIPTION	QUANTITY	TAMCN	DESCRIPTION	QUANTITY
A0021	AN/TYQ-101A Comm Data System	2	B1016	Generator Set MEP816B Skid Mtd 60Kw/400Hz	5
A0025	AN/MSQ-124 Comm Relay System	1	B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	48
A0032	AN/MRQ-13(V)1 Comm System	9	B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	26
A0153	AN/MRC-142C Digital Wideband Transmit System	12	B1135	Helicopter Expedient Refueling System (HERS)	6
A0257	AN/MSQ-145 LAAD C2 System	8	B2085/2086	SIXCON Fuel/Water Modules (41 Fuel, 36 Water)	77
A0305	AN/TSQ-269 Tac Air Opns Center	1	B2561/2566	Forklift, Variable Rch/LRTF RT Lt capability (21+12)	33
A0362	Unmanned Aircraft, RQ-21A	3	D0003/0198	AMK/MK-23A1 Truck, Cargo 7 ton (AMK=Armored)	47
A0402	Meteorological Mobile Facility	2	D0005/1062	AMK/MK-27A1 Truck, XLWB 7 ton (AMK=Armored)	89
A1405	AN/TPS-80 Multi Role Radar System (MRRS) G/ATOR	3	D0007/1073	AMK/MK-29A1 Truck, Dump 7 ton (AMK=Armored)	18
A1503	AN/TPS-59A (V)3 Radar Set	1	D0009/0013	AMK/MK-31A1 Trk Tractor 7-t w/AMK-970 refueler	24
A2600	AN/MSQ-143A(V)1 Tactical Command System	1	D0015	AMK-36A1 Truck, Armored Wrecker 7 ton w/w	6
B0016	Generator Set, Diesel MEP-903A (VMU only)	3	D0016/17*	M1102 Cargo/Chassis trailers (1.5-T) for HMMWV	152
B0038	All Terrain Crane (ATC), MAC-50	4	D0022/33*	M1152/(A1) Truck 4x4, Utility EC 2-dr 11,500gww	113
B0040	Multi Terrain Loader 277C	8	D0030	M1151A1 Truck 4x4 Armament Carrier EC 4-door	24
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	20	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	18
B0060	Mdm Crawler Tractor MCT (John Deere) 850-JR	6	D0081	MK-353 4-ton chassis trailer	81
B0063	Tractor/Scoop Loader, RT, 624K TRAM	19	D0862/0882	MK593 Cargo (18) /MK149 (33) Water Trlrs MTRV	51
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz (750#)	10	D0886/0035	LVSR MKR-18 Truck, Cargo 22.5 T 10x10/PLS Tlr	16
B0078	Grader, Motorized, Road, 120M	4	D0887/0235	LVSR MKR-16 Tractor w/M870A2 semi-trailer 40 T	8
B0392	Container Handler, rubber tired (RT), KALMAR	4	D1001	M997A2 4 litter Armored Ambulance	10
B0446	Crane, Wheel Mounted LRT-110	4	D1064	Truck, Fire Fighting, Aircraft & Structure P-19	16
B0675	Tactical Airfield Fuel Dispensing System (TAFDS)	6	D1158*	M1123 Truck, Utility Cargo/Troop carrier 1.25T	169
B0730*	Generator Set MEP831A Skid Mtd 3Kw/60Hz	28	D1214	LVSR MKR-15 Truck, Wrecker 10x10	2
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	43	E0103/1475	M110 7.62mm / M107 .50-cal Sniper Sys (4 M110)	6
B0930	Generator Set MMG-25 25Kw (commercial type)	8	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (81 M240)	148
B0953*	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	51	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (47 M2, 28 Mk19)	75
B0980*	Generator Set MEP531A Lt Wt Man Portable	45	E1839	AN/TWQ-2 Guided Missile Battery	30

Table 1-4: Selected Baseline MEB Aviation Combat Element (ACE) Equipment

*Includes units that may be part of other TAMCN(s)

Organizations

c. Baseline MEB Logistics Combat Element (LCE)

Selected Weapons:

- 12 M110 7.62mm Sniper System (E0103)
- 53 M249 5.56mm SAW LMG (E0960)
- 49 M2 0.50-cal HMG (E0980)
- 104 M240B 7.62mm MG (E0989)
- 80 MK-19 40-mm Grenade MG (E0994)
- 12 M107 0.50cal Sniper Rifle (E1475)

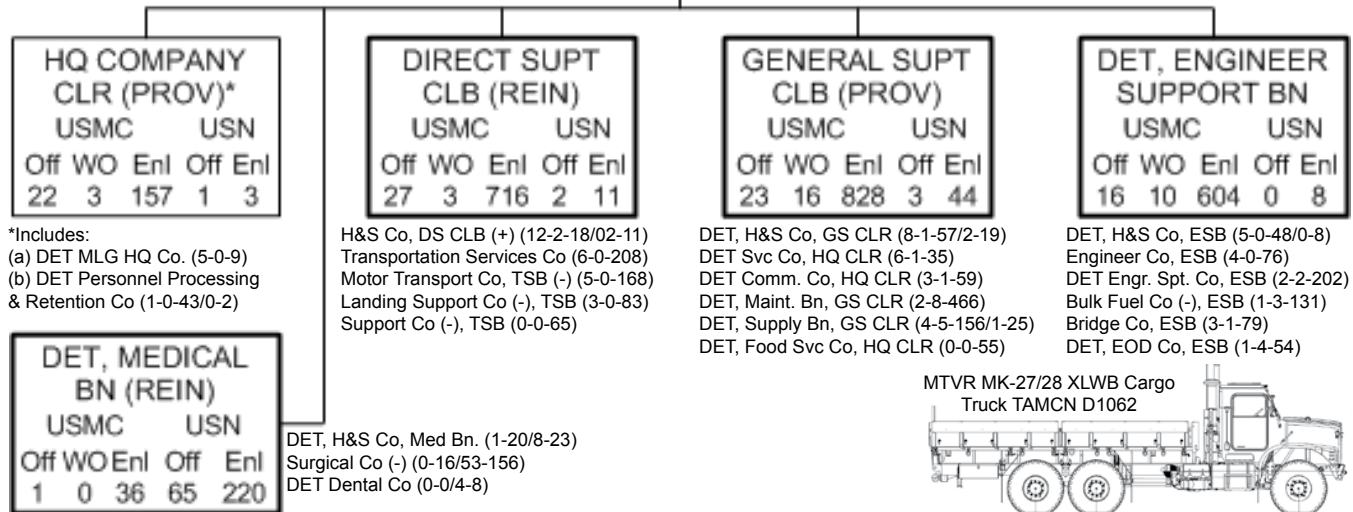


Figure 1-36: Baseline MEB LCE Organization

TAMCN	DESCRIPTION	QUANTITY	TAMCN	DESCRIPTION	QUANTITY
A0153	AN/MRC-142C Digital Wideband Transmit System	4	B1922	Scraper, Tractor 621G	8
B0024	613 Water Distributor (2,500-gal; SP; scraper mtd)	1	B2085/2086	SIXCON Fuel/Water Modules (74 Fuel, 71 Water)	145
B0025/26	T-90 Trailer mtd/T-120 skid mtd Hydroseeders	2	B2394	Pump, 600-gpm Tac Water Dist Sys, trailer mtd 3T	5
B0036/37	Grnd. Expedient Refuel Sys. (GERS) 12 sml./11 mdm	23	B2460	Tractor, full tracked (FT) D6K	8
B0038/446	All Terrain Crane (ATC) MAC-50/wheel mtd LRT-110	14	B2464	Loader, Scoop (bucket) Type F MC1155E	4
B0040	Multi Terrain Loader 277C	7	B2483	Loader, Backhoe, (BHL) 420E IT	6
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	19	B2561/2566	Forklift, Variable Reach/LRTF RT Lt capability (16)	27
B0055	Portable Bath Unit	13	C0034	Expeditionary Field Kitchen	4
B0060	Mdm Crawler Tractor MCT (John Deere) 850-JR	13	D0002/0235	M870A2E1 50-ton/M870A1 40-ton Semi-Trailers	15
B0063	Tractor/Scoop Loader, RT, 624K TRAM	23	D0003/0198	AMK/MK-23A1 Truck, Cargo 7 ton (AMK=Armored)	77
B0066	Containerized Batch (Laundry)	7	D0005/1062	AMK/MK-27A1 Armored Truck, XLWB Cargo 7 ton	28
B0071/2605	LtWt/Tactical Water Purification Sys (LWPS/TWPS)	16	D0007/1073	AMK/MK-29A1 Truck, Dump 7 ton (AMK=Armored)	21
B0075*	Small Field Refrigeration System (incl C0035)	12	D0008/0013	AMK/MK-31A1 MTVR Truck Tractors	21
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz (750#)	2	D0015	AMK-36A1 Truck, Armored Wrecker 7 ton w/winch	11
B0078	Grader, Motorized, Road, 120M	6	D0016/17*	M1102 Cargo/Chassis tirs (1.5-ton) for HMMWV	78
B0083	Generator Set, MEP809A Skid Mtd 200Kw/60Hz	1	D0022/33*	M1152/(A1) Truck 4x4, Utility EC 2-dr 11,500gww	73
B0114	Boat, Bridge Erection USCS BMK3 (has a trailer)	21	D0025	MRAP <i>Cougar</i> Cat I 4x4	9
B0119	Backhoe Excavator 250GR	3	D0027	MRAP <i>Cougar</i> Cat II 6x6	2
B0121/22	Bridge, Floating, Interior Bay M17/Ramp Bay M16	51	D0030	M1151A1 Truck 4x4 Armament Carrier EC 4-door	33
B0152	Medium Girder Bridge (MGB)	4	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	57
B0392	Container Handler, RT, KALMAR	3	D0035	M1076 PLS cargo trailer (16.5-tons)	39
B0395	Air Compressor, 260, P260WIRMIL (with trailer)	10	D0036	MRAP M-ATV 4x4	2
B0589	M9 Armored Combat Earth Mover (ACE)	2	D0052/0886	LVSr (armored/unarmored) MKR-18 16.5T truck	101
B0685	Amphibious Assault Fuel System (AAFS)	2	D0053/0887	LVSr (armored/unarmored) MKR-16 Truck Tractor	15
B0730	Generator Set MEP831A Skid Mtd 3Kw/60Hz	38	D0054/1214	LVSr (armored/unarmored) MKR-15 Wrecker	12
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	63	D0080/81	M353 3.5 ton/MK-353 4-ton chassis trailer	35
B0953*	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	70	D0215	MK-970 5,000-gal Refueler Semi-Trailer (for MK31)	12
B0980*	Generator Set MEP531A Lt Wt Man Portable	21	D0862/0882	MK593 6-ton cargo trailers MTVR type	30
B1021*	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	35	D1001/1002	M997A2/M1035 4 litter (2)/2 litter (9) Ambulance	18
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	15	D1158*	M1123 Truck, Utility Cargo/Troop carrier 1.25T	66
B1583	Pump, Fuel 600-gpm trailer mounted (2-ton)	34	E0856	AAVR7A1 Assault Amphib Vehicle Recovery	1
B1785	Roller, Compactor Vibratory, Self Propelled	2	E1378	M88A2 Recovery Vehicle, Heavy FT	4

Table 1-5: Selected Baseline MEB Logistics Combat Element (LCE) Equipment

d. Infantry Battalion (MEB GCE)

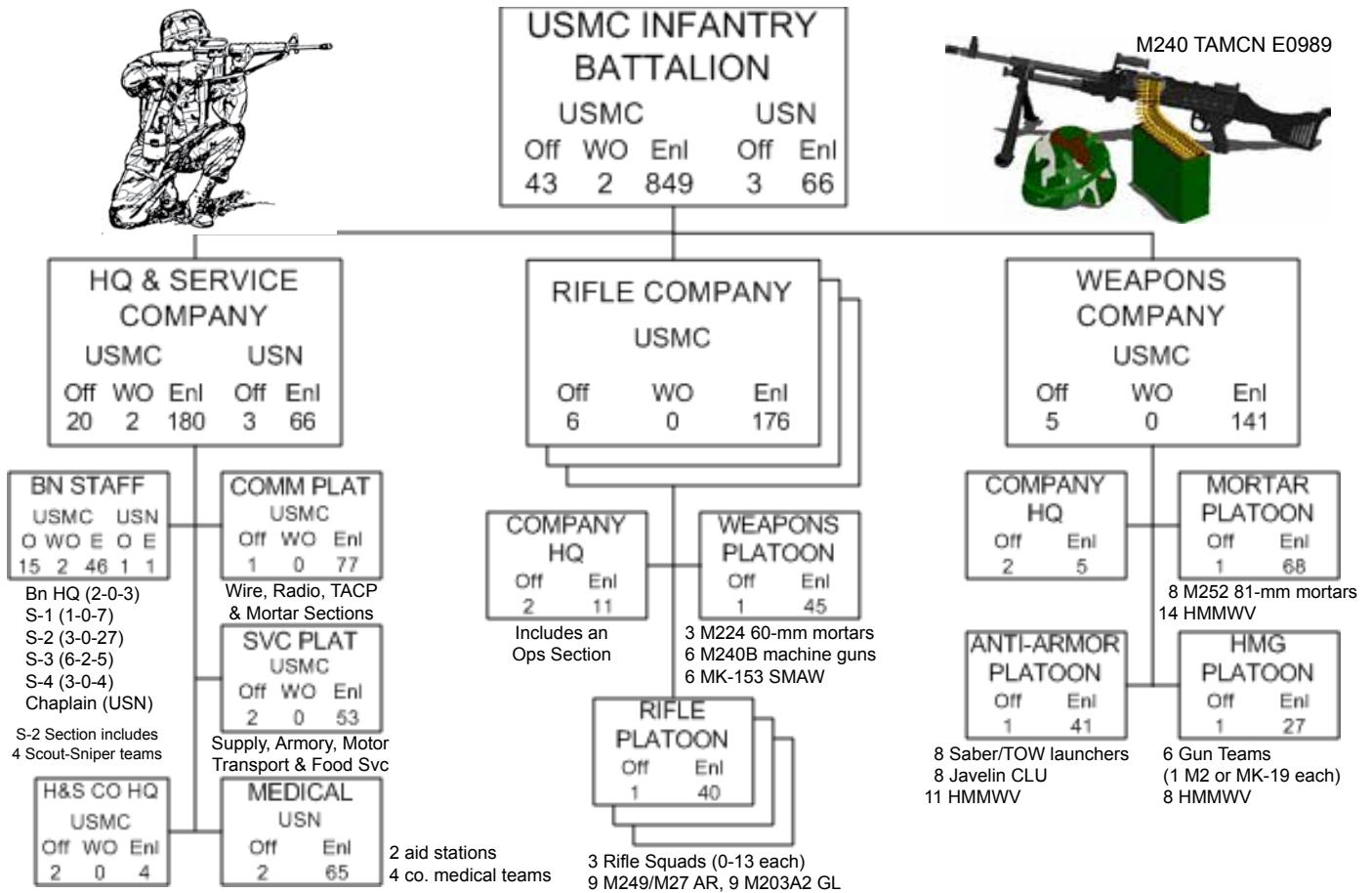


Figure 1-37: Marine Infantry Battalion (MEB GCE)

TAMCN	DESCRIPTION	QUANTITY	TAMCN	DESCRIPTION	QUANTITY
A0067	AN/MRC-148 HF Radio Vehicle System (w/D1158)	3	D1001/1002	M997A2/M1035 4 litter /2 litter Ambulance (2 ea)	4
A0255	Combat Ops Center AN/TSQ-239 (v.4) (plus trailer)	1	E0025/0892	Grenade Launchers (17 M32A1/156 M203A2)	173
A0321/0398	Drone Aircraft Systems Raven/Wasp IV (2 each)	4	E0103	M110 Semi-Auto Sniper System (AR-10)	8
A0403	AN/MRC-145B Mobile RT (w/D1158)	5	E0207	M98A2 Javelin ATGM CLU	8
B0730	Generator Set MEP831A Skid Mtd 3Kw/60Hz	2	E0915	MK-153 Launcher, Rkt, Aslt 83-mm SMAW	18
B0980*	Generator Set MEP531A Lt Wt Man Portable	3	E0960	M249 5.56mm Squad Automatic Weapon (SAW)	108
C6621	Ration Heating System	3	E0980	M2 0.50-cal Heavy Machine Gun	10
D0016/17*	M1102/M1102 MCC Lt. Tactical Trlrs (LTT 1.25 T)	9	E0989	M240B Machine Gun Mdm 7.62mm Ground	40
D0022*/33	M1152/(A1) Truck 4x4, Utility EC 2-dr 11,500gww	24	E0994	MK-19 50-mm Grenade Machine Gun	12
D0030	M1151A1 Truck 4x4 Armt Carrier EC 4-door	24	E1065	M224A1 LtWt Company Mortar 60-mm (LWCM)	9
D0032	M1167A1 Truck 4x4, TOW carrier EC 4 dr w/TOW	8	E1095	M252 Mortar, Medium 81-mm	8
D0034	M1165A1 Truck 4x4 C2/GP Armored EC 4-door	5	E1475	M107 Rifle, Scoped Spcl Application 0.50-cal	4

*Includes units that may be part of other TAMCN(s)

Table 1-6: Selected Equipment Items, Marine Infantry Battalion (MEB GCE)

Mission: The primary mission of the infantry battalion is to locate, close with, and destroy the enemy by fire and maneuver or to repel his assault by fire and close combat. As a balanced firepower and maneuver team, it attacks and destroys all targets in the assigned area of responsibility. With reinforcement, it is capable of independent, sustained operations for a period of several days as permitted by combat conditions. It is capable of conducting a coordinated deliberate defense.

Functions and Concept of Employment: The battalion is the basic tactical unit of ground combat power and the nucleus of a BLT. It exercises command and staff functions through a compact operational command group that consists of the commander and his executive staff. The staff is capable of integrating the efforts of attached units with those of supporting units by using representatives of these elements provided for that purpose. The staff is capable of supporting a tactical and main echelon and alternates during displacement. The weapons company commander also serves as the battalion fire support coordinator. As such, under the staff cognizance of the operations officer, he coordinates all fires in support of the battalion.

Mobility: The battalion is supposed to be foot mobile and helicopter or AAV transportable. However, the battalion's HMMWV trucks (D0022, D0032, D0033, D0034, D1001, D1002, A0067 and A0403), which it requires for the ground transportation of its heavy weapons, ammunition, and much of its communication equipment, are not internally transportable either by helicopter or AAV.

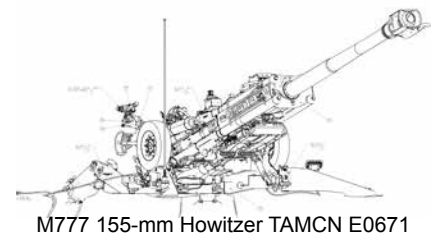
Organizations

e. Field Artillery Battalion, Reinforced (MEB GCE)

Additional Equipment (not shown in Table 1-6):

- 5 M1161 ITV light strike variant (D1161)
- 12 M1162 ITV prime mover variant (D1162)
- 6 M327 120mm towed rifled mortars (E1070)
- 6 M1164 ammunition trailers (D0840)

This equipment is unmanned but may be used by one field artillery battery in lieu of its M777 howitzers and MTRV/HMMWV trucks



M777 155-mm Howitzer TAMCN E0671

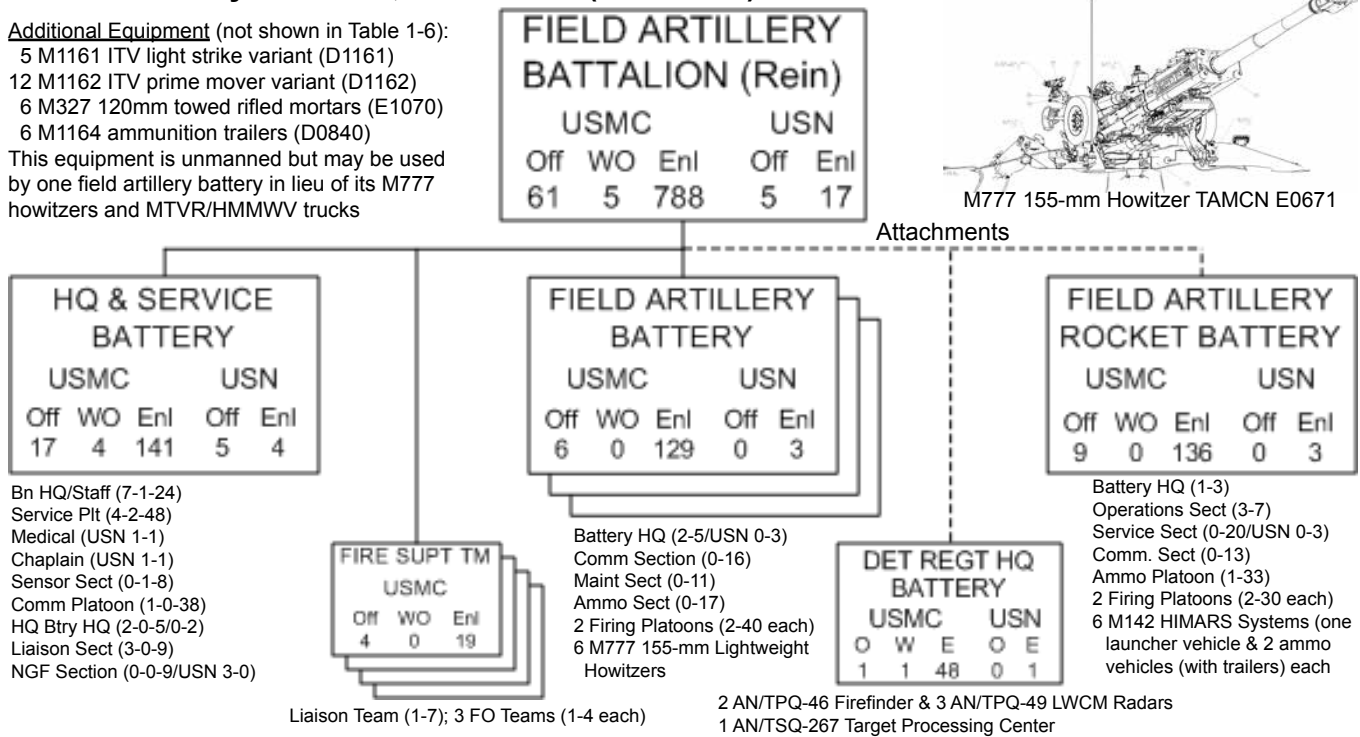


Figure 1-38: Marine Field Artillery Battalion, Reinforced (MEB GCE)

TAMCN	DESCRIPTION	QUANTITY	TAMCN	DESCRIPTION	QUANTITY
A0016	Ground Counterfire System	1	D0003/0198	AMK/MK-23A1 Truck, Cargo 7 ton (AMK=Armored)	75
A0067	AN/MRC-148 HF Radio Vehicle System (w/D1158)	5	D0015	AMK-36A1 Truck, Armored Wrecker 7 ton w/w	2
A0116	Survey Instruments M111 (vehicle mtd)	2	D0016/17*	M1102 Cargo/Chassis trs (1.5-ton) for HMMWV	81
A0169	AN/TPQ-49 Lt Wt Cntr Mortar Radar (LWCM)	3	D0022/33*	M1152/(A1) Truck 4x4, Utility EC 2-dr 11,500gww	59
A0255	Combat Ops Center AN/TSQ-239 (v.4)	1	D0030*	M1151A1 Truck 4x4 Armt Carrier EC 4-door	37
A0279	AN/TSQ-267 Target Processing Center	1	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	21
A0292	Shelter, Expandable Type V (HMMWV - for FDC)	14	D0081	MK-353 4-ton chassis trailer	2
A0403	AN/MRC-145B Mobile RT (w/D1158)	26	D0862/0882	MK593 Cargo (23) /MK149 (10) Water Trlrs MTRV	33
A0414	Drone Aircraft, Puma AE	1	D0886/0035	LVSR MKR-18 Truck, Cargo 22.5 T 10x10/PLS Tr	3
A1440	AN/TPQ-46 Firefinder Counter battery Radar	2	D1001/1002	M997A2/M1035 4 litter /2 litter Ambulance (1 ea)	2
B0730*	Generator Set MEP831A Skid Mtd 3Kw/60Hz	5	D1063/0861	AMK-37A1 Truck w/MK-38 trlr, HIMARS Resupply	12
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	3	D1158	M1123 Truck, Utility Cargo/Trp carrier 1.25T	2
B0953	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	2	E0671	M777A2 Howitzer, LtWt, Towed 155-mm	18
B0980*	Generator Set MEP531A Lt Wt Man Portable	2	E0892	M203A2 Grenade Lanuchers	53
B2085	SIXCON Fuel Modules	4	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (48 M240)	95
B2566	Forklift, RT, Light Capability (LRTF)	8	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (22 each)	44
C6621	Ration Heating System	3	E1500	M142 High Mobility Arty Rocket System (HIMARS)	6

*Includes units that may be part of other TAMCN(s)

Table 1-7: Selected Equipment Items, Marine Field Artillery Battalion, Reinforced (MEB GCE)

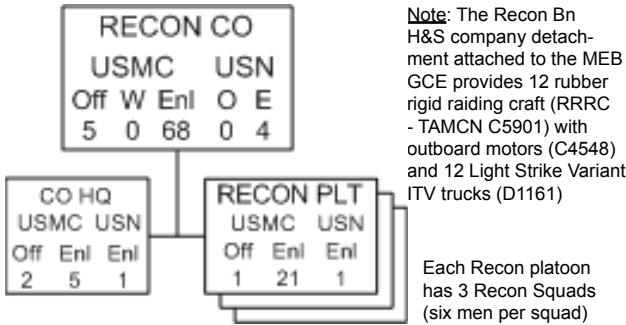
Mission: The mission of the Marine artillery battalion is to provide close and continuous artillery support to MAGTF operations. This support includes accurate and responsive fires in support of maneuver, long range fire to establish operational depth, counterfire to defeat threat fire support systems, and assistance in integrating all fire support assets into combat operations.

Functions and Concept of Employment: The battalion is the basic fighting unit of the Marine artillery. It can effectively mass its fires and/or engage several targets simultaneously. It normally acts as a single entity but may have one or more batteries operating separately. It maintains communications with its batteries and attachments, the maneuver unit(s) it supports, and its parent artillery regiment or MEB GCE staff, as appropriate. When serving as artillery component of a MEB, it is normally reinforced with target acquisition elements (radars, target processing center, ground counterfire system) and a rocket battery. The rocket battery provides reinforcing fires.

Each Marine artillery battalion is associated with an infantry regiment for training and deployment. When this regiment becomes the core element of a MEB GCE, the artillery battalion provides fire support teams (FST) to each GCE maneuver battalion. An FST provides a liaison team to the supported battalion headquarters and a forward observer team to each of that battalion's maneuver companies. The artillery battalion may also provide naval gunfire liaison and spotter teams to separate maneuver battalions or other units as the tactical situation requires.

Mobility: The battalion's primary means of tactical mobility is its organic motor vehicles. Heavy lift helicopters have a very limited ability to move howitzers and their ammunition. When air mobility is essential, the battalion may rearm one battery with M327 120-mm mortars.

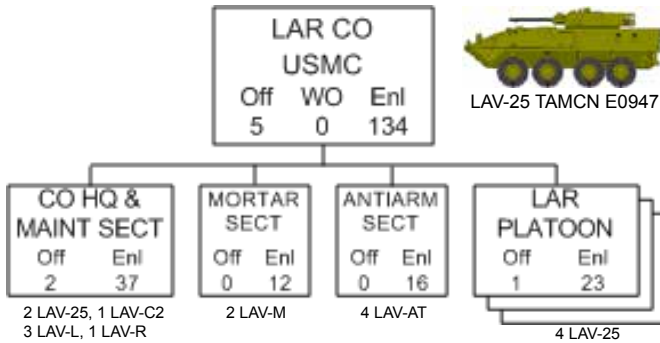
f. Reconnaissance Company, Reconnaissance Battalion Detachment (MEB GCE)



TAMCN	DESCRIPTION	QUANTITY
D0030	M1151A1 Truck 4x4 Armament Carrier EC 4-door	5
D0031/0034	M1165/(A1) Truck 4x4, C2/GP EC 4-door	4
D0033	M1152A1 Truck 4x4, Utility EC Armored 2-door	1
D0862	MK-593 Trailer, Cargo, MTRV	1
E0025/0892	M32A1/M203A2 Grenade Launchers (8 M32)	32
E0103	M110 Semi-Auto Sniper System (AR-10)	12
E0960	M249 5.56mm Squad Automatic Weapon (SAW)	16
E0980/0994	0.50-cal M2 / 40mm MK19 Heavy MG (5 each)	10
E0989	M240B Machine Gun Mdm 7.62mm Ground	6
E1475	M107 Rifle, Scoped Spcl Application 0.50-cal	4

Table 1-8: Recon Co, Recon Bn, Organization and Selected Equipment

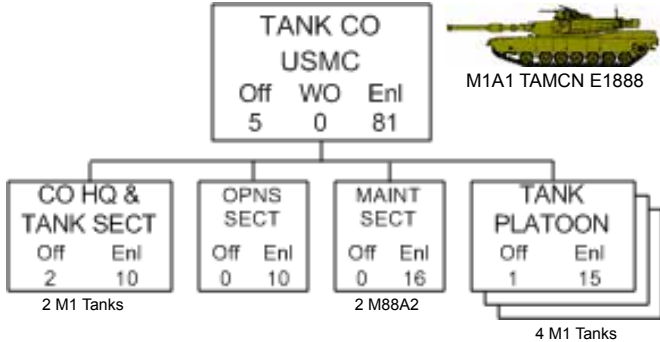
g. Light Armored Recon Company, LAR Battalion Detachment (MEB GCE)



TAMCN	DESCRIPTION	QUANTITY
B0730	Generator Set MEP831A Skid Mtd 3Kw/60Hz	4
E0025/0892	M32A1/M203A2 Grenade Launchers (6 M32)	22
E0915	MK-153 Launcher, Rkt, Aslt 83-mm SMAW	9
E0942	LAV-AT (w/TOW ATGM System)	4
E0946	LAV-C2 (Command & Control variant)	1
E0947	LAV-25 (Light Assault) (each has a 3-man scout team)	14
E0948	LAV-L (Logistics variant)	3
E0949	LAV-M (Mortar variant w/81-mm mortar)	2
E0950	LAV-R (Recovery variant)	1
E0960	M249 5.56mm Squad Automatic Weapon (SAW)	14
E1475	M107 Rifle, Scoped Spcl Application 0.50-cal	2

Table 1-9: LAR Co, LAR Bn, Organization and Selected Equipment

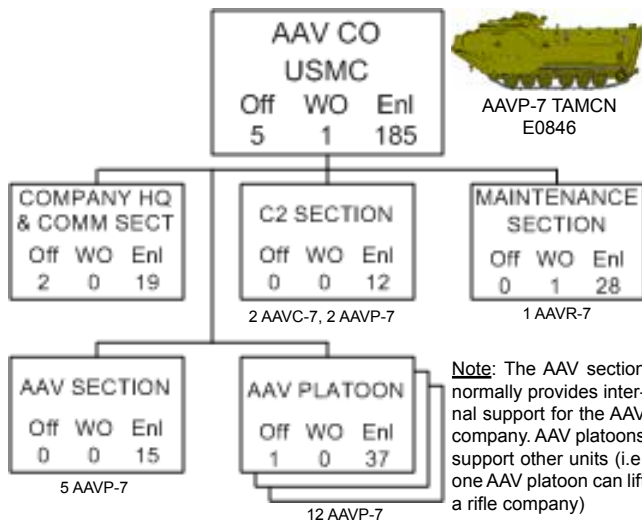
h. Tank Company, Tank Battalion Detachment (MEB GCE)



TAMCN	DESCRIPTION	QUANTITY
A0403	AN/MRC-145B Mobile Receiver-Transmitter (D1158)	1
D0016/17	M1102 Cargo/Chassis ttrs (1.5-ton) for HMMWV	3
D0030	M1151A1 Truck 4x4 Armament Carrier EC 4-door	2
D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	4
D0033	M1152A1 Truck 4x4, Utility EC Armored 2-door	2
E0980	M2 .50-cal Heavy Machine gun	4
E0989	M240B 7.62-mm Machine gun	6
E1378	M88A2 Recovery Vehicle, Heavy FT	2
E1888	M1A1 Tank, Combat, FT, 120-mm gun	14

Table 1-10: Tank Co, Tank Bn, Organization and Selected Equipment

i. Assault Amphibian Company, Assault Amphibian Battalion (-) (MEB GCE)



TAMCN	DESCRIPTION	QUANTITY
A0403	AN/MRC-145B Mobile Receiver-Transmitter (D1158)	1
B0036/37	Grnd. Expedient Refuel Sys. (GERS) 1 sml & 1 mdm	2
B2085	SIXCON Fuel Modules	3
D0003	AMK-23A1 Truck, Cargo, Armored 7 ton	2
D0016	M1102 Cargo trailer (1.5-ton) for HMMWV	3
D0030	M1151A1 Truck 4x4 Armament Carrier EC 4-door	2
D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	3
D0033	M1152A1 Truck 4x4, Utility EC Armored 2-door	1
D0882	MK149 4-ton Water Trailers for MTRV	2
D0886/0035	LVSF MKR-18 Truck, Cargo 22.5 T 10x10/PLS Tlr	2
E0796	AAVC7A1 Aslt Amphib Veh Command	2
E0846	AAVP7A1 Aslt Amphib Veh Personnel	43
E0856	AAVR7A1 Aslt Amphib Veh Recovery	1
E0892	M203A2 Grenade Lanuchers	10
E0980/0994	0.50-cal M2 / 40mm MK19 Heavy MG (1 Mk19)	5
E0989	M240B 7.62-mm Machine gun	9

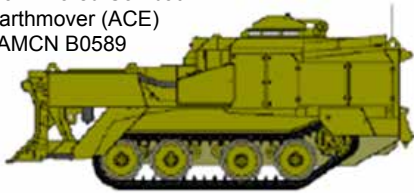
Table 1-11: AAV Co, AAV Bn, Organization and Selected Equipment

Organizations

1012. Engineer and Logistics Forces

a. Combat Engineer Battalion (FY17)

M9 Armored Combat Earthmover (ACE)
TAMCN B0589



COMBAT ENGINEER BATTALION (CEB)					
(1 st & 2 ^d CEB only)					
USMC			USN		
Off	WO	Enl	Off	Enl	
37	4	859	2	26	

*Note: The mobility assault company (MAC) consists of an assault breaching vehicle (ABV) platoon (operating six ABV TAMCN B0160); an assault bridge platoon (five B0149/150) and six route clearing platoons (RCP). Each RCP requires an equipment set that includes two *Husky* vehicle mine detectors (B0093) and five MRAP(s) (one B0035, two D0025 and two D0051). A MAC has only three equipment sets in garrison (for training). RCP(s) that deploy use prepositioned equipment sets. More sets may be flown in, as needed (see sect. 4019).

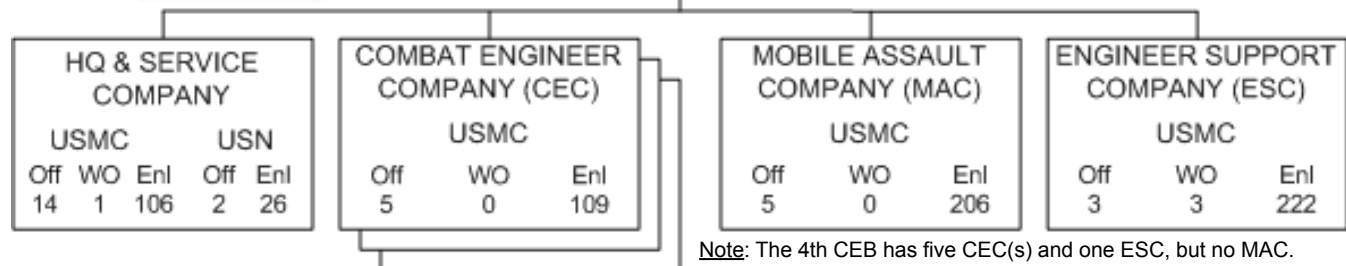


Figure 1-39: Combat Engineer Battalion Organization (UIC M11401-11407 & M12401-12407)

TAMCN	DESCRIPTION	*Quantity	TAMCN	DESCRIPTION	*Quantity
A0067/0403	AN/MRC-148/145B Mobile HF Radio/RT (D1158)	11	B2085/2086	SIXCON Fuel/Water Modules (12 Fuel, 4 Water)	16
A0255	Combat Ops Center AN/TSQ-239 (v.4)	1	B2483	Loader, Backhoe 420E	12
A0321/0414	UAS Raven DDL/Drone aircraft, Puma AE (1 ea)	2	B2561/2566	Forklift, 10k Variable Rch/5k LRTF RT-022 (2 LRTF)	6
B0035	Bomb Service Truck, <i>Buffalo</i> Mk. 1 (MRAP) (MAC)	**3	B2565	Engineer Equipment Trailer (EET)	22
B0036/0037	Grnd. Expedient Refuel Sys (GERS) 4 sml/4 mdm	8	C6621	Ration Heating System	3
B0040	Multi-Terrain Loader 277C	18	D0002/0235	M870A2E1 50-ton/M870A1 40-ton Semi-Trailers	6
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	12	D0003/0198	AMK/MK-23/25A1 MTVR Cargo Trucks (6 AMK)	10
B0048	PackBot-510 route clearing robot	**6	D0007/1073	AMK/MK-29/30A1 MTVR Dump Trucks (4 AMK)	6
B0058	Mine Roller System, Scout, Hvy (**9) (6 for MEUs)	**15	D0015	AMK/MK-36A1 MTVR Wrecker	2
B0060	Medium Crawler Tractor (MCT) 850J (John Deere)	5	D0016/0017	M1102/M1102 MCC Lt. Tactical Trlrs (LTT) (50 MCC)	82
B0063	Loader, Scoop Type - 624KR	10	D0022/33*	HMMWV Truck 4x4, Utility EC 2-dr (M1087/1152)	30
B0075	Small Field Refrigeration System	2	D0025	MRAP <i>Cougar</i> Cat I 4x4 (2 crew + 4 passengers)	**6
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz	16	D0051	MRAP <i>Cougar</i> CAT II 6x6 (2 crew + 8 passengers)	**6
B0078	Motorized Road Grader - 120M	2	D0030	HMMWV M1151A1 4-dr Armnt Carrier (4 per CEC)	20
B0093	Veh. Mtd. Mine Detect Sys. (VMMDS) (<i>Husky</i>)	**6	D0035	MK1076 PLS Trailer 16.5/22.5-ton	5
B0094	RedPack <i>Husky</i> spare parts trailer	**3	D0052/0886	LVSr (armored/unarmored) MKR-18 16.5/22.5T truck	5
B0160	M1150 Assault Breacher Vehicle (ABV) (MAC)	\$7	D0053/0887	LVSr (armored/unarmored) MKR-16 Truck Tractor	6
B0395	Air Compressor 260 CFM, (3-ton) Trailer Mounted	5	D0080	M-353 3.5-ton Chassis Trailer (for LVSr)	35
B0589	M9 Armored Combat Excavator (ACE)	12	D0862/0880	MK593 Cargo (7) /MK149 (6) Water Trlrs for MTVR	13
B0730*	Generator Set MEP831A Skid Mtd 3Kw/60Hz	30	D1001/1002	M997A2/1035A2 HMMWV 4-litter/2-litter Ambulance	2
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	16	D1158	HMMWV M1123 Troop/Cargo Carrier	3
B0930	Generator Set MMG-25 25Kw (commercial type)	14	D1214	LVSr MKR-15 Truck, Wrecker 10x10	3
B0953*	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	24	E0149/0150	MLC-70 Assault Bridge w/M60 AVLB (in the MAC)	5
B0980*	Generator Set MEP531A Lt Wt Man Portable	3	E0915	MK-153 SMAW Rocket Launchers (+36 M203A2 GL)	36
B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	12	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (49 M240)	92
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	2	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (16 M2, 8 MK19)	24
B1298	Rocket Propelled Line Charge (with MK-353 trailer)	38	E1378	M88A2 Armored Recovery Vehicle (ESC)	2

Notes: * Includes units that may be part of other TAMCN(s). **Totals for only three RCP equipment sets (six required for combat). \$T/O currently authorizes only six crews.

Table 1-12: Selected Combat Engineer Battalion Equipment

Selected tasks –

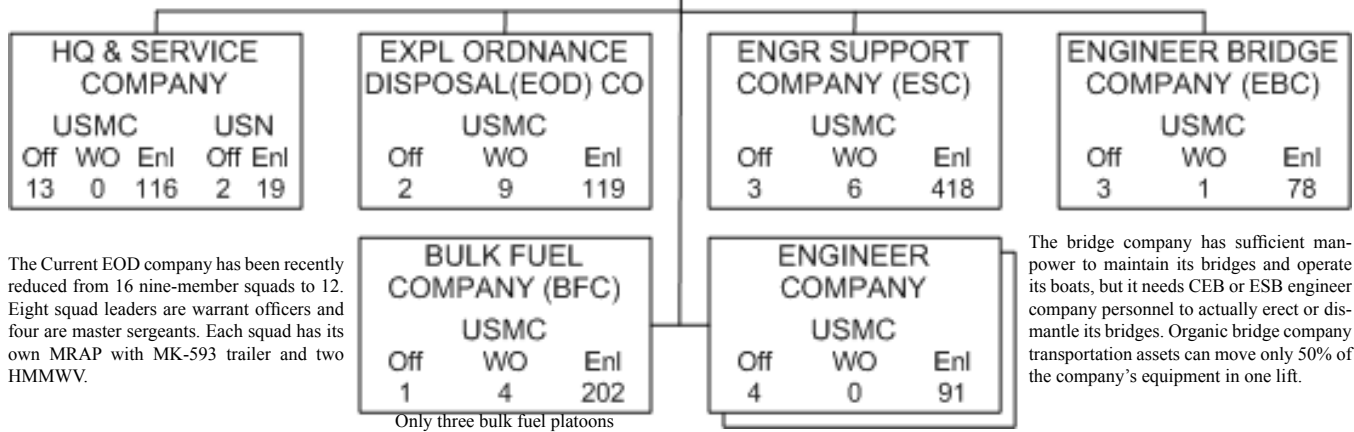
- Plan, organize and coordinate the assault breaching of obstacles from the high water mark inland.
- Limited ability to employ assault bridging and other standard bridge systems.
- Expedient repair of existing roads and bridges and limited new construction of combat roads and trails.
- Placement and clearing of mines and use of explosive demolitions.
- Clear helicopter landing zones and construct expedient airstrips.

The 3d Combat Assault Battalion provides an engineer company to III MEF (lieu of a CEB). It consists of 8 officers, 2 WO, 280 enlisted, headquarters, five combat engineer platoons and a support platoon. Equipment includes two GERS (1 B0036 and 1 B0037 see Table 1-12), 3 mobile bath/shower units, 3 tractors (850J), 5 624KR scoop loaders, 2 laundry units, 2 LWPS, 2 road graders, 30 VMR mine detectors, 2 air compressors, 8 M9 ACE, 52 generators (various), 15 line charge systems, 5 fuel and 5 water SIXCONs, 5 420D loaders, 3 EBFL and 2 LTRF forklifts, 6 Engineer trailers, 2 TWPS, 2 M870A2E2 semi-trailers, 17 HMMWV, 12 MTVR (6 AMK/MK-23/25, 6 AMK/MK-29/30), 1 MKR-18 with PLS trailer, 2 MKR-16 with M870A2 semi-trailers, 6 MK105 cargo, 29 MK-353 chassis and 2 MK149 water trailers, 15 SMAW, 15 SAW, 15 M240B, 4 .50-cal, and 4 MK-19.

b. Engineer Support Battalion (FY17)

This diagram depicts 7th and 8th ESB only. 9th ESB (III MEF) has no bridge company, only one engineer company and reduced engineer support and bulk fuel companies (310 and 184 enlisted, respectively). The 6th ESB has no EOD company, only one engineer company (with 4 officers, a WO and 137 enlisted), three full strength bulk fuel companies (four platoons each), three bridge companies, and an engineer support company. Reserve bulk fuel platoons have one WO and 67 enlisted each. Active platoons have one WO and 61 enlisted each.

ENGINEER SUPPORT BATTALION				
USMC			USN	
Off	WO	Enl	Off	Enl
30	20	1,115	2	19



The Current EOD company has been recently reduced from 16 nine-member squads to 12. Eight squad leaders are warrant officers and four are master sergeants. Each squad has its own MRAP with MK-593 trailer and two HMMWV.

The bridge company has sufficient manpower to maintain its bridges and operate its boats, but it needs CEB or ESB engineer company personnel to actually erect or dismantle its bridges. Organic bridge company transportation assets can move only 50% of the company's equipment in one lift.

Figure 1-40: Engineer Support Battalion Organization (7th ESB, UIC M21301-M21307 & M28314)

TAMCN	DESCRIPTION	Quantity	TAMCN	DESCRIPTION	Quantity
A0067	AN/MRC-148 Mobile HF Radio (incl D1158)	2	B1922	Scraper-Tractor Wheeled 621B	13
A0255	Combat Ops Center AN/TSQ-239(v4)	1	B2085/2086	SIXCON Fuel/Water Modules (15 Fuel, 16 Water)	31
B0024	613 Water Distributor (2,500-gal; SP; scraper mtd)	3	B2394	Pump, Water 600-gpm Tac Water Dist Sys, trlr mtd	10
B0025/26	T-90 Trailer mtd/T-120 skid mtd Hydroseeders (3 ea)	6	B2460	Tractor, Full Track D6K	16
B0036/37	Grnd. Expedient Refuel Sys. (GERS) 2 small./2 mdm	4	B2464	Loader, Scoop (bucket) Type F MC1155E	8
B0038	All Terrain Crane (ATC) MAC-50 (25-ton)	4	B2483	Loader, Backhoe 420E	8
B0040	Multi-Terrain Loader 277C	10	B2561/2566	Forklift, 10k Variable Rch/5k LRTF RT-022 (5 LRTF)	8
B0055	Mobile Bath/Shower Unit	17	B2565	Engineer Equipment Trailer (EET)	7
B0060	Medium Crawler Tractor (MCT) (John Deere) 850-J	18	B2605	Tactical Water Purification System (TWPS)	21
B0063	Loader, Scoop Type - 624KR	20	C4765	Skid Mounted Dry Chemical Fire Extinguisher	28
B0066	Containerized Batch (Laundry)	14	C5901/4548	Raiding Craft Cmbt, Rubber (CRRC)/outboard motor	8
B0071	Lightweight Water Purification System (LWPS)	28	D0002/0235	3 M870A2E1 50-ton/11 M870A1 40-ton Semi-Trailers	14
B0078	Motorized Road Grader - 120M	10	D0003/0198	AMK/MK-23/25A1 MTRV Cargo Trucks	10
B0114/115	Bridge Erection Boat (BEB) w/BEB trailer	21	D0005/1062	AMK/MK-27/28A1 MTRV LWB Cargo Trucks	10
B0119	Backhoe Excavator 250-GLCRA	6	D0007/1073	AMK/MK-29/30A1 MTRV Dump Trucks	43
B0121/122	Bridge, Floating, Interior (M17)/Ramp (M16) Bays**	51	D0015	AMK/MK-36A1 MTRV Wrecker	1
B0152	Medium Girder Bridge, dry gap (MGB)	4	D0016/17*	M1102 cargo/chassis Lt. Tactical Trlrs (LTT 1.25-ton)	50
B0395	Air Compressor 260 CFM, (3-ton) Trailer Mounted	16	D0022/33*	HMMWV Truck 4x4, Utility EC 2-dr (M1152/1087)	36
B0446	7.5-ton Wheel mounted Crane LRT-110	2	D0025	MRAP Cougar Cat I 4x4 (all in EOD Co)	15
B0589	M9 Armored Combat Excavator (ACE)	4	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	20
B0626	Mobile Fire Suppression System (HMMWV Mounted)	5	D0035	MK1076 PLS Trailer 16.5/22.5-ton (for LVSR)	8
B0676	Forward Area Water Point Supply (FAWPS) System	9	D0860/0880	(21) M105A2 1.5T cgo/(7) M149A2 400gal water trailers	28
B0685	Amphibious Assault Fuel System (AAFS)	3	D0862	MK593 4-ton cargo trailer (for MTRV)	11
B0730*	Generator Set MEP831A Skid Mtd 3Kw/60Hz	34	D0886	LVSR (unarmored) MKR-18 16.5/22.5T truck	40
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	70	D0887	LVSR (unarmored) MKR-16 Truck Tractor	14
B0953*	Generator Set MEP1060 (805B) Skid Mtd 30Kw/60Hz	46	D1158	M1123A2 HMMWV Troop/Cargo Carrier	36
B0980*	Generator Set MEP531A Lt Wt Man Portable	20	D1214	MKR-15 LVSR Wrecker	2
B1021*	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	62	E0025/0892	M32A1/M203A2 grenade launchers (72 M32A1)	131
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	16	E0064/0066	Recon/Route Clearing (RCP) robots (12 are E0064)	36
B1298	Rocket Propelled Line Charge (incl an M-353 trailer)	10	E0103/1475	M110 7.62mm/M107 .50-cal Sniper Systems (24 ea)	48
B1583	Pump, Fuel 600-gpm trailer mounted (2-ton)	51	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (72 M240)	110
B1785	Self-Propelled Roller-Compactor, Vibratory	4	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (18 M2)	40

Notes: *Includes units that may be part of other TAMCN(s). **36 interior bays (M17) & 15 ramp bays (M16)

Table 1-13: Selected Engineer Support Battalion Equipment

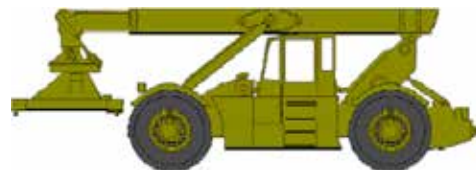
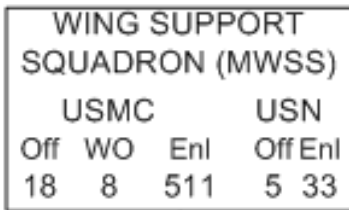
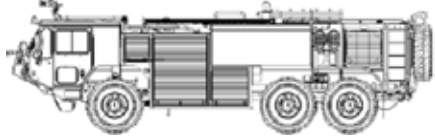
Selected Engineer Support Battalion Tasks –

- Surveying and drafting
- Construction and maintenance of expeditionary airfields, camps and MSR
- Explosive ordnance disposal and explosive/non-explosive demolition
- Bulk fuel storage and distribution
- Bridging, mine clearing and road construction
- Bulk water production, storage and distribution

Organizations

c. Marine Wing Support Squadron (FY17)

P-19R (replacement for P-19) Crash-Fire-Rescue (CFR) Truck TAMCN D0041



Kalmar rough terrain container handler (RTCH) TAMCN B0392

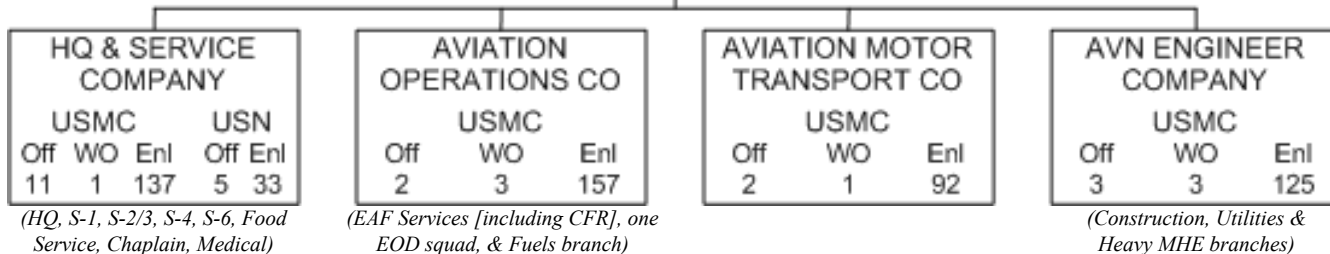


Figure 1-41: Marine Wing Support Squadron Organization FY15 (UIC M000273-274 & M00373-374)

TAMCN	DESCRIPTION	Quantity	TAMCN	DESCRIPTION	Quantity
A0067/0403	AN/MRC-148/145B Mobile HF Radio/RT (D1158)	5	B2127	Runway Sweeper, Vehicle Mounted	2
A0254	Combat Ops Center AN/TSQ-239(v3)	1	B2394	Pump, Water 600-gpm Tac Water Dist Sys, trlr mtd	2
A0321	UAS Raven DDL (Drone system)	1	B2460	Tractor, Full Track D6K	2
B0024	613 Water Distributor (2,500-gal; SP; scraper mtd)	1	B2483	Loader, Backhoe 420E	3
B0025/26	T-90 Trailer mtd/T-120 skid mtd Hydroseeders (1 ea)	2	B2561/2566	Forklift, 10k Variable Rch/5k LRTF RT-022 (6 LRTF)	15
B0036/37	Grnd. Expedient Refuel Sys. (GERS) 3 small./3 mdm	6	B2565	Engineer Equipment Trailer (EET)	6
B0038	All Terrain Crane (ATC) MAC-50 (25-ton)	2	B2605	Tactical Water Purification System (TWPS)	4
B0040	Multi-Terrain Loader 277C	4	C0034	Modular Kitchen (incl. one E0070 trailer each)	2
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	6	C4765	Skid Mounted Dry Chemical Fire Extinguisher	9
B0049	Large Field Refrigeration System (full container)	2	C6621*	Tray Ration Heating System (TRHS)	8
B0055	Mobile Bath/Shower Unit	5	D0003/0198	AMK/MK-23/25A1 MTVR Cargo Trucks	12
B0060	Medium Crawler Tractor (MCT) (John Deere) 850-J	3	D0005/1062	AMK/MK-27/28A1 MTVR LWB Cargo Trucks	25
B0063	Loader, Scoop Type - 624KR	9	D0007/1073	AMK/MK-29/30A1 MTVR Dump Trucks	9
B0066	Containerized Batch (Laundry)	2	D0009/0013	AMK/MK-31A1 MTVR Truck Tractors	12
B0071	Lightweight Water Purification System (LWPS)	3	D0015	AMK/MK-36A1 MTVR Wrecker	2
B0075*	Small Field Refrigeration System (Tricon)	5	D0016/17	M1102 cargo/chassis Lt. Tactical Trlrs (LTT 1.25-ton)	21
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz (750#)	4	D0022/33*	HMMWV Truck 4x4, Utility EC 2-dr (M1152/1087)	24
B0078	Motorized Road Grader - 120M	2	D0025	MRAP Cougar Cat I 4x4 (EOD Squad)	1
B0119	Backhoe Excavator 250-GLCRA	2	D0030	M1151A1 Truck 4x4 Armt Carrier EC 4-door	8
B0392	Rough Terrain Container Handler (RTCH) Kalmar	2	D0034	M1165A1 HMMWV Troop/C2 carriers	5
B0395	Air Compressor 260 CFM, (3-ton) Trailer Mounted	2	D0035	M1076 PLS cargo trailer (16.5-tons)	4
B0446	7.5-ton Wheel mounted Crane LRT-110	2	D0080	MK-353 3.5-ton chassis trailer (excludes B0953)	20
B0626	Mobile Fire Suppression System (HMMWV Mounted)	3	D0211	Flatrack Refueling Capability - FRC (2,500-gal)	5
B0675	Tactical Airfield Fuel Dispensing System (TAFDS)	3	D0215	MK-970 5,000-gal Refueler Semi-Trailer (for MTVR)	12
B0730	Generator Set MEP831A Skid Mtd 3Kw/60Hz	6	D0235	M870A1 40-ton semi-trailer (LVTR towed)	4
B0891	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	6	D0862/0882	MK593 Cargo (10) /MK149 (11) Water Trlrs MTVR	21
B0953	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	8	D0886	LVSr (unarmored) MKR-18 16.5/22.5T truck	8
B0980*	Generator Set MEP531A Lt Wt Man Portable	3	D0887	LVSr (unarmored) MKR-16 Truck Tractor	4
B1021*	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	16	D1001	M997A2 4-Litter Armored HMMWV Ambulance	4
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	6	D1064	P-19 Crash Fire Rescue Trucks (P-19R is D0041)	8
B1135	Helicopter Expedient Refueling System (HERS)	3	D1158	M1123A2 HMMWV Troop/Cargo Carrier	40
B1583	Pump, Fuel 600-gpm trailer mounted (2-ton)	21	D1214	MKR-15 LVSr Wrecker	1
B1785	Self-Propelled Roller-Compactor, Vibratory	2	E0103/1475	2 M110 7.62mm /1 M107 .50-cal Sniper Systems	3
B1922	Scraper-Tractor Wheeled 621B	2	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (18 M240)	48
B2085/2086	SIXCON Fuel/Water Modules (16 Fuel, 18 Water)	34	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (12 each)	24

*Includes units that may be part of other TAMCN(s).

Table 1-14: Selected Marine Wing Support Squadron Equipment (UIC M000273-274 & M00373-374)

NOTE: Although all MWSS have used the same TO/E since FY06, odd numbered MWSS(s) still support fixed wing air squadrons more or less exclusively while even numbered MWSS support rotary wing squadrons.

Selected Wing Support Squadron Tasks –

- Expeditionary airfield services (including repair, communication, lighting and aircraft recovery)
- Clearing and operating helicopter landing zones
- Construct and maintain expedient roads and expeditionary airfields.
- Fuel storage and refueling.
- Plan, construct, repair, and maintain base camps.
- Purify, store and dispense water.

d. Naval Mobile Construction Battalion (FY17)

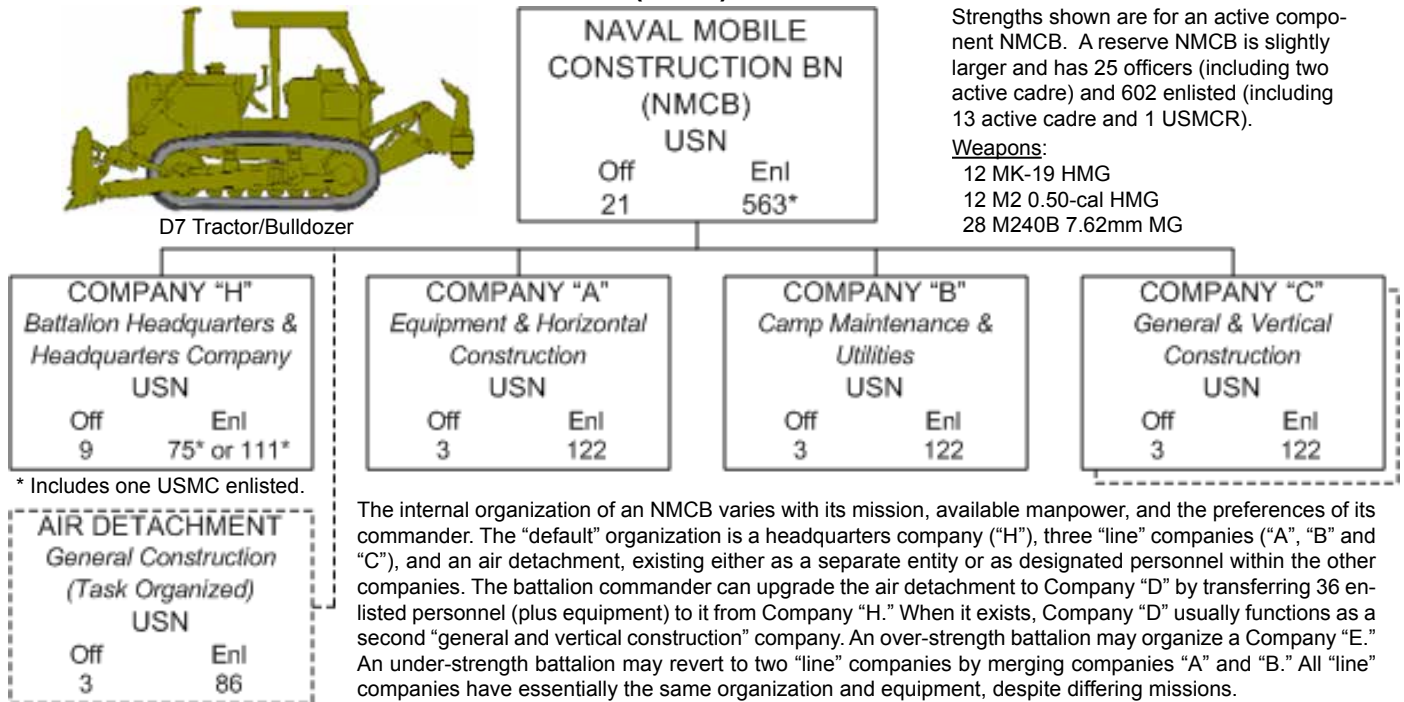


Figure 1-42: Naval Mobile Construction Battalion ("Seabee") Organization

Major End Items	Quantity	Major End Items	Quantity
40-ton Hydraulic Crane, Truck-Mounted	2	Arc Welding Set, 300 amp AC/DC "portable" (weighs 3,200-lbs)	5
Air Compressor 250 CFM	4	SIXCON Fuel/Water 900-gal Storage Modules (8 fuel, 8 water)	16
Crawler Mounted Excavator	2	TRICON cargo containers (incl. 101 transport frames)	272
Electric Power Plant (two 30-KW generators/1 trailer)	1	Tray Ration Heating System (TRHS)	5
30-KW Generators (MEP-805)	9	Floodlight Set, Trailer Mounted, Self Contained	10
60-KW Generators, skid mounted (MEP-1070)	2	Truck, Fork Lift, Rough Terrain 7,000 to 11,000-lb Lift	9
Motorized Road Grader 6x4	8	Truck, Fork Lift, Rough Terrain 12,000-lbs Lift	4
SP Roller-Compactor, Vibratory	8	*LSSV (4 Maintenance Utility vehicles & 2 Litter Carriers)	6
Wheeled Scoop Loader 125-hp minimum w/6,000-lb forklift	8	**JLTV (3 general purpose, 2 gun carrier, 1 shelter carrier)	6
Skid Steer Loader DED with 73-hp minimum	5	HMMWV M1151A1 Armament Carrier 4x4 (4-door)	13
Full Track Scoop Loader DED 2.5 cubic yards	4	HMMWV M1165A1 C2/GP Carrier 4x4 (4-door)	4
Full Track Skid Steer Loader with Armored Cab	3	HMMWV M1152A1 4x4 Cargo Carrier 2-door, belly armor	10
Tractor Crawler Straight blade, hydraulic	8	MK-28A1 7-ton MTVR XLWB Cargo Truck, RTAA w/o winch	16
Tractor Crawler Low Speed Hydraulic w/blade or ripper (D7?)	2	MK-28CA1 MTVR Field Servicing Truck, RTAA	1
LDR/BHKO Wheeled Industrial Tractor 4x2 60-hp minimum	8	MK-28CA1 2,000-gal Tank Trucks (4 refuelers, 4 water distributors)	8
Scraper-Tractor Earth moving DED 4x2 18 cu yards	2	MK-30A1 7-ton MTVR Dump Trucks, w/winch, RTAA	16
Mixer, Concrete 11 cu. ft. Portable, Wheeled Mounted	8	Trailers, 1.5-ton, 2 wheel (8 M105A2 cargo; 10 M149A2)	18
Towed Magnetic Sweeper, Wheel Mounted	4	MK-31 MTVR 7-ton Truck Tractor w/o winch RTAA	20
Mobile Shower Units (10 4-head, 3 2-head)	13	34-ton Flatbed Semi-Trailer (for ISO container)	8
Expeditionary Self-Service Laundry (TRICON)	2	55-ton Low Bed Semi-Trailer	16
125 GPH LWPS w/two 3,000-gal "onion" water tanks each	5	MK-36 MTVR 7-ton Wrecker w/winch	2

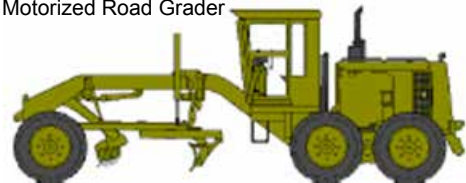
*LSSV = Light Service Support Vehicle (a commercial type 4x4 light truck). **JLTV = Joint Light Tactical Vehicle; for Oshkosh version (M-ATV) see p. II-7.

Table 1-15: Selected Naval Mobile Construction Battalion Equipment

An NMCB provides a full spectrum of general engineering capabilities and limited combat engineering capabilities to a supported MAGTF. It conducts the following initial engineer operations in support of combat operations plus the permanent construction work required during security and stability operations:

- Battle Damage Repair (BDR)
- Construction and maintenance of advance base facilities
- Power generation and distribution
- Vertical and horizontal construction
- Water purification and storage, including water well drilling

Motorized Road Grader



The Naval Construction Force (1st Naval Construction Division) includes a total of seven Naval Construction regiments (three active and four reserve) commanding a total of 21 NMCB(s) (9 active and 12 reserve). As of FY15, current force structure reorganization plans will reduce the NCF to six active and six reserve NMCB(s) (presumably under two active and two reserve NCF regimental headquarters). A Seabee company or air detachment normally supports a MEU. A battalion supports a MEB and a regiment supports a MEF.

Organizations

e. Direct Support Combat Logistics Battalion (FY17)

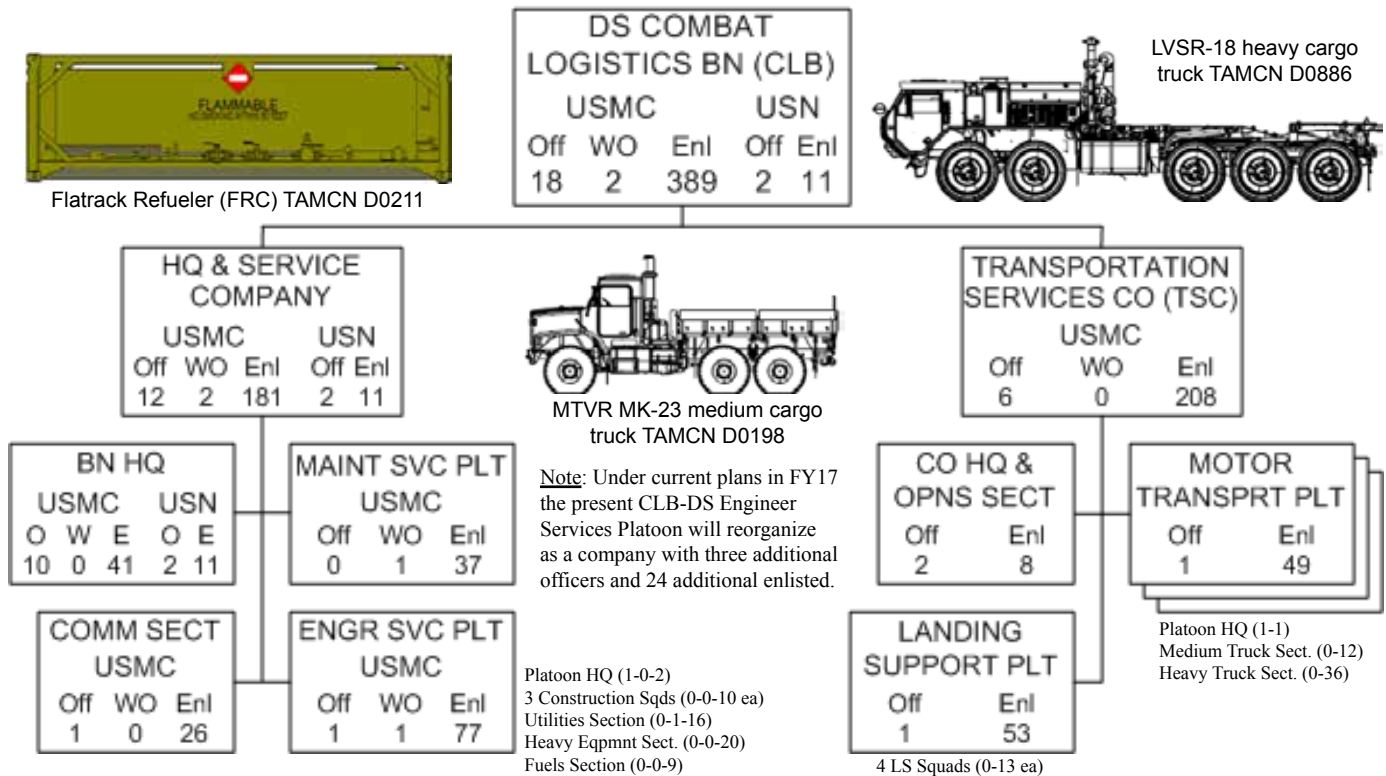


Figure 1-43: Direct Support Combat Logistics Battalion Organization

TAMCN	DESCRIPTION	Quantity	TAMCN	DESCRIPTION	Quantity
A0067/0403	AN/MRC-148/145B Mobile HF Radio/RT (w/D1158)	6	B2085/2086	SIXCON Fuel/Water Modules (39 Fuel/30 Water)	69
A0255	Combat Operations Center AN/TSQ-239(v4)	1	B2483	Loader, Backhoe 420E (ESC)	2
B0036/37	Grnd. Expedient Refuel Sys. (GERS) 5 sml/4 mdm	9	B2561/2566	Forklift, 10k Variable Rch/5k LRTF RT-022 (5 each)	10
B0038	All Terrain Crane (ATC) MAC-50 (25-ton)	1	B2565	Engineer Equipment Trailer (EET)	5
B0040	Multi-Terrain Loader 277C	2	D0003/0198	AMK/MK-23/25A1 MTRVr Cargo Trucks (38 in TSC)	39
B0043	Generator Set MEP1050 Skid mounted 15Kw/60Hz	4	D0015	AMK/MK-36A1 MTRVr Wrecker (Maint. Svcs Platoon)	1
B0055	Mobile Bath/Shower Unit	2	D0016*	M1102 Light Tactical Trailers (LTT 1.25-ton)	2
B0060	Mdm Crawler Tractor (MCT) (John Deere) 850-J	4	D0030	HMMWV M1151A1 Armament Carrier (4-dr) (TSC)	25
B0063	Loader, Scoop Type - 624KR	5	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	14
B0071	Lightweight Water Purification System (LWPS)	2	D0033/0187	HMMWV M1152A1/1097A2 Trp/cargo/shelter carrier	6
B0075	Small Field Refrigeration System (Tricon)	4	D0035	M1076 PLS cargo trailer (16.5-tons)	19
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz (750#)	2	D0052/0886	LVSr (armored/unarmored) MKR-18 16.5T truck	38
B0078	Motorized Road Grader - 120M (ESC)	1	D0053/0887	LVSr (armored/unarmored) MKR-16 Truck Tractor	6
B0392	Rough Terrain Container Handler (RTCH) Kalmar	1	D0054	LVSr (armored) MKR-15 Wrecker	1
B0446	7.5-ton Wheel mounted Crane LRT-110	1	D0211	Flatrack Refueling Capability - FRC (2,500-gal)	10
B0730	Generator Set MEP831A Skid Mtd 3Kw/60Hz	6	D0880	M149A2 cargo 400gal water trailer	15
B0891	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	4	D0862/0882	MK593 4T Cargo (18) /MK149 600g (13) water ttrs	31
B0953	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	10	D1158	M1123A2 HMMWV Troop/Cargo Carrier	2
B0980*	Generator Set MEP531A Lt Wt Man Portable	5	E0025	M32A1 grenade launcher	12
B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	6	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (34 M240)	49
B1922	Scraper-Tractor Wheeled 621B	2	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (29 MK19)	52

*Includes units that may be part of other TAMCN(s).

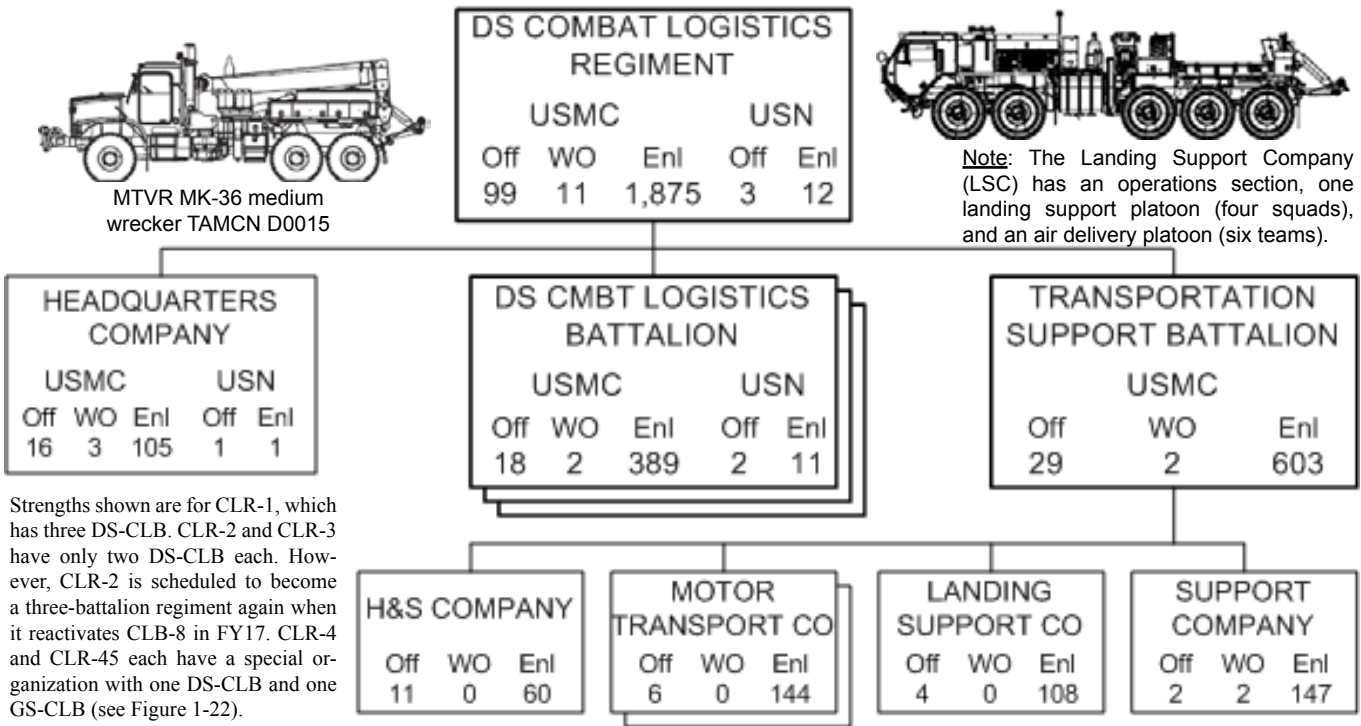
Table 1-16: Selected Direct Support Combat Logistics Battalion (CLB-DS) Equipment (FY17)

The direct support combat logistics battalion (CLB-DS) supports an infantry regimental landing team (RLT). In the field it serves primarily as the nucleus of a logistics task force assembled from all MLG components. Together with the transportation support battalion it is a primary source of medium and heavy lift motor transport and material and container handling equipment for throughput and sustainment operations.

The CLB-DS was originally a product of the FY06 reorganization that replaced the old Force Service Support Group (FSSG) with the Marine Logistics Group (MLG). This added a landing support platoon to the old motor transport company and redesignated it the transportation services company. It also reorganized the old support company into the maintenance services company and created an engineer services company from ESB assets. However, in FY13-14 the Marine Corps reduced the engineer services and maintenance services companies to platoons and incorporated them in the H&S company. This left the battalion with only two organic companies. However, the battalion will receive substantial augmentation from other MLG assets whenever it deploys.

f. Direct Support Combat Logistics Regiment (FY17)

MKR-15 heavy wrecker TAMCN D1214



Strengths shown are for CLR-1, which has three DS-CLB. CLR-2 and CLR-3 have only two DS-CLB each. However, CLR-2 is scheduled to become a three-battalion regiment again when it reactivates CLB-8 in FY17. CLR-4 and CLR-45 each have a special organization with one DS-CLB and one GS-CLB (see Figure 1-22).

Figure 1-44: Direct Support Combat Logistics Regiment Organization

TAMCN	DESCRIPTION	Quantity	TAMCN	DESCRIPTION	Quantity
A0067/0403	AN/MRC-148/145B Mobile HF Radio/RT (w/D1158)	24	B2561/2566	Forklift, 10k Variable Rch/5k LRTF RT-022 (25 ea)	50
A0254/0255	Combat Ops Center AN/TSQ-239(v3)/(v4) (1 v3)	5	B2565	Engineer Equipment Trailer (EET)	20
B0036/0037	Grnd. Expedient Refuel Sys (GERS) 26 small/23 mdm	49	D0002/0235	M870A2E1 50-ton/M870A2 40-ton Semi-trailers (4 E1)	20
B0038	All Terrain Crane (ATC) MAC-50 (25-ton)	13	D0003/0198	AMK/MK-23/25A1 MTVR Cargo Trucks	185
B0040	Multi-Terrain Loader 277C	6	D0005/1062	AMK/MK-27/28A1 MTVR LWB Trucks	33
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	12	D0009/0013	AMK/MK-31A1 MTVR Truck Tractors	34
B0049	Large Field Refrigeration System (full container)	2	D0015	AMK-36A1 MTVR Wrecker	15
B0055	Mobile Bath/Shower Unit	6	D0016/17*	M1102/M1102 MCC Lt. Tactical Trlrs (LTT 1.25-ton)	36
B0060	Mdm Crawler Tractor (MCT) (John Deere) 850-J	12	D0022/33*	HMMWV 1152A1/A1B3 Troop/cargo/shelter carrier	39
B0063	Loader, Scoop Type - 624KR	28	D0025	MRAP Cougar Cat I 4x4 (in H&S co & TSB)	6
B0071	Lightweight Water Purification System (LWPS)	6	D0027	MRAP Cougar Cat II 6x6 (two per MT Co)	4
B0075	Small Field Refrigeration System (Tricon)	13	D0030	HMMWV M1151A1 Armament Carrier (4-door)	97
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz (750#)	6	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	65
B0078	Motorized Road Grader - 120M	3	D0035	M1076 PLS cargo trailer (16.5-tons)	103
B0392	Rough Terrain Container Handler (RTCH) Kalmar	6	D0036	MRAP MATV Cat. I 4x4 (two per MT Co)	4
B0395	Air Compressor 260 CFM, (3-ton) Trailer Mounted	1	D0052/0886	LVSr (armored/unarmored) MKR-18 16.5T truck	206
B0446	7.5-ton Wheel mounted Crane LRT-110	4	D0053/0887	LVSr (armored/unarmored) MKR-16 Truck Tractor	30
B0626	Mobile Fire Suppression System (HMMWV Mtd)	2	D0054/1214	LVSr (armored/unarmored) MKR-15 Wrecker	17
B0730	Generator Set MEP831A Skid Mtd 3Kw/60Hz	25	D0211	Flatrack Refueling Capability - FRC (2,500-gal)	50
B0891	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	18	D0215	MK-970 5,000-gal Refueler Semi-Trailer (for MK31)	34
B0953	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	32	D0860/0880	M105A2 1.5T (16)/M149A2 600g (79) water trailers	95
B0980*	Generator Set MEP531A Lt Wt Man Portable	17	D0862/0882	MK593 4T Cargo (102) /MK149 600g (39) water trlrs	141
B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	20	D1001	M997A2 4-Litter Armored HMMWV Ambulance	4
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	2	D1158	M1123A2 HMMWV Troop/Cargo Carrier	20
B1922	Scraper-Tractor Wheeled 621B	6	E0025	M32A1 grenade launcher	38
B2085/2086	SIXCON Fuel/Water Modules (187 Fuel/173 Water)	360	E0960/0989	5.56mm M249 / 7.62-mm M240B LMG (119 M240)	164
B2483	Loader, Backhoe 420E	6	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (106 MK19)	190

*Includes units that may be part of other TAMCN(s).

Table 1-17: Selected Direct Support Combat Logistics Regiment (CLR-DS) Equipment (FY15)

During FY-13 and 14 the Marine Corps made additional changes to the CLR-DS. By assembling the motor transportation and material handling assets from the General Support Combat Logistic Regiments (CLR-GS) and some of the former maintenance services companies from the CLB-DS(s) it created a Transportation Support Battalion (TSB). The TSB could reinforce the direct support CLB(s) as required. It also served to concentrate material and container handling equipment where it would be most needed.

The Marine Corps also transferred the landing support company (LSC) from the MLG HQ CLR to the TSB. It has 10 of the 25-ton all-terrain cranes (B0038) but the three container handlers (B0392) and most of the other material handling equipment belong to the support company.

Organizations

g. General Support Combat Logistics Regiment (FY17)

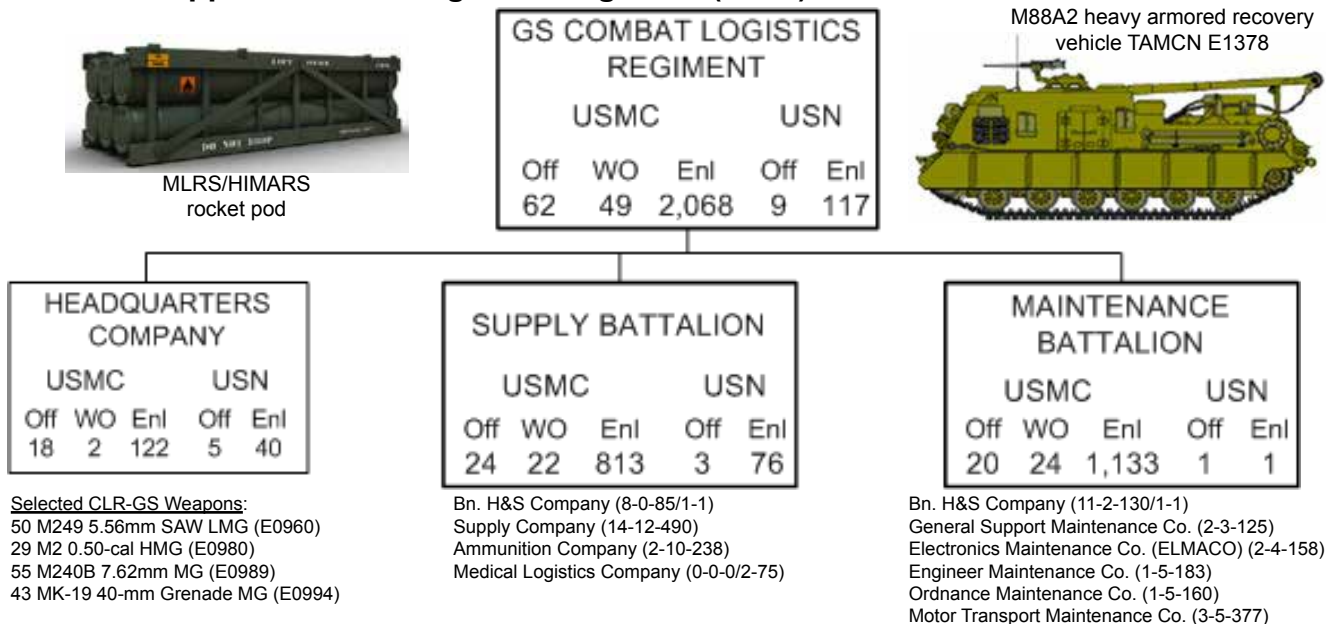


Figure 1-45: General Support Logistics Regiment (CLR-GS) Organization

TAMCN	DESCRIPTION	Quantity	TAMCN	DESCRIPTION	Quantity
A0067/0403	AN/MRC-148/145B Mobile HF Radio/RT (w/D1158)	8	B2085	Storage Tank Module, Fuel (SIXCON)	9
A0254/0255	Combat Ops Center AN/TSQ-239(v3)/(v4) (1 ea)	2	B2565	Engineer Equipment Trailer (EET)	2
B0036/0037	Grnd. Expedient Refuel Sys (GERS) 1 small/1 mdm	2	B2566	Forklift, RT, Light Capability (LRTF) (5k lift)	3
B0038	All Terrain Crane (ATC) MAC-50 (25-ton)	1	D0003/0198	AMK/MK-23/25A1 MTRV Cargo Trucks	10
B0043	Generator Set MEP1050 Skid mtd 15Kw/60Hz	6	D0005/1062	AMK/MK-27/28A1 MTRV XLWB Trucks	21
B0049/0075	Large/Small Field Refrigeration Systems (10 large)	25	D0009/0013	AMK/MK-31A1 MTRV Truck Tractors	22
B0063	Loader, Scoop Type - 624KR	3	D0015	AMK-36A1 MTRV Wrecker	13
B0077	Generator Set MEP1030 Skid mtd 5Kw/60Hz (750#)	6	D0016/17*	M1102/M1102 MCC Lt. Tactical Trlrs (LTT 1.25-ton)	20
B0083	Generator Set MEP809A Skid Mtd 200Kw/60Hz	3	D0033/187*	HMMWV M1152/1097 Troop/cargo/shelter carrier	42
B0395	Air Compressor 260 CFM, (3-ton) Trailer Mounted	2	D0031/0034	M1165/(A1) Truck 4x4, C2/GP EC 4-door	47
B0626	Mobile Fire Suppression System (HMMWV mtd)	3	D0080	M-353 3.5-ton chassis trailer	37
B0891*	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	14	D0862/0880	MK593 Cargo (15) /MK149 (16) Water Trlrs MTRV	31
B0921	Generator Set MEP813A Skid Mtd 10Kw/4000Hz	1	D1158	M1123A2 HMMWV Troop/Cargo Carrier	2
B0953	Diesel Generator 30-kw MEP805B (w/MK-353 trlr)	13	D1214	MKR-15 LVSR Wrecker	2
B0980*	Generator Set MEP531A Lt Wt Man Portable	24	E0070*	DS Trlr MMC-20 (carries shelter/flatrack; MTRV towed)	8
B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	9	E0856	AAV-7R Amphib Recovery Vehicle (w/armament)	3
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz	8	E1378	M88A2 Armored Recovery Vehicle (w/armament)	8

*Includes units that may be part of other TAMCN(s).

Table 1-18: Selected General Support Combat Logistics Battalion (CLB-GS) Equipment (FY15)

Starting in FY14 the General Support Combat Logistics Regiment (CLR-GS) was scheduled to reorganize its existing supply and maintenance battalions and motor transport company into two CLB-GS(s). However, pressure from the logistics community caused the reversal of this decision. In FY14-15 the CLR-GS reverted to separate supply and maintenance battalions as shown above.

In addition to its C2 elements the CLR-GS headquarters company includes a medical planning section even though the MLG medical battalion has been removed from the CLR-GS and placed directly under MLG headquarters.

h. MLG Headquarters Combat Logistics Regiment (FY17)

Originally formed by expansion of the headquarters and service battalion of the old Force Service Support Group (FSSG) this CLR provided command and control and certain supplementary capabilities to the MLG as a whole. FSRG has redesignated this unit as the MLG Headquarters CLR and significantly reduced its size. These reductions include the elimination of all "plus-up" personnel for the CLB-MEU(s) and transfer of all medical personnel to the CLB-MEU(s). Detail changes to and missions of the sub-elements of this regiment are as follows:

- **Headquarters Company:** This is a command element for the CLR-HQ only, not the MLG. It no longer has a medical planning mission.
- **CLB-MEU:** These units are used solely to support MEU deployments but could reinforce or fill out other MLG elements.
- **Communication Company:** This unit provides primary communications to the MLG and CLR-HQ headquarters companies and the medical and dental battalions. It provides supplemental communications to other MLG elements. FSRG reduced this unit by 61 enlisted because it now supports a smaller MLG with stronger CLR/CLB-level communication capabilities.



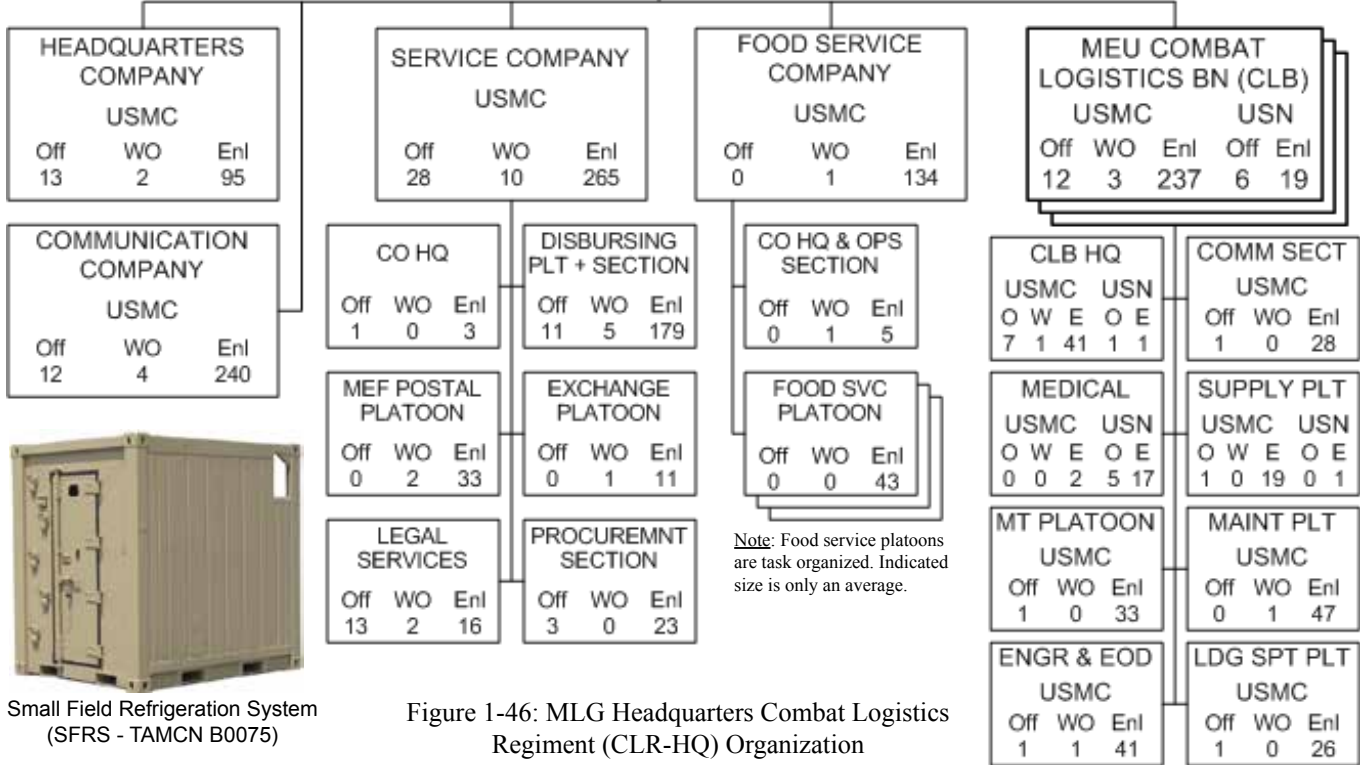
HMMWV with Shelter

Note: HQ company HQ-CLR has eight 60mm mortars M224.

MLG HQ COMBAT LOGISTICS REGIMENT					
USMC			USN		
Off	WO	Enl	Off	Enl	
89	26	1,445	18	57	



MEP-1060 Advanced Mobile Medium Power Source (AMMPS) TAMCN B0953



Small Field Refrigeration System (SFRRS - TAMCN B0075)

Figure 1-46: MLG Headquarters Combat Logistics Regiment (CLR-HQ) Organization

TAMCN	DESCRIPTION	Quantity	TAMCN	DESCRIPTION	Quantity
A0067/0403	AN/MRC-148/145B Mobile HF Radio/RT (w/D1158)	25	B2605	Tactical Water Purification System (TWPS)**	6
A0153	AN/MRC-142C Dig. W-band Transmt Sys.(w/D1158)	16	C0034	Modular Kitchen (+1 E0070 & 2 C6621 ea) (FS Co)	14
A0255	Combat Ops Center AN/TSQ-239(v4)**	3	C6621*	Ration Heating System (FS Co except 2 per CLB)	31
A0499	AN/TSQ-227A System Control Group	1	D0003/0198	AMK/MK-23/25A1 MTVR Cargo Trucks	68
B0036/0037	Grnd. Expedient Refuel Sys (GERS) 13 sml/13 mdm	26	D0005	AMK-27/28A1 MTVR LWB Trucks**	6
B0040	Multi-Terrain Loader 277C**	6	D0015	AMK-36A1 MTVR Wreckers**	6
B0055	Mobile Bath/Shower Unit**	6	D0016/17*	M1102/M1102 MCC Lt. Tactical Trlrs (LTT 1.25-ton)	31
B0063	Loader, Scoop Type - 624KR**	9	D0022/33*	HMMWV 1152A1/A1B3 Troop/cargo/shelter carrier	37
B0071	Lightweight Water Purif. Sys. (LWPS)**	6	D0030	HMMWV M1151A1 Armament Carrier (4-dr)**	12
B0075*	Small Field Refrigeration System (Tricon) (FS Co)	15	D0031/34	M1165/(A1) Truck 4x4, C2/GP EC 4-door	14
B0395	Air Compressor 260 CFM (3-ton) Trlr Mtd**	3	D0862	MK593 MTVR Cargo trailers (4-ton)**	18
B0626	Mobile Fire Suppression System**	3	D0882/0882	M149 (or MK149) MTVR Water trailers (400gal)	16
B0730	Generator Set MEP831A Skid Mtd 3Kw/60Hz	21	D0886	MKR-18 LVSR Cargo Truck**	9
B0891	Generator Set MEP1040 Skid Mtd 10Kw/60Hz**	21	D1001/1002	M997A2/1035A2 4-litter/2-litter Ambulance (3 ea)**	6
B0953*	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	23	D1158	HMMWV M1123 Troop/Cargo Carrier (+41 MRC)	15
B0980*	Generator Set MEP531A Lt Wt Man Portable**	3	E0070*	DS Trlr MMC-20 (carries 20' ISO container; MTVR towed)**	6
B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz**	12	E0103/1475	M110 7.62mm/M107 .50-cal Sniper Sys (6 ea)**	12
B2085/2086	SIXCON Fuel/Water Modules (90 Fuel/12 Water)**	102	E0892	M203A2 Grenade Lanuchers**	12
B2460	Tractor, Full Track D6K**	3	E0960/0989	5.56mm M249 / 7.62mm M240B LMG (40 M240)	44
B2483	Loader, Backhoe 420E**	3	E0980/0994	0.50-cal M2 / 40mm MK19 HMG (35 MK19)	75
B2561/2566	Forklift, 10k Variable Rch/5k LRTF RT (9 LRTF)**	12	E1378	M88A2 Armored Recovery Vehicle (w/armament)**	3

*Includes units that may be part of other TAMCN(s). **Found in the MEU-CLB(s) only.

Table 1-19: Selected MLG HQ CLR Equipment Items (FY15)

- Service Company:** This unit provides legal, postal, disbursing, post exchange and local procurement services for the MAGTF.
- Food Service Company:** Recent reorganizations have reduced this unit from four task organized food service platoons to three slightly larger platoons. It is the primary food service provider to the MLG medical and dental battalions (which have no organic food services) and provides supplemental feeding to any MAGTF element outside of the ACE that requires it. Food service support for the ACE comes from the MWSS food service sections. These and the FS company are the only MAGTF elements that can prepare and

Organizations

Unit	Cargo/Mission Category	MTVR Cargo		MK-593		LVSR MKR-18		MK31/MK970		PLS Trailer		FRC Flatrack		SIXCON		Max Capability***			
		Qty	Payload	Qty	Payload	Qty	Payload	Qty	Payload	Qty	Payload	Qty	Payload	Qty	Payload	Qty	Cargo	Pax	Liquid
CLB-DS																			
CLB DS Transport Svc Co	Gen Cargo (CC)*		228 ST		72.0 ST		627.0 ST									1,240.5 ST	1,012.5 ST	810.0 ST	
	Gen Cargo (hwy)*		456 ST		72.0 ST		855.0 ST									1,810.5 ST	1,354.5 ST	1,263.0 ST	
	Passengers	38	608	18	0	38	0	0	19	0						0	608	0	
	Bulk Fuel		38 SIXCON	18 SIXCON	18 SIXCON	0	0 gal	0	0	57 SIXCON	10	25,000 gal				24	21,600 gal	0 gal	46,600 gal
	Bulk Water		38 SIXCON	18 SIXCON	18 SIXCON	18 SIXCON	114 SIXCON	114 SIXCON		57 SIXCON						22	19,800 gal	0 gal	19,800 gal
Transportation Support Battalion																			
TSB Motor Transport Co A or B	Gen Cargo (CC)*		240 ST		72.0 ST		759.0 ST									1,450.5 ST	1,210.5 ST	1,038.0 ST	
	Gen Cargo (hwy)*	40	480 ST		72.0 ST		1,035.0 ST									2,112.5 ST	1,624.5 ST	1,648.5 ST	
	Passengers	(incl. 14 LWB*)	696	18	0	46	0	23	0							0	696	0	
	Bulk Fuel		40 SIXCON	18 SIXCON	18 SIXCON	17	85,000 gal	17	85,000 gal	69 SIXCON	**10	25,000 gal				35	31,500 gal	85,000 gal	141,500 gal
	Bulk Water		40 SIXCON	18 SIXCON	18 SIXCON	138 SIXCON	138 SIXCON			69 SIXCON						40	36,000 gal	0 gal	36,000 gal
CLB-MEU																			
MEU CLB Motor Transport	Gen Cargo (CC)*		144 ST		24.0 ST		49.5 ST									217.5 ST	73.5 ST	27.0 ST	
	Gen Cargo (hwy)*	24	288 ST		24.0 ST		67.5 ST									379.5 ST	91.5 ST	175.5 ST	
	Passengers	(incl. 2 LWB*)	392	6	0	3	0	0	0							0	392	0	
	Bulk Fuel		24 SIXCON	6 SIXCON	6 SIXCON	0	0 gal	0	0	0 SIXCON	0	0 gal				30	27,000 gal	0 gal	27,000 gal
	Bulk Water		24 SIXCON	6 SIXCON	6 SIXCON	9 SIXCON	9 SIXCON			0 SIXCON						4	3,600 gal	0 gal	3,600 gal

*CC = Cross Country; hwy = highway; LWB = Long Wheel Base variant; **From the TSB Support Co. ***Max payloads if the company is configured to carry max cargo, pax or fuel/water, respectively and has 100% equipment availability. Note: MTVR Cargo truck carries 6.0 ST cross country or 12 ST highway or 16 troops (20 troops if LWB) or one (cross country) or two (highway) SIXCON. It tows an MK-105 (4-ton payload) cargo trailer. LVSR MKR-18 carries 16.5 ST cross country or 22.5 ST highway or 3 SIXCON or 1 FRC or 1 20' container; a SIXCON module holds 900-gal of water or fuel.

Table 1-20: MAGTF Motor Transport Capability Worksheet

serve UGR-A/B rations. Battalion/regimental food service sections can only serve UGR H&S, UGR-E or POR rations (see 4024a and Table 4-55, page IV-49 for ration details). The major equipment of the Food Service Company includes 14 Expeditionary Field Kitchens (EFK - TAMCN C0034), 10 Enhanced Tray Ration Heater Systems (E-TRHS C0035, each includes an SFRS, see below), two Large Field Refrigeration Systems (LFRS B0049), and 12 Small Field Refrigeration Systems (SFRS B0075) not already included in the E-TRHS(s). The company also has 15 Tray Ration Heater Systems (TRHS C6621) not already included in the EFK (two each) or E-TRHS (one each). A Food Service Company can feed 13,250 to up to 20,750 personnel twice a day, including 3,750 to 7,500 in forward areas (UGR-H&S rations only). The FS company has no organic vehicles and requires motor transport support to displace or send prepared rations to forward areas. (For equipment details see 4024b, page IV-50.)

Table 1-20 is a suggested motor transport capability worksheet. A typical MEB has one transportation services company (TSC) and one TSB motor transport company (MTC). MLG-1 has three TSC and two MTC. MLG-2 is similar but will not get its third TSC until FY17. MLG-3 has two TSC and only one MTC (reinforced). MLG-4 has two TSC and two MTC available to reinforce active MLG(s) as needed.

The table does not include motor transport assets organic to other MLG elements. It is assumed that these assets (including all MLG HMMWV) are required for the internal functioning of their owning units and would not be available for other purposes. Also, each TSC or MTC has six LVSR-16 truck tractor and M870 series semi-trailer combinations. These are used to carry engineer equipment but in an emergency they could carry a 20' ISO container or six SIXCON(s) each.

The maximum capability figures in the table assume the maximum load of the cargo category indicated. MTVR and LVSR-18 trucks and MK-593 and PLS trailers normally carry only dry cargo. However, SIXCON modules do give them some ability to carry bulk liquids. An MTVR or MK-593 can each carry one loaded SIXCON. An LVSR truck or PLS trailer can each carry three loaded SIXCONs or an FRC flatrack refueler (TAMCN D0211). MTVR trucks may carry troops (16 per standard cargo MK-23/25 or 20 per long wheel base [LWB] Mk-27/28). LVSR and trailers never carry troops except in emergencies. When the maximum number of troops are carried the table indicates the maximum amount of dry cargo that can also be carried. Certain vehicles can only carry liquid cargoes. The M-149 trailer (MTVR towed) only carries potable water. The MTVR truck tractor (MK/AMK-31) and MK-970 semi-trailer combination only carries fuel.



Figure 1-47: LVSR-18 with Steel 20-foot Sea Container

1013. US Army Forces

a. The Modular Army

In 2003, the US Army began to convert itself from its Cold War configuration to its current “modular” organization. The purpose of the modular organization was to better enable the Army to support frequent troop rotations to and from Iraq and Afghanistan. In the Modular Army the brigade combat team (BCT) replaced the division as the Army’s largest combat unit with a fixed organization. To bolster its BCT(s), the Army fielded a series of “multi-functional” support brigades (aviation, fires, sustainment, battlefield surveillance and mobility enhancement). It also retained its pre-existing “functional” brigades (for engineers, medical, military police, etc.). In 2013, in response to the end of the war in Iraq, the winding down of the war in Afghanistan and an ongoing budget crisis, the Army announced a major restructuring that would cut 80,000 billets from the active force. Some of the details of this restructuring are provided below.

The major command echelons of the currently restructuring Modular Army are as follows:

- **THEATER ARMY (TA):** This echelon has no Marine Corps counterpart. It is the permanent Army Service Component Command (ASCC) under a geographic combatant commander (GCC). A TA exercises administrative control (ADCON) over all Army units in its assigned theater. If a GCC designates a TA commander as joint force land component commander (JFLCC), the TA headquarters provides an initial C2 capability for the direction of a major land campaign. See FM 3-93 (*Theater Army Operations* 10-11).
- **CORPS:** This echelon corresponds to that of a Marine Expeditionary Force (MEF). It has no organic elements apart from its headquarters but, by doctrine, it controls two or more combat divisions plus assigned/attached supporting troops. Primarily it serves as a base upon which to build a JTF headquarters. Alternatively, it can provide operational level command and control to major contingency operations or a joint land force component (JFLC). It may also serve as an intermediate-level tactical headquarters. Like a MEF, it shapes the battlefield and creates conditions for future success. Its subordinate divisions supervise battles and engagements while letting the brigade combat teams, or BCT, do the actual fighting. The Army has three “standing” corps: I Corps at Joint Base Lewis-McChord, Washington; III Corps at Fort Hood, Texas; and XVIII Airborne Corps at Fort Bragg, North Carolina. A V Corps existed in US Army Europe until 2013. (See FM 3-92 *Corps Ops* 11-10 and FM 3-94 *Theater Army, Corps & Division Ops.* 04-14 for additional discussion).
- **DIVISION:** This is the primary tactical warfighting headquarters. It directs the operations of assigned and attached brigade combat teams (BCT) and multi-functional support brigades. It may also act as a JTF, JFLC or ARFOR headquarters in smaller theaters. In each of the Army’s 10 active and eight National Guard divisions only the headquarters and command group and a supporting special troops battalion are permanent. A division will have BCT(s) and support brigades attached/assigned to it as needed. In garrison an active division will have a combat aviation brigade (CAB) and (normally) three BCT(s). When a division deploys it is task organized with two to five BCT (not necessarily the ones it had in garrison), a CAB, and one or more other support brigades (usually multi-functional). See ATP 3-91, *Division Operations*, October 2014.
- **BRIGADE COMBAT TEAM (BCT):** The BCT has replaced the division as the Army’s largest all-arms combat unit with a fixed organization. As of FY15 the Army had a total of 60 BCT(s) (32 active and 28 National Guard plus an ABCT equipment set in Korea). The standard types are “Armored” (ABCT – see 1014b), “Infantry” (IBCT – see 1014c) and “Stryker” (SBCT - see 1014d). Originally, in order to save manpower, the Army configured its Armored (called “Heavy” until FY12) and Infantry BCT(s) with only two “maneuver” battalions each rather than the previous norm of three per brigade. The change made the BCT(s) small enough so that each active division could have four. This facilitated troop rotation and relief during the extended campaigns in Iraq and Afghanistan but it greatly limited a BCT commander’s tactical options. The Army justified this by arguing that the BCT reconnaissance, surveillance, target acquisition (RSTA) battalion would so enhance the BCT commander’s situational awareness that he would not need a third maneuver battalion. If necessary the RSTA battalion itself could even fight as a half-strength third maneuver battalion. However, in 2013 the Army eliminated 13 active BCT(s) to free enough troops so that each of the remaining active BCT(s) would incorporate a third maneuver battalion. National Guard BCT(s) will remain at two battalions for now. While most BCT(s) are assigned to divisions, two SBCT(s) serve as independent “armored cavalry” regiments not assigned to any division. As such their mission is to conduct corps level reconnaissance and covering force operations. See FM 3-96 *Brigade Combat Team*, October 2015.
- **MULTI-FUNCTIONAL SUPPORT BRIGADES:** Like BCT(s) these are combined arms task forces providing combat support or combat service support to the BCT(s). The basic types are combat aviation (see paragraph 1014e), fires (section 1014f), battlefield surveillance (National Guard only - section 1014k), maneuver enhancement (National Guard and Army Reserve only - paragraph 1014h), and sustainment (paragraph 1014i). Multi-functional brigades may operate under a division, corps, theater army, a joint headquarters, another Service headquarters (such as a MEF) or an allied force. They include their own signal and logistics units.
- **FUNCTIONAL SUPPORT BRIGADES AND GROUPS:** These are theater-level single-function combat service support task forces whose elements come from the same Army “branch.” They may be engineer, military police, chemical, air/missile defense, signal, medical, civil affairs, or military intelligence (MI). When deployed these brigades/groups (or elements of them) are usually attached/assigned to theater commands. The theater commands may then sub-attach/assign them to subordinate corps or divisions. Like a multi-functional support brigade, a functional brigades has modular structures with (typically) two to seven functional battalions (of two to seven companies each). Its single-branch focus means it will usually lack the communication and sustainment capabilities of a multi-functional brigade and must rely on theater assets for such support. Functional brigade commanders are likely to be brigadier generals though multi-functional brigade and functional group commanders are only colonels. Two or more functional brigades from the same branch serving in the same theater may be under a support command (major general). The support command serves as an interface with the combatant commander, JFLCC or Army service component commander for that functional area.

Organizations

b. Army Armored Brigade Combat Team (ABCT) (New Type)

Note: The 120mm mortar in the Army's M1064 self-propelled mortar system is the M121. Unlike the Marine Corps M327 EFSS mortar, it is a smoothbore weapon with a maximum range of 7,200 meters and a rate of fire of 16 rpm (max) or 4 rpm (sustained). *FM 2-22,90 December 2007*

RSTA = Reconnaissance, Surveillance, Target Acquisition

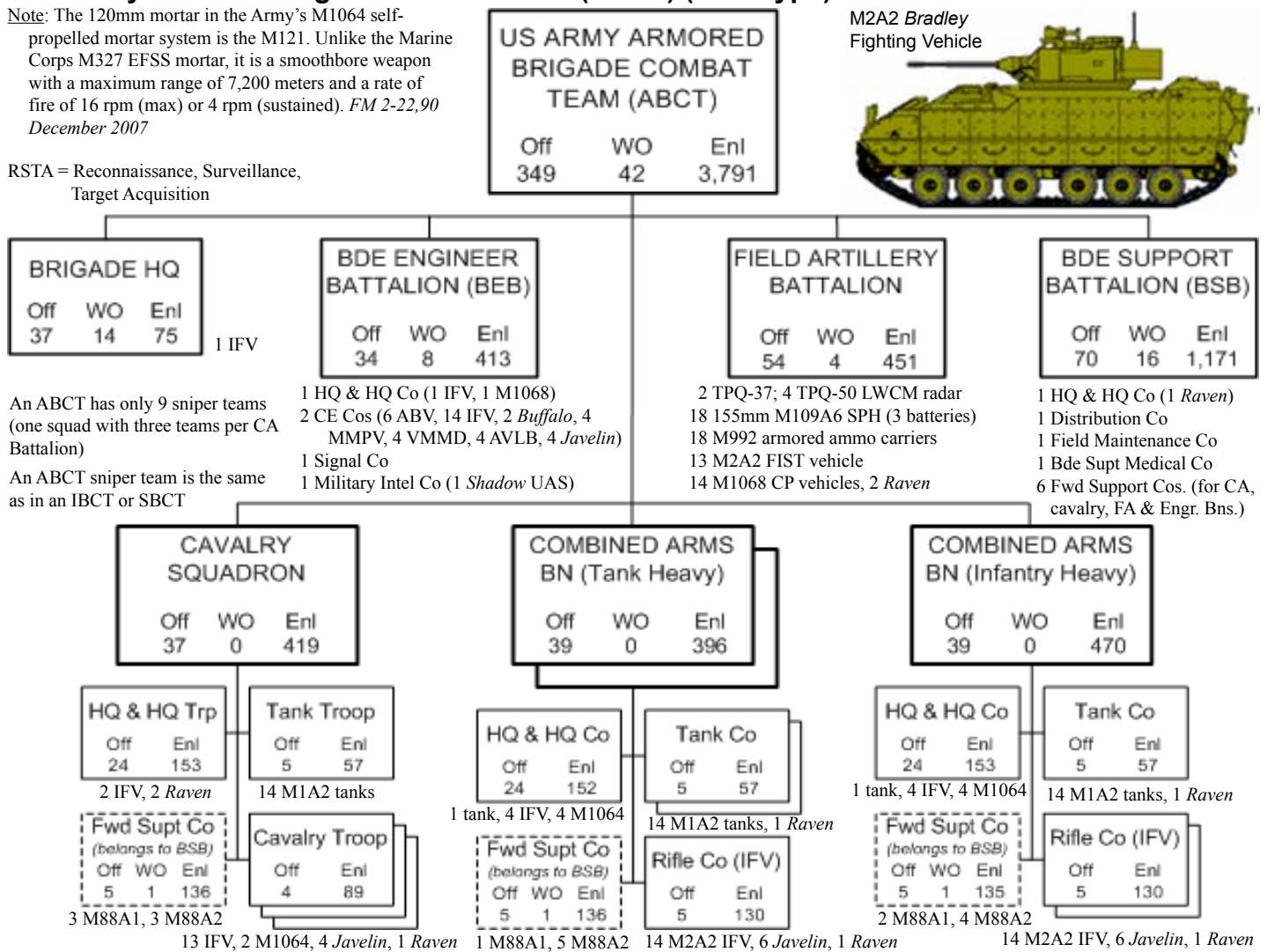


Figure 1-48: Active Army Armored Brigade Combat Team (ABCT) Organization (FY16)

Major End Items	Quantity	Major End Items	Quantity
UAS (1 Shadow system [4 aircraft] & 20 Raven)	21	M917 20-ton dump trucks	2
Assault Breacher Vehicle (ABV) M1160	6	M916A3 truck tractors w/M870A3 40-ton semi-trailers	12
M9 Armored Combat Earthmover (ACE)	2	PLS Flatrack modular 2.5k fuel/ 2k water tanks (10 water)	54
Tractor, full tracked low speed T-9 (four have rippers)	6	Mobile kitchens (7 containerized/19 Assault [carried in LTT])	26
Backhoes HMEE (high mobility engr excavator)/2 Loader Type II	8	Medium trailers (42 LMTV, 38 MTV, 53 water, 28 generator)	161
Forklift trucks (5 heavy Atlas & 9 rough terrain 4k capacity)	14	Light tactical trailers (72 M1101, 51 M1102, 62 for generators)	185
Motorized Road Graders	2	M109A6 155-mm SP Howitzer	18
MRAP vehicles (2 Buffalo, 4 MMPV (RG-33?) & 4 VMMD)	10	M992A2 Armored ammunition carrier	18
HMMWV troop/cargo/shelter carriers (M1152A1/M1097/M998 etc)	362	Armored C2 vehicles (44 M1068 & 14 M577) (M113 variants)	58
HMMWV armament (HMG) carriers (M1151A1/M1114 etc)	49	M113A3 Armored personnel carrier (26 are ambulances)	53
HMMWV armored ambulances (M997A2)	11	M1064 Armored Self-propelled 120-mm mortar (M113 variant)	18
LMTV (2.5-ton) trucks (all M1078 cargo except 15 M1079 vans)	102	M2A2 Infantry Fighting Vehicles (125 IFV, 13 FIST versions)	138
MTV (5-ton) series trucks (all cargo except 11 vans)	98	M1A2 Main battle tank	87
MTV (5-ton) truck-tractors w/7 25-ton & 13 12-ton van semi-trailers	20	M60/JAB/Wolverine Arm'd Vehicle Launched Bridge (AVLB)	4
Wreckers (9 M1089 5-ton MTV and 11 M984 10-ton HEMTT)	20	Armored recovery vehicle 22 M88A2 (hvy) / 13 M88A1 (mdm)	35
HEMTT 10-ton trucks (cargo types except 45 refuelers [2.5k-gal])	90	Command launch unit (CLU) Javelin ATGM	40
PLS 16.5-ton Heavy Cargo Trucks M1074/75	81	Heavy machine guns (260 .50-cal M2 & 94 40mm MK-19)	354
PLS (16.5-ton) Trailers (M1076)	176	Lt machine guns (263 7.62mm M240B & 340 5.56mm SAW)	603

Table 1-21: Selected Army Armored Brigade Combat Team (ABCT) New Type - Equipment Items

The active Army currently plans to retain nine active ABCT organized as shown above. The National Guard is keeping its seven ABCT(s). These have only two combined arms battalions (CAB) each but the Army is assigning one of its three separate CAB(s) to a Guard ABCT (the 1/34) to give it a third CAB. Another Guard ABCT (the 81st) is earmarked for conversion to an SBCT. See ATP 3-20.15 (*Tank Platoon 12-12*); ATP 3-21.71 (*Mech Infantry Platoon & Squad 11-10*); FMs 3-20.96 (*Recon/Cav Sqdn 03-10*), 3-90.1 (*Tank and Mech Inf Co Team 12-02*) and 3-90.5 (*Combined Arms Bn w/chg 1 04-08*).

c. Army Infantry Brigade Combat Team (IBCT) (New Type)

Note: The Army's towed 120mm mortar is the M120. Unlike the Marine Corps M327 EFSS mortar, it is a smooth-bore weapon with a maximum range of 7,200 meters and a rate of fire of 16 rpm (max) or 4 rpm (sustained). FM 2-22,90 December 2007



RSTA = Reconnaissance, Surveillance, Target Acquisition

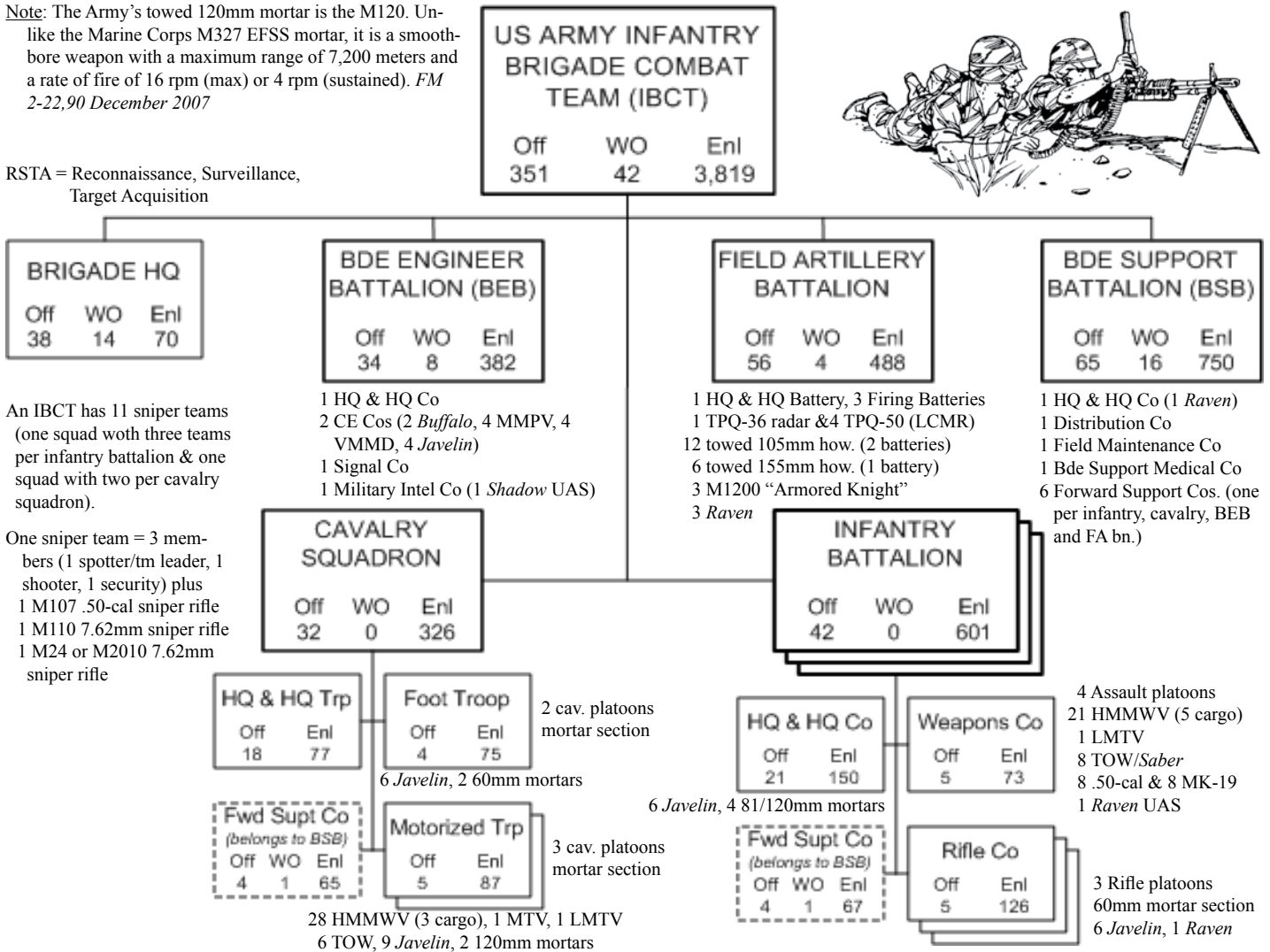


Figure 1-49: Active Army Infantry Brigade Combat Team (IBCT) Organization (FY16)

Major End Items	Quantity	Major End Items	Quantity
UAS (1 Shadow system [4 aircraft] & 21 Raven)	22	HEMTT 10-ton trucks (76 cargo & 8 refuelers [2.5k-gal])	84
Boats, 7-man rubber inflatable	9	M983A4 HEMTT trk-tractors w/M870A3 40-ton semi-trailers	4
Tractor, full tracked (4) high speed (DUECE)/(2) low speed T-5	6	PLS heavy (16.5-ton) trailers (M1076)	78
Backhoes 6 HMEE (high mobility engr excavator)/4 Scoop Loaders	10	Mdm trailers (85 cargo 53 water, 37 generator, 4 line charge)	179
Forklift trucks (5 heavy Atlas & 9 rough terrain 4k capacity)	14	Lt tactical trailers (172 M1101, 28 M1102, 53 generator trlrs)	253
Motorized Road Graders	2	PLS Flatrack modular 28 2.5k fuel/10 2k water tanks	38
MRAP Vehicles (2 Buffalo, 4 MMPV (RG-33?) & 4 VMMD)	10	Mobile kitchens (7 containerized/19 Assault [carried in LTT])	26
M1200 "Armored Knight" surveillance system (on 4x4 armr'd veh)	3	Howitzer, light towed 105-mm M119	12
HMMWV troop/cargo/shelter carriers (M1152A1/M1097/M998 etc)	466	Howitzer, Medium towed 155-mm M777	6
HMMWV armament/TOW carriers (AC/TC)	108	Mortar 120mm M121 (+12 81mm M252 for use in lieu of M121)	16
HMMWV Ambulance (M997A2)	43	Mortar 60-mm M224 (two per company mortar section)	20
LMTV (2.5-ton) trucks (all M1078 cargo except 10 M1079 vans)	97	Improved TOW System/Saber Launcher/Guidance Units	36
MTV (5-ton) series trucks (all cargo except 8 vans & 11 dump)	127	Command launch unit (CLU) Javelin ATGM	100
MTV (5-ton) truck-tractors w/9 25-ton & 2 12-ton van semi-trailers	11	Heavy machine guns (158 .50-cal M2 & 84 40mm MK-19)	242
Wreckers (13 M1089 5-ton MTV and 10 M984 10-ton HEMTT)	23	Lt machine guns (243 7.62mm M240B & 352 5.56mm SAW)	595

Table 1-22: Selected Army Infantry Brigade Combat Team (IBCT) New Type - Equipment Items

The active Army currently has 16 IBCT(s) but three of them have only two infantry battalions each. The Army may deactivate one of these brigades in order to complete the others. The National Guard will keep its 20 existing IBCT(s) (with only two infantry battalions each). The Army is increasing the number of reserve component separate infantry battalions (for use with ME brigades) from 14 to 19 (18 in the Guard and one in the Army Reserve). It may use some of them as "third maneuver battalions" for certain National Guard brigades. For infantry doctrine see ATP 3-18.12 (Air Assault Ops 03-11); ATP 3-20.97 (Dismounted Recon Troop 11-10); ATP 3-20.98 (Recon Platoon 04-13); ATP 3-21.90 (Tactical Employment of Mortars 04-11), and FM(s) 3-20.96 (Recon/Cav Sqn 03-10), 3-20.971 (Rcn/Cav Troop 08-09), 3-21.8 (Rifle Platoon & Squad 03-07), 3-21.10 (Rifle Co 07-06), 3-21.12 (Infantry Weapons Co 07-08), and 3-21.20 (Infantry Battalion 12-06).

Organizations

d. Army Stryker Brigade Combat Team (SBCT) (New Type)

For armament of *Stryker* variants see Table 2-1

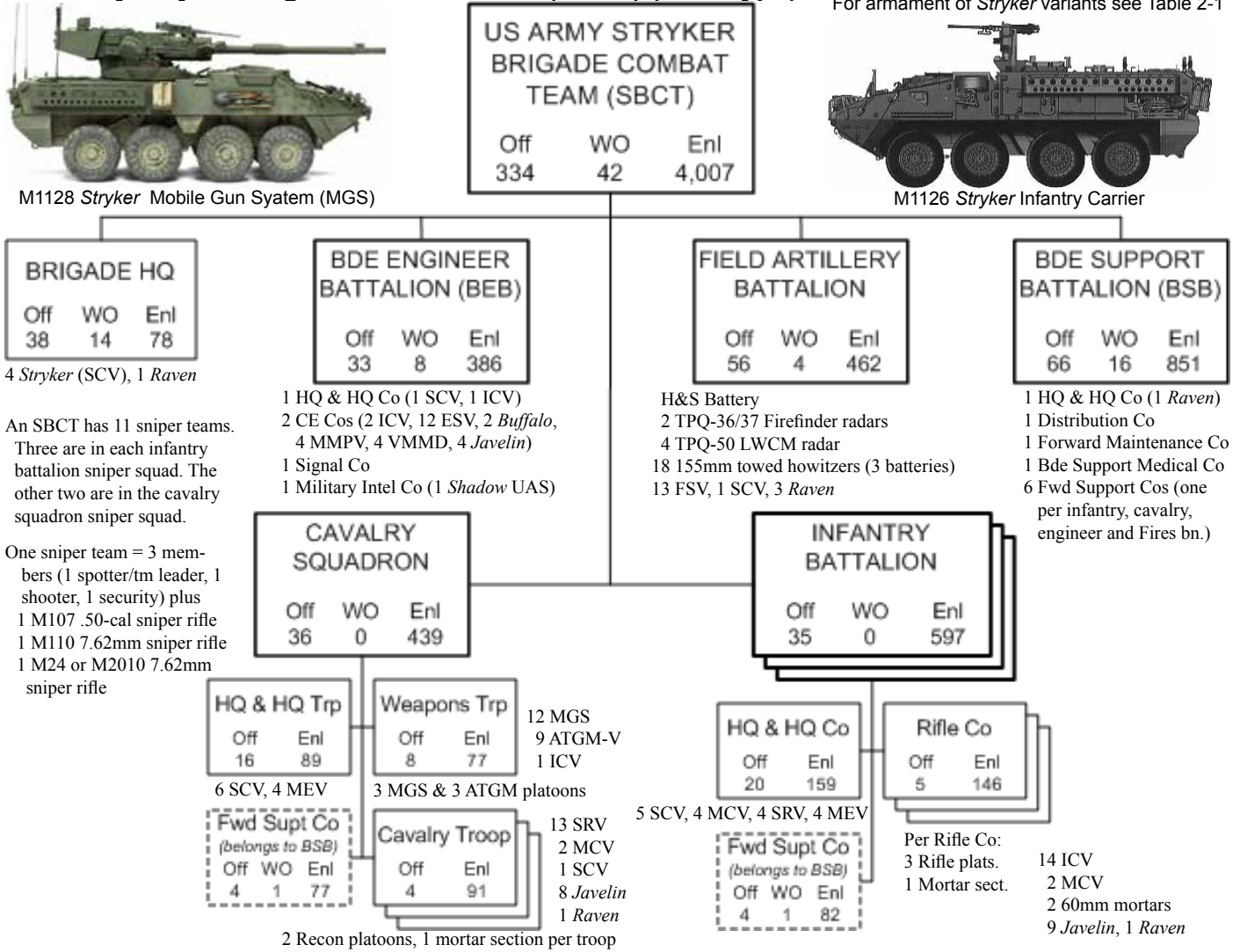


Figure 1-50: Army Stryker Brigade Combat Team (SBCT) Organization (FY16)

Major End Items	Quantity	Major End Items	Quantity
UAS (1 <i>Shadow</i> system [4 aircraft], 19 <i>Raven</i>)	20	Light tactical trailers (107 M1101, 94 M1102, 51 generator)	252
Tractor, full tracked (4) high speed (DUECE)/(2) low speed T-5	6	Mobile kitchens (7 containerized/19 Assault [in LTT])	26
Backhoes HMEE (high mobility engr excavator)/2 Loader Type II	8	PLS Flatrack modules 2.5k fuel/ 2k water tanks (10 water)	32
Bridge, Rapid Emplaced M21 (carried by HEMTT trucks)	4	Howitzer, Medium towed 155-mm M777	18
Volcano-type mine dispensing system M139	3	Mortars (12 81mm & 18 60mm - in MCV(s) for dismounted use)	30
Forklift trucks (7 heavy <i>Atlas</i> & 9 rough terrain 4k capacity)	16	M1126 Stryker Infantry Carrier Vehicle (ICV)	130
Motorized Road Graders	2	M1127 Stryker Reconnaissance Vehicle (SRV)	57
MRAP Vehicles (2 <i>Buffalo</i> , 4 MMPV (RG-33?) & 4 VMMD)	10	M1128 Stryker Mobile Gun System (MGS) (105mm gun)	12
HMMWV troop/cargo/shelter carriers (incl 6 armament carriers)	346	M1129 Mortar Carrier Type B (MCV-B*) (120mm Mortar)	36
HMMWV armored ambulances (M997A2)	12	M1130 Stryker Command Vehicle (SCV)	30
LMTV (2.5-ton) series cargo trucks (M1078)	5	M1131 Stryker Fire Support Vehicle (FSV)	13
MTV (5-ton) series trucks (all cargo types except 8 vans & 4 dump)	234	M1132 Stryker Engineer Squad Vehicle (ESV)	12
MTV (5-ton) truck-tractors w/14 25-ton & 1 12-ton van semi-trailers	15	M1133 Stryker Medical Evacuation Vehicle (MEV)	18
HEMTT 10-ton cargo trucks (incl 4 bridge carriers & 22 refuelers)	140	M1134 Stryker AT Guided Missile Vehicle (TOW) (ATGM-V)	9
HEMTT 10-ton wreckers M984	23	Command launch unit (CLU) <i>Javelin</i> ATGM	109
PLS heavy (16.5-ton) trailers (M1076)	114	Heavy machineguns (308 .50-cal M2 & 147 40mm MK-19)	455
Mdm trailers (60 MTV cargo, 64 water, 35 generator, 6 line charge)	141	Lt machineguns (271 7.62mm M240B & 344 5.56mm SAW)	615

*Replaces the MCV-A; the MCV-B carries a 120mm RMS6L recoilless mortar that only fires from the vehicle. In the MCV-A the mortar could only fire from the ground.

Table 1-23: Selected Army Stryker Brigade Combat Team (SBCT) New Type - Equipment Items

As of FY16 the Army is reducing its nine SBCT(s) to eight by converting the active 2/25th ID to an IBCT. However, the Army also plans to convert the National Guard 81st ABCT to an SBCT. When/if this happens the Army will have nine SBCT(s) again (but only seven will be active). An SBCT uses the *Stryker* family of 8x8 armored vehicles (see Table 2-1, p. II-2). See ATP 3-20.16 (MGS Platoon 02-2013), ATP 3-21.9 (Stryker Plt and Squad 12-2010), 3-21.11 (Stryker Rifle Co 07-2006), 3-21.21 (Stryker Bn 04-2003), 3-21.94 (Stryker Recon Plt 04-2003), and 3-34.221 (Stryker BCT Engineer Ops 01-2005).

e. Army Aviation Units

UNIT TYPES	#AC	#RC	Off	WO	Enl	REMARKS
Assault Helicopter Bn (AHB)	8	17	32	60	290	30 UH-60 (can lift up to two rifle companies if 80%+ of aircraft are available)
Assault Helicopter Bn (AHB)	3	0	36	60	350	30 UH-60 + pathfinder co. (4 offs. 55 enl) - 82d & 101st ABD & 101D only
Gen. Supt. Avn. Bn (GSAB) (CAB)	11	8	42	73	469	12 CH-47, 8 UH-60 (C3), 15 HH-60* (Air Ambulance) + 1 ATS** Company
Gen. Supt. Avn. Bn (old TAB)	0	5	53	100	503	12 CH-47, 8 UH-60 (C3), 30 HH-60* (Air Ambulance - 2 Cos) no ATS** Co
Gen. Supt. Avn. Bn (TAB-A)	0	2	54	102	547	12 CH-47, 8 UH-60 (C3), 30 HH-60* (Air Ambulance - 2 Cos.) + 1 ATS** Co
Gen. Supt. Avn. Bn (old TAB)	0	1	63	126	594	12 CH-47, 8 UH-60 (C3), 42 HH-60* (Air Ambulance - 3 Cos.) no ATS** Co
Gen. Supt. Avn. Bn (USAREUR)	1	0	26	84	259	20 CH-47, 21 HH-60 (Air Ambulance), 4 UC-35, 4 C-12F (FW Co)
Attack/Recon Avn. Sqdn (ARS)	1	0	33	62	262	30 OH-58D (three attack/recon troops - to deactivate by FY18)
Attack/Recon Avn. Bn (ARB)	10	7	33	50	317	24 AH-64 (three atk/recon cos.) (RC bns to deactivate by FY18)
Attack/Recon Avn. Sqdn (ARS)	8	0	33	57	401	24 AH-64, 3 RQ-7 systems (three attack/recon troops of 8 AH64, 1 RQ-7 ea)
Security & Support Bn (SSB)	0	6	35	65	352	32 UH-72A in one Air Ambulance and three troop/cargo lift companies
Ext Range Multi-Purpose UAS Co	8	0	1	10	115	12 MQ-1C <i>Gray Eagle</i> (<i>Predator</i> variant) (one per active CAB by FY16)
Theater Avn. Battalion (TA Bn)	0	4	25	88	57	8 UC-35, 16 C-12F (three cos. intra-theater light cargo/VIP transport)
Theater Avn. Company (TA Co)	1	0	4	28	5	3 UC-35, 5 C-12F (lt. cargo/VIP transport - in ROK)

*An air ambulance (AA) company is supposed to have 15 aircraft but some National Guard AA companies still have only 12. **Air Traffic Support

Table 1-24: Army Aviation Units (except ARSOF and MI aviation) (FY16)

An Army aviation battalion/squadron is a self-contained task force consisting of a headquarters company, an aircraft maintenance company, a forward support company (tactical supply) and three (or more) aviation companies. Exceptions include:

- Assault helicopter battalions (AHB) assigned to the 82d and 101st Airborne and 10th Infantry Division CAB(s) include a pathfinder company.
- A general support aviation battalion (GSAB), if assigned to a combat aviation brigade (CAB), has a heavy lift company (CH-47), a C3 company (UH-60), an air ambulance (AA with HH-60) company and an air traffic support (ATS) company.
- Support and Security Battalions (SSB) provide unarmed UH72A transport/ambulance helicopters for operations in benign environments. The UH-72A *Lakotas* is an unarmed modified Eurocopter EC-145. It resembles a “stretched” OH-58. It carries one or two crew and up to nine passengers or two stretcher cases; weight = 3,951-lbs (empty) or 7,903-lbs (max. takeoff); fuel = 229-gal (370nm range at SL); cruise speed = 133 knots.
- Army fixed wing aviation operates separate companies (eight aircraft each) or small battalions (two or three companies) of intra-theater transports. The C-12F *Huron* is a twin engine turboprop carrying up to 8 passengers or 2,310-lbs of cargo. Military intelligence aerial exploitation battalions also use it as an ISR platform. The UC-35A is the Army version of the Cessna Citation V *Ultra*. It carries seven to eight passengers.

Army aviation battalions are grouped into combat aviation brigades (CAB) and theater aviation brigades (TAB). Army doctrine used to recognize four types of CAB (light, medium, heavy and “expeditionary”), depending on their “mix” of AH-64 and OH-58 equipped ARB/ARS(s). It also had two types of TAB (“normal” and “composite”).

Currently, Army aviation is undergoing a comprehensive and painful reorganization. The Army’s Aviation Restructuring Initiative (ARI) affects all Army aviation units except those in ARSOF and aerial exploitation. Apart from an overall strength reduction, the major changes will be (1) retirement of the OH-58 and older AH-64(s) attack helicopters and (2) consolidation of the remaining AH-64(s) (including those currently belonging to the National Guard/Reserve) into twenty active Army ARS/ARB. The Guard and Reserve strongly oppose this move. While they may delay it they are unlikely to prevent it.

The Army has already eliminated two active CAB(s) and will eliminate a third by FY17. First to go was the 159th CAB, one of two organic to the 101st Air Assault Division. With only one CAB left the 101st is now an airborne division. This is the first time since 1963 that the Army has not had an air assault division within its force structure.

Each active Army CAB will have an ARS, an ARB, an AHB and a GSAB. The ARS includes three RQ-7 *Shadow* UAS systems (four aircraft per system) and will focus on recon missions. The ARB (with no RQ-7 systems) will focus on attack missions. Division headquarters directly tasks the division ERMP company but it belongs to the ARB administratively.

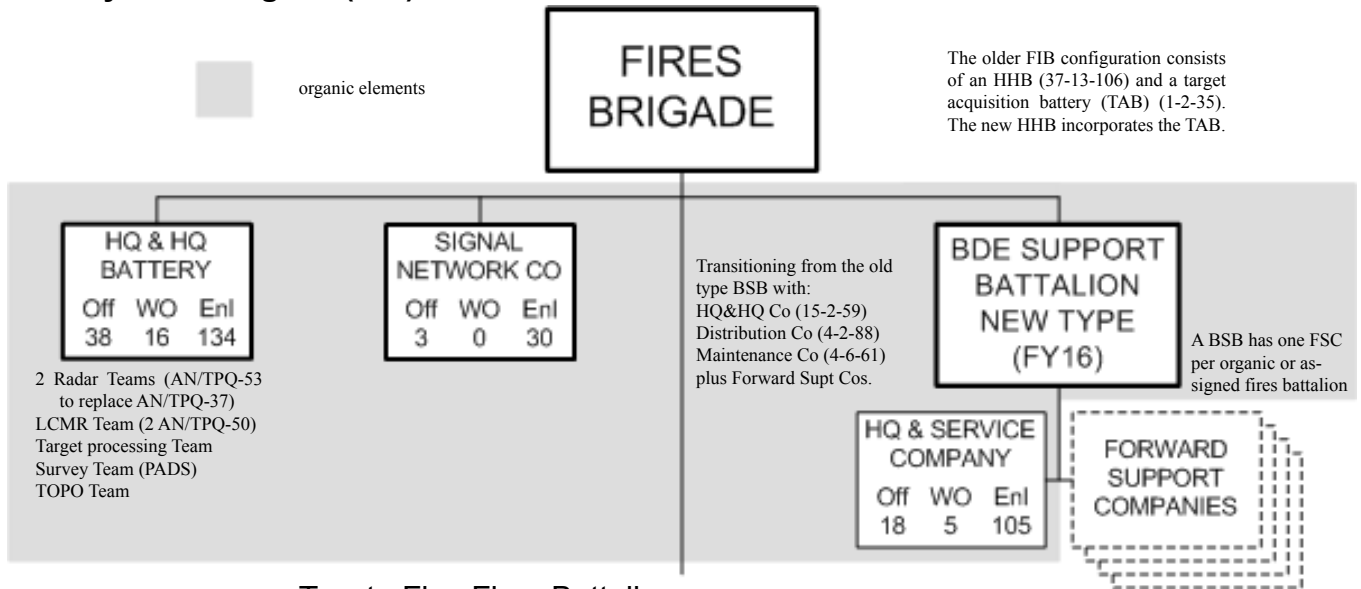
Each of the eight Army National Guard divisions will have an Expeditionary CAB (ECAB) with two AHB(s) and one GSAB (with two air ambulance companies). An ECAB has no attack helicopters, but the Army’s External Stores Support System (ESSS) gives a UH-60 four pylons for fuel tanks and/or weapons including AGM-114 *Hellfire* missiles (four per pylon) or a variety of gun/rocket pods. In theory this could allow at least some Guard H-60(s) to assume an attack role. The Army has not yet announced an attack mission for Guard H-60(s) but it might do so as part of a deal to end Guard opposition to ARI.

Only two TAB(s) will survive ARI. One will be a General Support TAB (TAB-GS). It will have all six of the National Guard’s SSB plus a special GSAB with two CH-47, one C3 and one AA companies. It will serve mainly in CONUS or permissive environments overseas. The other will be an Assault TAB (TAB-A). It will have four GSAB(s) (only one CH-47 company in each). It deploys to combat theaters to reinforce other aviation commands with C3, heavy lift and air ambulance assets. It may also operate autonomously.

See FM 3-04 *Army Aviation* (07-2015), FM 3-04.300 *Airfield and Flight Operations w/Chg 2* (08-2008), ATP 3-04.1, *Aviation Tactical Employment* (04-2016)

Organizations

f. Army Fires Brigade (FIB)



Two to Five Fires Battalions (any combination of the following:)

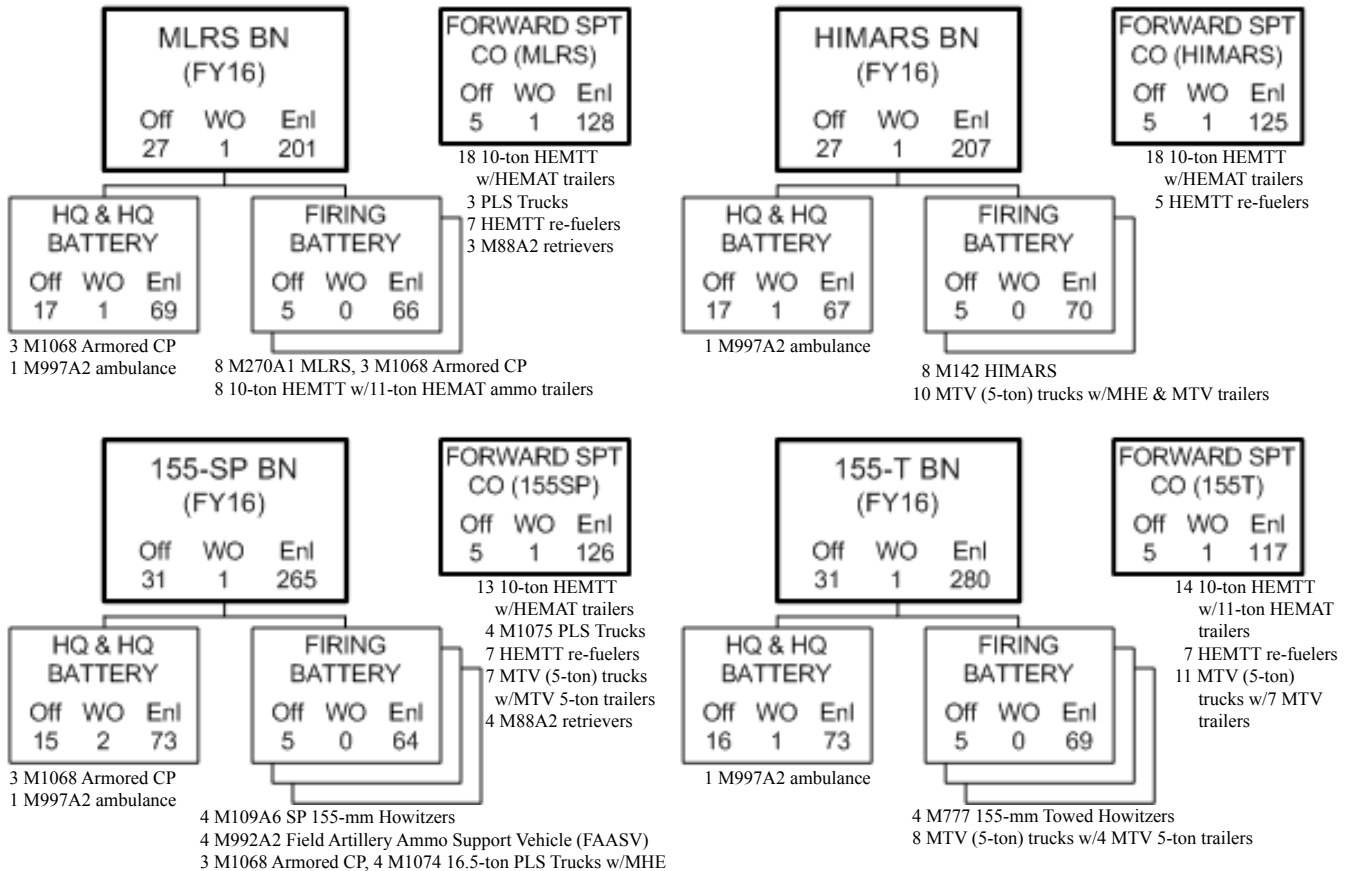


Figure 1-51: Army Fires Brigade Organization

Army Fires Brigades (FIB) command all Army field artillery assets not organic to brigade combat teams (BCT). A FIB is a task organized force that conducts strike operations for any joint, Service or functional headquarters. It is not oriented towards any particular geographic region. It may be attached to or under the OPCON of any division or higher headquarters, to include an Army Corps, a MEF or a MEF GCE.

As of early FY16, the Army had 12 FIB(s) (eight in the National Guard) with a total of 40 fires battalions (29 National Guard). A FIB has both organic and assigned elements. The organic elements, as indicated in Figure 1-51, include all of the brigade's headquarters and headquarters battery (including target acquisition assets), signal company, and brigade support battalion (BSB). Most FIB will also have one organic HIMARS or MLRS battalion with its associated forward support company (assigned to the FIB BSB). The remaining fires battalions (and associated FSC[s]) are only assigned to a FIB in garrison. They may be assigned to any FIB that deploys to an active theater.

An FIB artillery battalion is a “stripped down” organization consisting of little more than artillery pieces and their crews, fire direction elements, a medical platoon and a forward ammunition echelon. Except for a two-man PADS team (PADS = Position and Azimuth Determining System - using GPS), a FIB battalion has no survey or target acquisition assets (i.e. no forward observer, liaison, radar or met teams). It must instead rely on assets belonging to FIB-level target acquisition assets and to other artillery units whose fires the FIB reinforces. It depends on a forward support company (FSC) for all Level II and higher maintenance, all classes of supply except VIII (medical), and about half of its Class V (ammunition). FSC(s) operate as part of the FIB’s support battalion and not of the fires battalions they support (see 1014i).

To save manpower each FIB is losing its target acquisition battery (TAB). Essential TAB assets will be part of the FIB headquarters battery. The FIB BSB headquarters company is absorbing the key assets of its distribution and maintenance companies and becoming a headquarters and service company (HSC). The BSB continues to command the forward support companies of whatever fires battalions are assigned or organic to the parent FIB. As of FY16, all active Army and about half the National Guard FIB(s) had completed this process.

The fires battalions themselves are converting from a universal structure based on three firing batteries of six weapons each to three four-gun 155-mm batteries or two eight-system HIMARS/MLRS batteries. Currently, all FIB 155-mm battalions (both towed and self-propelled) exist only in the National Guard.

The Army suspended the reorganization of the HIMARS/MLRS battalions in FY12, when it was 80% complete. It resumed it in FY14 and all HIMARS/MLRS battalions will have the new structure before the end of FY16.

All active Army FIB battalions are either MLRS (six battalions, including two in Korea) or HIMARS (five battalions). The National Guard has two MLRS, 12 HIMARS, eight 155-mm SP and seven 155-mm towed battalions.

Even as the Army is reducing the number of its fires battalions it is actually increasing the number of headquarters controlling them. Though the Army seems to have scrapped plans to increase the number of FIB headquarters to 15, each active Army division is organizing its own division artillery headquarters. This headquarters plans and directs the fires of the fires battalions organic to the division’s BCT(s) and other supporting fires (from Army and Air Force aviation, FIB fires battalions, etc.). Most have no organic or assigned subordinate units (but the 1st Cavalry Division’s artillery headquarters [formerly the 41st FIB] has its own MLRS battalion) but do include target acquisition element (survey and target processing sections, a AN/TPQ-37 *Firefinder* and two AN/TPQ-50 LCMR radars).

End Item	Quantity		End Item	Quantity	
	HIMARS Bn	FSC		HIMARS Bn	FSC
HMMWV(s) all types (including 4 armament carriers)	45	12	HEMTT 10-ton 8x8 wrecker (M984)		4
LMTV (2.5-ton) cargo truck (M1078)	6	7	Light Tactical Trailers 1.25/2.25-ton M1101/1102	18	3
LMTV/MTV expandable vans (M1079/M1087)		2	LMTV (2.5-ton)/MTV (5-ton) cargo trailer M1082/95	3	1
MTV (5-ton) cargo truck (M1083/84/85) (10 per firing battery)	20	11	MTV 5-ton trailer M1095 (10 per firing battery)	20	7
MTV truck tractor (M1088) w/12-ton semi-trailer		1	M1112 400-gallon water trailer	3	2
HEMTT 10-ton truck (M977/85) w/HEMAT trailer (M989) (16 ammo)		18	M142 HIMARS Multiple Rocket Launcher System	16	
HEMTT 2,500-gal 8x8 fuel truck (M978)		5	Heavy Machinegun (.50-cal M2/40-mm MK-19)	32	15

Table 1-25: Selected Army High Mobility Artillery Rocket System (HIMARS) Battalion Equipment

Notes: A HIMARS vehicle carries 1 six-round rocket pod (5,095-lbs for M30 cluster munitions or 5,905-lbs for M31A1 unitary warheads) ready to fire. Loading a new pod takes five to eight minutes. A 5-ton MTV truck or trailer carries two pods (or four per truck-trailer combination). A 10-ton HEMTT truck (M977/ M985) or 11-ton HEMAT trailer carries four pods (or eight per truck-trailer combination). A HIMARS battalion carries up to 96 rocket pods (16 ready to fire and 80 on 20 MTV trucks with trailers). An MLRS battalion carries up to 160 rocket pods (32 ready to fire and 128 on 16 HEMTT trucks with HEMAT trailers). A HIMARS or MLRS forward support company carries 128 pods (on 16 10-ton HEMTT trucks with 11-ton HEMAT trailers). See page IV-16.

End Item	Quantity		End Item	Quantity	
	155T Bn	FSC		155T Bn	FSC
HMMWV(s) all types	55	12	HEMTT 10-ton 8x8 wrecker (M984)		5
LMTV (2.5-ton) cargo truck (M1078)	7	5	Light Tactical Trailers (LTT) 1.25/2.25-ton M1101/1102	25	3
LMTV/MTV expandable vans (M1079/M1087)		3	LMTV 2.5-ton trailer M1082	3	1
MTV (5-ton) cargo truck (M1083/84/85) (8 per battery)	24	11	MTV 5-ton trailer M1095 (4 per battery)	12	7
MTV truck tractor (M1088) w/12-ton semi-trailer		1	M1112 400-gallon water trailer	4	2
HEMTT 10-ton truck (M977/85) w/HEMAT trailer (M989) (12 ammo)		14	M777 towed 155-mm howitzer	12	
HEMTT 2,500-gal 8x8 fuel truck (M978)		7	Heavy Machinegun (.50-cal M2/40-mm MK-19)	39	17

Table 1-26: Selected Army 155-mm Towed Howitzer (155T) Battalion Equipment

Notes: An MTV (5-ton) truck or an MTV (5-ton) trailer should be able to carry 64 155-mm rounds each (128 per truck-trailer combination). An MTV serving as a howitzer prime mover will probably carry only 32 rounds. A HEMTT (10-ton) truck or HEMAT (11-ton) trailer can each carry up to 128 155-mm rounds (256 rounds per truck-trailer combination). A self-propelled 155-mm battalion can carry 39 rounds (two can be *Excalibur* guided projectiles) in each M109A6 howitzer and 93 rounds (of which three can be *Excalibur*) in each M992A2 Field Artillery Ammunition Support Vehicle (FAASV). A PLS flatrack (transportable on a PLS truck or trailer) could carry up to 224 rounds. A towed howitzer battalion could carry up to 896 rounds. A self-propelled battalion could carry up to 2,480. A forward support company for 155-mm howitzers could carry up to 3,072 rounds. The actual number of rounds carried will depend on policies established at theater level. One complete round of 155mm ammunition weighs approximately 145-lbs (exact weight depends on projectile type).

References: ATP 3-09.24 (*Fires Brigade Techniques* 11-12), ATP 3-09.32 (*JFIRE* 11-12); ATP 3-09.60 (*MLRS & HIMARS Ops* 01-14), FM 3-09 (*FA Ops & Fire Supt* 04-14), FM 3-09.21 (*TTP for the Field Arty Bde* 03-01), and FM 3-09.70 (*TTP for M109A6 Ops* 08-00).

Organizations

g. Military Intelligence Units

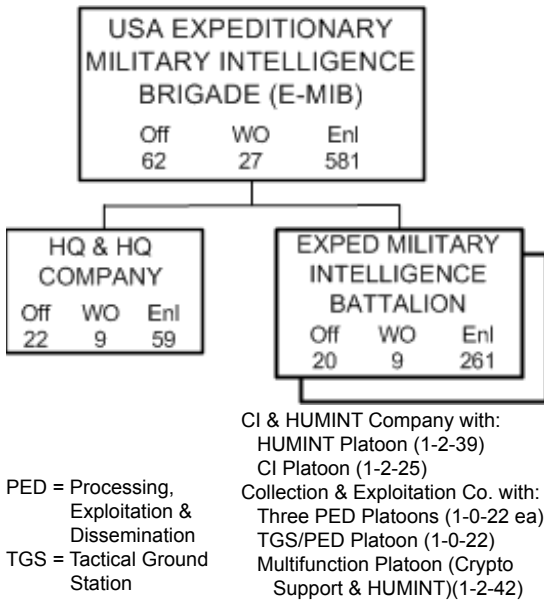


Figure 1-52: Expeditionary Military Intelligence Brigade (FY16)

brigades supported the Army's three "standing" corps (I, III, and XVIII Airborne). Each consisted of two combat electronic warfare intelligence (CEWI) battalions and a reconnaissance and surveillance (R&S) squadron (with long and short range scout teams). The CEWI battalions included substantial counter intelligence and HUMINT capabilities. The seven National Guard BFSB(s) were similar but had the only one CEWI battalion each. The BFSB was purely a collections unit with very little analytical capability.

The BFSB(s) were not a huge success. After they had served only eight years and made deployments to Iraq and Afghanistan, the Army decided, in the face of looming manpower reductions to reorganize them as single function expeditionary military intelligence brigades (E-MIB). An E-MIB has a smaller headquarters with two CEWI battalions only (see Figure 1-52). The seven National Guard BFSB(s) are reorganizing as two Reserve and two National Guard E-MIB(s). In lieu of the R&S squadrons, the Army is adding long range scout (LRS) companies to its corps headquarters battalions. These are significantly smaller. An LRS company has only nine rather than 15 six-man long LRS teams (same mission as USMC Force Recon teams) and it has no short range scout teams.

The three active E-MIB(s) are already converted (no active BFSB(s) remain). The National Guard and Reserve E-MIB(s) will have completed their conversions from BFSB(s) by the end of FY17.

See ATP 2-19.1 *Echelons Above Corps Intelligence Organizations*, 12-2015; ATP 2-19.3 *Corps and Division Intelligence Techniques*, 03-2015; FM 3-55.93 *Long Range Surveillance Unit Ops* 06-2009.

h. The Army Maneuver Enhancement Brigade (ME Bde¹)

The Army first introduced the ME Brigade concept in 2006. An ME Brigade secures and maintains the MSR(s) within an assigned AO. It has replaced division/corps rear operations centers, and assumed control of division/corps (MEF equivalent) engineer, EOD, MP, and CBRN functions. It may assume similar responsibilities for a Theater Army joint security area. The ME brigade itself is merely a command element forming the nucleus of a task force of mainly military police and general engineering units. It can add civil affairs, EOD, and CRBN elements as necessary. To deal with any "Level 3" security threat that might exist within its AO (see JP 3-10) an ME brigade may also include a battalion-sized Tactical Combat Force (TCF), usually a separate National Guard infantry battalion. As part of its current reorganization the Army has deactivated all its active ME brigades but is keeping three Army Reserve and 16 National Guard brigades. However, Reserve and National Guard brigades will be much less useful than active brigades for supporting protracted operations overseas.

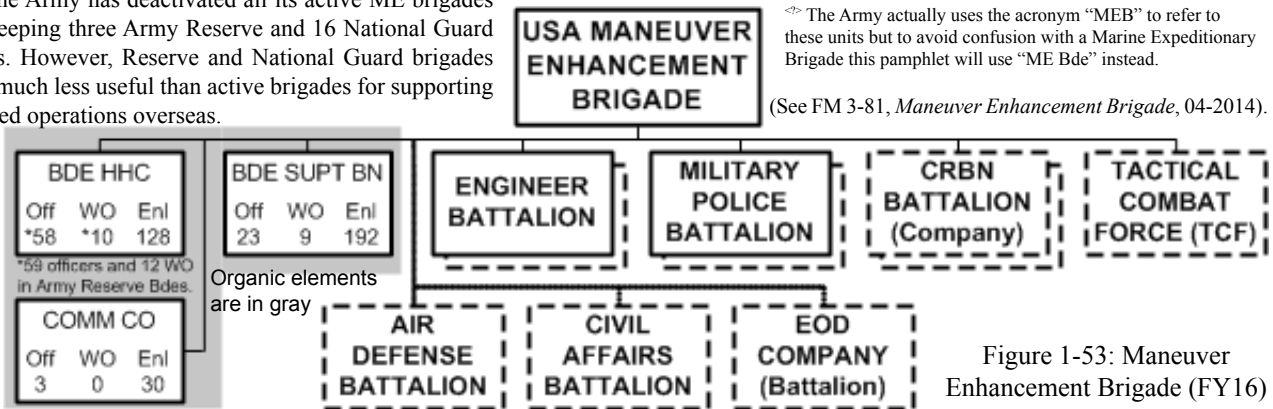
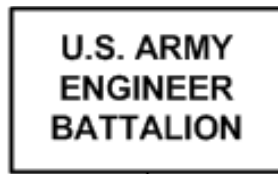


Figure 1-53: Maneuver Enhancement Brigade (FY16)

i. Army Engineers

A modular engineer battalion may have two to five (three or four is usual) engineer companies plus up to three separate sections, teams, platoons etc.



The Army has a 249th Engineer Prime Power Battalion in addition to its standard modular battalions. The 249th provides detachments with special expertise in the use and maintenance of electrical power equipment and/or systems. It has a unique T/O.

Note: Most Army engineer battalions specialize in either combat or general engineering. The subordinate units assigned/attached to them reflect this.

Figure 1-54: Army Modular Engineer Battalion Organization

The US Army has grouped most of its non-BCT engineers into modular battalions of the type shown in Figure 1-54, above. These battalions operate under the Army's 15 (four active) engineer functional brigades (two to five battalions each) or 22 maneuver enhancement brigades (two being phased out - see 1014h). Each consists of a "base" with a headquarters and headquarters company (HHC) and a forward support (CSS) company plus attached/assigned companies/detachments (Tables 1-27 and 1-28). Tables 1-29a and b display selected equipment items.

Unit Type		T/O Strength			Number of units (by component)			
		OFF	WO	Enl	Active	USAR	NG	Total
Engineer Battalion Base (HHC and forward support company - exact strengths vary)		22	5	132	11	26	47	84
Combat Engineering Companies	Engineer Sapper Company (tracked) (Sap-T)	5	0	98	5	6	9	20
	Engineer Sapper Company (wheeled) (Sap-W)	5	0	88	3	0	29	32
	Engineer Mobility Augmentation Company (MAC)	5	0	111	4	17	15	36
	Engineer Route Clearance Company (RCC)	6	0	142	12	12	4	28
General Engineering Companies	Engineer Multi-Role Bridge Company (MRBC)	5	1	177	4	9	13	26
	Engineer Horizontal Construction Company (HCC)	5	0	155	2	15	36	89
	Engineer Construction Company (ECC; ex-HCC) (new)	5	1	147	7	8	7	22
	Engineer Vertical Construction Company (VCC)	5	3	150	3	24	31	58
	Engineer Vertical Construction Company (VCC) (new)	5	1	148	0	11	11	22
	Engineer Support Company (ESC)	5	0	114	2	5	15	22
	Engineer Support Company (ESC) (new)	5	1	139	5	1	8	14

Table 1-27: Summary of Standard Army Engineer Companies (FY16)

Type	# of Units		Personnel			Capabilities
	AC	RC	Off	WO	Enl	
Asphalt Team	0	8	0	0	39	Can produce 2,250-tons asphalt & pave 3-4 miles single lane road/airfield per shift; mans one shift/day with organic personnel; if contract/indigenous labor available can man two shifts/day; supports up to five HCC(s)
Concrete Section	0	24	0	0	12	Mixes/pours up to 900 cu yds concrete per 10-hour shift; transports concrete; mans one shift/day with organic personnel; if contract/indigenous labor available can man two shifts/day; supports up to two VCC(s)
Quarry Platoon	0	8	1	0	34	Prepares 150+ tons rock/sand/gravel per hour; carries 130 cu yd per lift; mans one 10-hour shift/day with organic personnel; if contract/indigenous labor available can man two shifts/day; supports up to four HCC(s)
Eqpt Support Plt	0	12	1	0	41	Augments an HCC with 20-ton dump trucks and other equipment. Conducts borrow pit operations.
Area Clearing Plt	0	15	1	0	30	Uses robotic flail systems to clear anti-personnel (not antitank) mines in non-hostile environments.
SurveyDesign Tm	5	35	0	1	13	Conducts planning & surveys for engineer projects; assets to be integrated into engineer battalion HHC(s)
Fire Fighting Team	7	83	0	0	7	A fire fighting team is one fire engine (pumper) with crew; a fire fighting HQ controls two to eight teams; missions include fire prevention, aircraft crash/fire/rescue, fighting wildfires & petroleum fires
Fire Fighting HQ	0	18	0	1	2	
Heavy Diving Team	5	0	2	0	23	For construction/salvage; supports LOTS (logistics over the shore); six 3-member dive teams; max depth 190'
Utilities Detachment	0	21	1	1	52	Converted from asphalt teams; provides limited facilities engineering (mason/carpenter/plumbing/road maint)
Fwd Spt Tm, Main	0	5	22	1	11	Provides engineer planning/design services with reachback capability to CONUS; a main team supports a theater/ASCC and exercises C2 over advance teams that support divisions/corps
Fwd Spt Tm, Adv	8	19	7	0	1	
Geospatial Plan Cell	7	0	1	2	24	Theater/ASCC level geospatial planning; coordinates with Defense Mapping Agency/Host Nation Topo assets
Exp Hzrd Coord Cell	0	4	5	0	10	Gathers data on, tracks & predicts explosive hazard incidents; supports a theater army or JOA

Table 1-28: Selected US Army Small Engineer Units (FY16)

Notes: (Table 1-27) **Sapper Company (wheeled or tracked)**: has three sapper platoons (two 10-man squads each). This unit (a) breaches obstacles; (b) executes hasty route clearance (up to 120 km/75 miles per day); (c) augments construction and route clearing units; (d) fights as infantry when required.

(Table 1-27) **Mobility Augmentation Company (MAC)**: has two assault platoons and one counter mobility platoon. This unit (a) emplaces/marks minefields and other obstacles; (b) spearheads combined arms obstacle breaching and assault gap crossing; (c) craters roads; (d) destroys bridges and railroad lines.

(Table 1-27) **Route Clearance Company (RCC)**: three route clearance platoons (two sections each - a section has 2 *Huskys*, 1 *Buffalo*, and 2 Type II MRAP[s]). This unit does (a) route reconnaissance; and (b) up to 255 km/156 miles two-way route clearance per day. A sapper company may reinforce it.

(Table 1-27) **Multi-Role Bridge Company (MRBC)**: maintains and employs MGB and ribbon bridge equipment; can deploy up to 213 meters of class 75 (class 96 for wheeled traffic only) bridging or six class 75 rafts or four MGB(s). It can erect, dismantle, or transport its own bridges without requiring augmentation.

Organizations

Major Equipment Item	Bn HHC + FSC	Sapper Co Wheel*	Sapper Co Tracked*	MAC	RCC	HCC	VCC	ESC	Clearance Platoon
Field Kitchens (Assault (LTT)/Containerized 20-ft Truck fork lift, Atlas type (10,000 capacity)	4/1						1	1	
Tractor, full track, low speed T-9 (*T-5)					2	11		*4	2
Tractor, full track, high speed (DUECE)								2	
Tractor, Wheeled, industrial or w/excavator						2	3		
High Mobility Engineer Excavator (HMEE)					4			6	
Excavator: hydraulic (HYEX) crawler mount						4			
Compactor, high speed, tamping, SP (CCE)						2			
Loader, Scoop Type (all versions)						2		4	
Loader, skid steer (all versions)				4	1	6	12	8	
Crane: wheel mtd hydraulic AT422T/Type II						1			
Water distributor, SP, 2,500-gal (scraper chassis)									2
Motorized Road Grader					1	4		6	
Roller, motorized/vibratory						4		6	
Scraper, elevating/earthmoving, SP 11-18 cu yds						6		6	
HMMWV all types (includes 2 ambulances in HHC)	20	6	3	3	6	10	7	8	2
LMTV 2.5-ton cargo trucks M1078	10	1	1	1	1		4	1	
LMTV & MTV truck vans M1079/M1087	2								
MTV 5-ton cargo trucks (all types except LHS)	4			1		4	3	1	
MTV 5-ton truck tractors w/25-ton semi-trailers	**1							8	
MTV 10-ton dump trucks M1157		#9			2	10	9	#16	
MTV 5-ton wreckers M1089	1						1		
10-ton 8x8 HEMTT cargo trucks (all types)	6	1		10					
10-ton 8x8 HEMTT refueler trucks (all types)	6								
10-ton 8x8 HEMTT truck tractor (all types)					3	24			4
10-ton 8x8 HEMTT wreckers (all types)	1	1	1	1	1	1		1	
20-ton M915 series dump trucks						8	3		
PLS 16.5-ton heavy trucks M1074/1075	1		1	1	1	4	1	1	
PLS 16.5-ton heavy trailers M1076	6			4		3			
PLS Engr Mission Module - Water Distributor						3			
Hippo 2000-gal Water-tank PLS flatrack	2								
M870 40-ton semi-trailers					3	24			4
Trailer, light tactical M1101/02	***9	5	1		2	1	1	1	
Trailer medium LMTV/MTV cargo types	7	6	6	5	2	17	9	15	
Medium trailers with power plants/generators	3	3	3	4					
Medium trailers with mine clearing launchers		3	3	4					
Trailer, medium, water M1112 (400-gal)	3	1	1	1	1	1	1	1	
M1068/M577A3 armored CP	1		1	1					
M113A3 armored personnel carriers	2		13	13					
Armored Vehicle Launched Bridge 63 ft MLC70				6					
M88A1 armored recovery vehicle (medium)	1		1	1					
Tractor M9 ACE				4					
Mine Detecting Set AN/PSS-14	8	20	20	12	26	8	8	8	6
Mine Dispenser M139 HTLD Volcano				4					
Vehicle Mounted Mine Detector (VMMD <i>Husky</i>)					12				
Mine Protected Clearance Vehicle (<i>Buffalo</i>)					6				
Robotic Medium Flail countermine system									2
Medium Mine Protected Vehicle Type II (RG-33?)					18				4
<i>Javelin</i> ATGM command launch units		3	3						1
Heavy machine guns (0.50-cal/MK-19)	15/1	7/4	14/4	13/4	22/1	6/1	5/1	6/1	5/1
Light machine guns (7.62-mm/5.56-mm)	6/19	10/14	10/14	8/9	10/18	0/20	1/18	0/20	2/4
M203/M320 40-mm grenade launchers	8	16	16	12	16	4	4	8	4

Notes: SP = Self Propelled; *Also has three *Raven* UAS; **Semi-trailer is a 12-ton supply van; ***Three are generator trailers #5-ton dump trucks if an airborne company

Table 1-29a: Selected Equipment Items Organic to Standard U.S. Army Engineer Units

(Table 1-27) General (Construction) Engineer Companies: Based on recent experience the Army is reorganizing its construction engineers. This is to correct capability shortfalls resulting from overmodularization. In other words, construction units are too specialized. Construction projects are seldom purely vertical or horizontal in nature. Those too small to justify more than a company sized force currently require a task force created by breaking up several units to obtain essential skill sets. This is an inefficient use of resources. The current reorganization incorporates both vertical and horizontal capabilities within construction companies. New companies also have 2-man survey cells and battalion HHC(s) survey sections (1 WO, 7 Enl ea.) to replace survey and design teams.

- Horizontal Construction Company (HCC): two horizontal construction platoons; one equipment support platoon; repairs/maintains/constructs roads and airfields; prepares bridge sites, emplaces culverts; hauls construction materials; clears and grubs; emplaces force protection/battlefield defensive measures.
- Construction Company: two horizontal platoons; one vertical platoon; horizontal platoons as above; vertical platoon as below; replacing HCC(s).
- Vertical Construction Company (VCC): old type (three vertical construction platoons); constructs, repairs and maintains base camps, detention facilities and other vertical infrastructure. New type (two vertical construction platoons; one engineer support platoon); adds a survey cell and limited horizontal construction/repair, and lifting/hauling assets for facilities operations.

Major Equipment Item	Construction Co	VCC (new)	ESC (new)	MRBC	Asphalt Ops Tm	Concrete Tm	Quarry Pit	Eqpt Spt Plt	Utilities Det
Bridge Erection Boat (BEB) w/cradle				14					
MGB Bridge set (dry) with launcher				4					
Interior/Ramp Bays, Improved Ribbon Bridge				30/12					
Boat, landing, inflatable 15-man w/outboard motor				20					
Truck fork lift (Atlas except *LCRTF)		*1							1
Tractor, full track, low speed T-9	8	2		1				1	
Tractor, Wheeled, industrial or w/excavator	4	2	7						1
High Mobility Engineer Excavator (HMEE)				4					
Excavator: hydraulic (HYEX) crawler mount	3	2		1			2		
Small Engineer Excavator (SEE) with Auger									1
Compactor, high speed, tamping, SP (CCE)	2								
Loader, Scoop Type (all versions)	1		2						
Loader, skid steer (all versions)	5	4	6	1	1	1			
Pneumatic Tool/Compressor Outfit trailer mtd									1
Crane: wheel mtd hydraulic AT422T/Type II	1	1	1	1				2	
Water distributor, SP, 2,500-gal (scraper chassis)			1						
Crush screen & wash plant							1		
Hot oil heater, electric, trailer mtd 2.1mil BTU output					1				
Motorized Road Grader	4	1	6		1		1		1
Concrete mixer, rotary tiller, diesel, self propelled						1			
Asphalt melter, skid mounted, 750 GPH					1				
Paving machine, bituminous					2				
Roller, motorized	2	2	2		4				1
Scraper, elevating/earthmoving, SP 11-18 cu yds	6	2	1	7					
Towed rotary sweeper, gas or diesel	4				2	1			
HMMWV troop/cargo types	10	8	10	12			1	2	7
LMTV 2.5-ton cargo trucks M1078	1	2	1	4					
MTV 5-ton cargo trucks (all types except LHS)	7	6	6	1	2		2	1	
MTV 8.8-ton MTV LHS cargo truck M1148				2					
MTV 5-ton truck tractors w/25-ton semi-trailers			2						
MTV 10-ton dump trucks M1157	8	9	10			1	2	2	**1
10-ton 8x8 HEMTT cargo trucks (all types)				58					
10-ton 8x8 HEMTT refueler trucks (all types)	1	1	1	2					
10-ton 8x8 HEMTT truck tractor (all types)	17	8	2	2	7	1		6	
10-ton 8x8 HEMTT wreckers (all types)	1	1	1	2					
20-ton M915 series dump trucks	7	6	1		2		10	8	
20-ton M915 series truck tractors							2		1
PLS 16.5-ton heavy trucks M1074/1075	3	2	1	1	3	4	1	1	1
PLS 16.5-ton heavy trailers M1076	2	1		44		4	1	1	1
PLS Dump body module, 14-ton					4	6			2
PLS Concrete mixer module, 2,600-gal						3			1
PLS Spreader, bituminous module 2,500 gal					2				
PLS Engr Mission Module - Water Distributor					1				
M870 40-ton semi-trailers	17	8	2	2	6	1	2	6	1
Trailer, light tactical M1101/02	1	1	1	6			1		1
Trailer medium LMTV/MTV cargo types	14	17	15		1	1		7	
Trailer, medium, water M1112 (400-gal)	1	1	1	1					
Portable Concrete Mixer		2							
Mine Detecting Set AN/PSS-14	8	4	6	16	2		2	2	
Heavy machine guns (0.50-cal/MK-19)	5/1	8/1	6/1	4/1					
Light machine guns (7.62-mm/5.56-mm)	0/20	4/19	0/19	0/22	4	1	3	4	6
M203/M320 40-mm grenade launchers	4	4	8	4					

Notes: *Light Capability Rough Terrain Forklift (LCRTF) 5k lb. capability; **uses a 5-ton dump truck instead

Table 1-29b: Selected Equipment Items Organic to standard U.S. Army engineer units (continued)

- **Engineer Support Company (ESC):** old type (two light and one medium rapidly deployable earthmoving (RDE) platoons); runway repair; initial base camp construction; non-explosive obstacle breaching and area clearing; builds tactical UAV airfields, ALZ(s) and HLZ(s). New type (two mixed rapidly deployable earthmoving (RDE) platoons and one vertical construction platoon) offers limited vertical construction capabilities, a survey cell, and about two thirds of the old engineer support company's horizontal construction capabilities.

(Table 1-28) Separate engineer platoons/sections/teams provide special capabilities. These can be in the areas of construction support, mine clearing, diving, well drilling, facilities maintenance, vertical or horizontal construction augmentation, geospatial and infrastructure (including fire fighting and prime power) support. In the Army, the Quartermaster Corps, not the engineers, is responsible for water supply/production, bulk fuel, and field services (laundry, showers, etc.). Army engineers build the facilities required for these functions but quartermasters operate them. Likewise, the Army EOD mission belongs to the Ordnance Corps. Army engineers detect, investigate, and sometimes clear (detonate) explosive hazards but do not dismantle them.

References: FM 3-34 (Engineer Opns 04-14); ATP 3-34.22 (Engineer Opns BCT & Below 12-14); ATP 3-34.23 (Engineer Opns Above BCT 06-15); ATP 3-34.40 (General Engineering 02-15); FM 3-34.480 (Engineer Prime Power Opns 04-07); Engineer Construction Force Design Update (05-13 updt 02-14)

Organizations

j. The Modular Army Sustainment System

In 2006 the U.S. Army began to reorganize its service support forces and change its logistics doctrine. This process was part of the Army-wide “Modular Force” restructuring to meet the requirements of the War on Terror. It was largely complete by FY11.

Sustainment is one of eight elements of combat power for the Modular Army (see ADP 3-0 *Unified Land Ops* 08-12). By doctrine, sustainment operations provide freedom of action, endurance and operational reach for Army forces. Sustainment consists of three elements: logistics, personnel services and health service support. These are further described as follows:

- 1) Logistics comprise planning/execution of movement/support of forces; design, development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; acquisition, operation, maintenance and disposal of facilities; acquisition of services; and explosive ordnance disposal (see ADP 4-0 *Sustainment*).

Army logistics include the following functions:

- Maintenance (second echelon and higher)
- Transportation (includes movement control, inter modal operations and container management)
- Supply (all classes)
- Field Services (includes shower & laundry, field feeding, water, clothing repair, air delivery, postal, and mortuary affairs)
- Distribution
- Operational contract support
- General service support

- 2) Personnel services man and fund the force, administer personnel, and promote morale. They include the following functions:

- Human resources support
- Financial management operations
- Legal support
- Religious support
- Band support

- 3) Health service support (HSS) for the force also includes force health protection. The Army Medical Department (AMEDD) operates the Army Health System (AHS) and is the main HSS provider (ATTP 4-02). AHS functions are:

- Casualty care (includes care of disease and non-battle casualties)
- Medical evacuation
- Medical logistics

The Army’s old sustainment doctrine (dating from World War II) relied on a “pull” system under which logisticians stockpiled supplies at Army (Theater Army) level supply points within the combat theater, advancing them as necessary to keep them within two to three hours’ driving time of the units they supported. Supported units “pulled” the supplies they needed, using their own transportation. Higher echelons (division, corps, army, etc.) reinforced user transportation as needed to ensure adequate deliveries during periods of peak demand.

Current doctrine is much more oriented towards a “push” system. In a push or “just in time” system logisticians push supplies to supported unit using the logisticians’ own transportation assets. They anticipate requirements using prior usage data and user requisitions. The emphasis is on getting user units what they need (but not more) when they need it (but not sooner). This minimizes stockpiling. Logisticians also handle second echelon maintenance (formerly a user responsibility) as well as third and fourth echelon. Logisticians (rather than using units) handle most pay, finance and personnel administration matters. Table 1-30 illustrates the distribution-based system’s simplified command structure.

Command Echelons	Old “Push” Based Support Echelons (1)	New Modular “Pull”-Based Sustainment System Echelons	Health Service Support System Echelons
Theater Army ASCC or JOA	Theater Support Command	Theater Sustainment Command (TSC) Expeditionary Sustainment Cmd. (ESC)	Medical Command or Medical Bde (small theater only)
Army Corps	Corps Support Command	Sustainment Brigade	Medical Brigade
Division	Division Support Command		
Brigade or BCT	Forward Support Battalion	Brigade Support Battalion (BSB)	Brigade Support Medical Co. (2)
Maneuver Battalion	Battalion Service Platoon and Maintenance Platoon/Section	None organic but a Forward Support Co. from the BSB provides direct support	Battalion Medical Platoon

(1) No longer in use but included for comparison; (2) Exists in a BCT only. A functional or multifunctional support brigade will only have a medical platoon or section.

Table 1-30: Army Combat Service Support Command Echelons

In its wars in Iraq and Afghanistan the Army has relied less on its own sustainment units and more on support from civilian contractors. This was due in part to the limited mobilization/availability of Army Reserve/National Guard units.

A Theater Sustainment Command (TSC) is the senior (“two star” level) headquarters for the sustainment system of a theater army (or ASCC). A theater army/ASCC is subordinate to a geographic combatant command (GCC). It provides C2 for theater opening (TO) and theater distribution (TD) as well as sustainment operations. The Army’s five TSC(s) are committed as follows:

- The 1st TSC is the logistical headquarters for ARCENT (3d Army).
- The 8th TSC is the logistical headquarters for USARPAC (and 8th Army).

- The 21st TSC supports USAREUR (7th Army) and AFRICOM. Because it is forward deployed it will likely assume an Expeditionary Sustainment Command mission when directing logistical operations in an active theater (see below).
- 167th TSC (National Guard) is earmarked for USARNO (5th Army) and USARSO (6th Army).
- 377th TSC (Army Reserve) is earmarked for USAREUR and has elements forward deployed with USAREUR.

A TSC typically operates from a “sanctuary” area outside its geographic theater. It employs one or more **Expeditionary Sustainment Commands (ESC)** to establish command and control of operational level logistics within a specified area of operations (AO) or joint operating area (JOA). An ESC is a “one star” headquarters that acts as the forward command post of its parent TSC. If the TSC elects to deploy forward and assume an ESC mission within a given AO/JOA, any ESC already operating in that AO/JOA would re-deploy and/or be re-assigned elsewhere. See ATP 4-94, *Theater Sustainment Command* (2013)

Note that while JP 1-02 defines “sustainment” as covering all aspects of logistics, in practice the Army’s sustainment system provides medical support above the BCT echelon only in special situations. Normally, Army health services above the BCT operate under their own chain of command independently of the rest of the sustainment system (see paragraph 4003h).

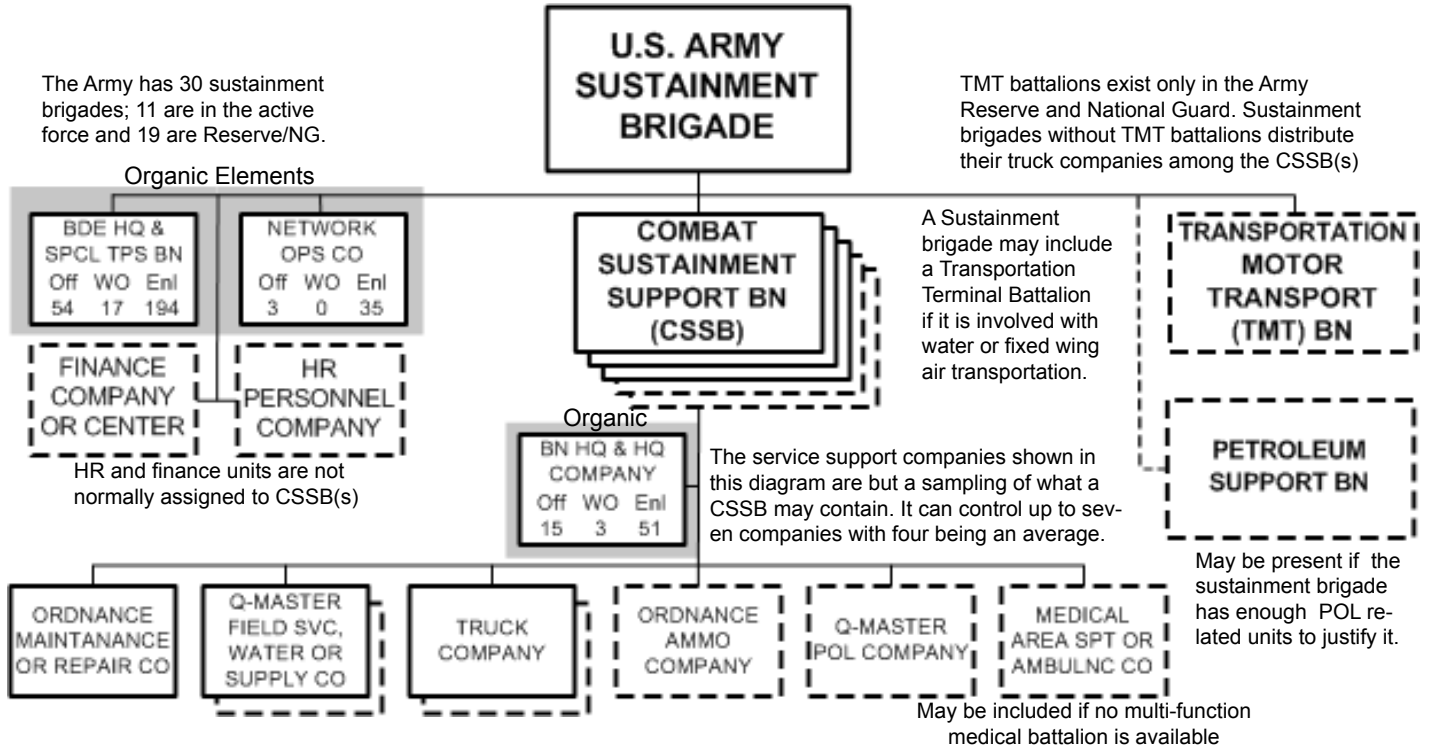


Figure 1-55: Army Sustainment Brigade Organization (typical configuration)

Sustainment Brigades are the subordinate commands of the TSC/ESC(s). They replace division and corps support commands (see Table 1-30). Each has a common command element and three to seven task-organized battalions (each with three to seven separate companies). The battalions can be combat sustainment support battalions (CSSB) (16 of 85 are active), motor transport battalions, (19 Reserve/National Guard only), ammunition battalions (two Army Reserve), transportation terminal battalions (for air/water transport – three of eight are active) or petroleum battalions (one of 14 is active). The exact composition of a given sustainment brigade is entirely METT-TC dependent. It is typically OPCON to a TSC/ESC, which assigns it an AO and the mission of supporting all friendly units within that AO. If the supported units are BCT(s) or multi-functional support brigades, the sustainment brigade deals with them through their brigade support battalions (BSB). A sustainment brigade may be OPCON to a division headquarters. Figure 1-55 shows the configuration of a typical sustainment brigade.

The basic missions of a sustainment brigade (see ATP 4-93, *Sustainment Brigade*, 2013) are as follows:

- **Theater Opening:** This is the establishment and initial operation of ports of debarkation (air, sea or rail) and sustainment bases. It includes facilitating port throughput for the reception, staging and onward movement of forces entering a theater of operations.
- **Theater Distribution:** This covers the receipt, storage, issue, transportation, configuration, reconfiguration, classification, trans-loading, and collection of stocks and unit equipment. It also includes the reception and transportation of units and replacement personnel. It is normally conducted according to the TSC theater distribution plan (ATTP 4-0.1, *Army Theater Distribution*, 2011).
- **Sustainment:** This is the provision of the logistics, personnel services, and health service support necessary to maintain operations until mission accomplishment (ADP 4-0, *Sustainment May* 2012). It includes the following three sub-functions:
 - **Logistics:** (ATP 4-93)
 - **Maintenance:** For maintenance, the Army’s guiding principle is “replace forward; fix rear.” It doctrinally recognizes field maintenance and sustainment maintenance. Field maintenance repairs items, typically in forward areas, to restore them to service with their current users. Sustainment maintenance (typically performed further to the rear) repairs items for return to

Organizations

the supply system while issuing replacements to the original users. The Army (FY16) has 72 support maintenance companies for field maintenance and 10 component repair companies for sustainment maintenance. All are task organized. (See ATP 4-33, *Maintenance Operations*, 2014 and ATP 4-31/MCRP 4-11.4A *Recovery and BDAR*, 2014).

- **Supply:** Sustainment brigades do not normally handle Class VI (personal demand items) or Class VIII (medical). Items other than Classes V and VIII are primarily a Quartermaster Corps responsibility.
 - **Class I (ration and water):** Subsistence platoons found in Quartermaster supply companies and composite supply companies receive and distribute rations. The operational commander determines the number of days of supply (DOS) kept on hand. Rations are often "pushed" to supported units based on current strength reports rather than "pulled" by specific requests from the support units. Brigade support battalions will have water purification systems and at least some mobile storage capability. Modular Quartermaster Water Purification and Distribution Companies provide tailored operational and tactical level water production, storage, and bulk area distribution. The water sections in composite Quartermaster supply companies also have this capability. However, in the early stages of an operation, before its own water units are up and running, the Army will frequently rely on commercial packaged/bottled water. *For water supply equipment see 4023; for food service supply/equipment see 4024.*
 - **Classes II (general supplies), III (P) (packaged fuel) and IV (construction materials):** As with Class I (ration) they are shipped to the sustainment brigades in theater in 40-foot ISO sea containers. The supply platoons in the Quartermaster supply and composite supply companies (operating under the sustainment brigades' CSSB(s)) receive this cargo, transfer it to lighter, less conspicuous "tactical" trucks for forwarding to supported units as required.
 - **Class III (B) (bulk fuel):** In the Army this is a Quartermaster Corps responsibility. The Army's 12 Quartermaster Petroleum Pipeline and Terminal Operations (PPTO - all Army Reserve) companies are each roughly equivalent to two USMC bulk fuel platoons. They receive fuel delivered to the theater and pump it forward. A PPTO company stores up to 2.1 million gallons; operates up to 90 miles of pipeline; and pumps up to 720,000 gallons per day. Petroleum support companies (three active and 25 Army Reserve) receive and store fuel (in fuel farms) and forward it to brigade support battalions using POL truck companies (with 5k or 7.5k gallon fuel semi-trailers) or PLS truck companies with flatrack fuel tanks (see Table 1-32). Each petroleum support company is task organized with a variable number of platoons (usually three). Most are 50k platoons. A 50k platoon operates two storage sections (six 50k bags each) and an area support section (six 20k bags). A 210k platoon (found in seven Army Reserve companies) has four 210k bags in lieu of the six 50k bags of a 50k company. POL companies can serve under a CSSB or one of the Army's 14 (one active, the rest Reserve) POL support battalions. A POL support battalion would typically have one or more PPTO and/or POL support companies and one or more POL truck companies. (See ATP 4-43, *Petroleum Supply Operations* 2015).
 - **Class V (ammunition):** Ammunition flows into a theater through a theater ammunition supply point (ASP). Theater level ASP personnel store and reconfigure ammunition loads and then ship them to corps/division level ASP(s) or directly to BCT-level ammunition transfer and handling points (ATHP). Sustainment brigades control the ASP(s). The Army defines an ASP as an ammunition support activity operated by one or more modular ammunition platoons. An Army ammunition company normally consists of three ammunition platoons (it can control up to five) and a section of two rough terrain container handlers (RTCH). It can operate under an ammunition battalion or a CSSB. One ammunition platoon can store up to 11,237 ST of ammunition and its organic material handling equipment can lift up to 1,128 ST/day. Three platoons can operate a division-sized ASP. One platoon can support a brigade. The platoons may be widely dispersed and operate independently. The rough terrain container handler (RTCH) section enables a platoon to handle 20-foot sea containers. Much of the ammunition arriving at a theater ASP and a smaller proportion of that arriving at division ASP(s) will be containerized. Ammunition companies and platoons provide support on an area basis. They are not normally attached to or in direct support of any specific maneuver or fires unit. To order ammunition, brigade ammunition officers send requests via their supporting sustainment brigade to the TSC/ESC and Theater Army for approval. (See ATP 4-35, *Munitions Operations and Distribution Techniques* 2014 and FM 4-30, *Ordnance Operations* 2014)
 - **Class VII (major end items) and Class IX (repair parts):** These are handled similarly to Classes II, III(P), and IV but because of their high cost, Class VII items are closely controlled through command channels.
- **Field Services:** This includes showers, hygiene, laundry, clothing repair and mortuary affairs. Quartermaster field service companies provide all field services except mortuary affairs (see ATP 4-42 *General Supply and Field Service Ops*, 2014 and FM 4-40 *Quartermaster Ops*, 2014). Quartermaster collection companies recover, register and evacuate human remains.
- **Transportation:** The TSC/ESC staff employs movement control battalions (MCB) to control movement throughout the combat theater. An MCB is usually assigned or attached to the senior logistics headquarters in its theater. It controls four to ten movement control teams (MCT), depending on AO requirements. An MCT (3 officers, 18 enlisted) operates as four sub-teams (in separate locations) and performs all movement control related tasks. An MCB places MCT(s) with the G/S-4(s) in division and sustainment brigade headquarters, motor transport and terminal battalions, air or sea ports and along MSR(s). Sustainment brigades (and below) control operational and tactical intra-theater transportation. This is mainly surface transportation (trucks [Tables 1-31 & 1-32] and sometimes rail). Air (fixed-wing and helicopter) and water transportation (for Army watercraft see section 2009) can serve as needed and available. (See ATP 4-16, *Movement Control* 2013; ATP 4-14 *Expeditionary Railway Center Ops*, 2014; FM 4-01.45 *Tactical Convoy Ops* 2009; and ATP 4-15 [FM 55-50], *Water Transportation Ops*, 2011.)

As part of its transportation mission a sustainment brigade establishes and maintains a "hub and spoke" type support network of centralized receiving and shipping points (CRSP), theater distribution centers (TDC) and convoy support centers (CSC).

A CRSP is a dock-to-dock distribution center. It funnels cargo to forward operating bases or other CRSP(s). It rarely handles Class V (ammo) or holds cargo more than 24 hours. A TDC, usually positioned near a major road, airfield or railhead, acts as a super CRSP that also warehouses and performs supply management, movement control and cargo handling functions. CSC(s) of variable size and capability are “truck stops” established along main and alternate supply routes where convoys can refuel, perform limited maintenance and rest/relieve crews.

Type		No. of Cos.		Equipment
		AC	RC	
Light-Medium Truck Co		0	26	(5 squads) 50 MTV 5T trks w/25 MTV trlrs + (1 squad) 10 MTV truck tractors w/22T semi-trailers
Medium Truck Co.	M915 (Cargo)	4	46	(6 squads) 60 M915 15T truck tractors w/34T semi-trailer (M871)
	M915 (POL 5k)	0	20	(6 squads) 60 M915 15T truck tractors w/5k gal refueler semi-trailer (M969)
	M915 (POL 7.5k)	0	8	(6 squads) 60 M915 15T truck tractors w/7.5k gal refueler semi-trailer (M1062)
	MTV (Cargo)	0	21	(6 squads) 60 MTV 5T truck tractors w/22T semi-trailer (M872)
	MTV (POL)	3	4	(6 squads) 60 MTV 5T truck tractors w/5k gal refueler semi-trailer (M969)
	PLS	3	37	(6 squads) 60 PLS 16.5T trucks w/PLS 16.5-ton trailers (w/container handling equipment)
Composite Truck Co (Lt)		7	3	(8 squads) 40 PLS trucks w/PLS trailers; + (8 squads) 40 MTV trucks w/MTV trailers, 20 MATV
Composite Truck Co (Hvy)		5	1	(8 squads) 40 PLS trks w/trlrs; + (4 squads) 20 MTV trucks w/trlrs; + (3 squads) 18 HET, 20 MATV
Heavy Truck Co (HET)		4	12	(12 squads) 96 M1070 HET w/M1000 trailers (one active HET co. has only 9 squads and 72 HET)

AC = Active Component; RC = Reserve Component; HET = Heavy Equipment Transporter; 7.5k POL truck companies not for off-road use.

Table 1-31: Army Truck Companies (FY16)

The Army plans to reorganize its medium and light-medium truck companies to give them organic convoy escorts. This will involve replacing two trucks per 10 truck squad with two MATV escort vehicles (see 2001d and Table 2-8) and accepting a 20% loss in cargo capability. However, only the composite companies have actually made the change. Since few MATV(s) are currently available these companies use armored HMMWV armament carriers instead.

Composite truck companies reach IOC in FY15. They operate under sustainment brigades/battalions. A light composite truck company supports either an army corps or a division that does not include an ABCT. A heavy composite truck company supports a division that does include one or more ABCT.

Medium cargo truck companies have two semi-trailers per tractor to facilitate trailer transfer operations. POL/PLS companies have only one trailer per tractor.

Supply Class or Load Type	Lt-Mdm Truck Co (MTV)	Medium Truck Company						Composite Truck Co		Heavy Truck Co (HET)	
		MTV w/22T Semi-Tlr		M915 w/34T Semi-Trailer			PLS	Light (PLS & MTV)	Heavy (PLS, MTV & HET)		
		Cargo Co	5k POL Semi-T Co	Cargo Co	5k POL Semi-T Co	7.5k POL Semi-T Co					
Total Capability (STON if dry cargo or gallons if liquid) Per Lift Per Company (assuming 100% equipment available)											
Class I	303.1	561.6	N/A	748.8	N/A	N/A	748.8	834.4	666.8	N/A	
Class II	156.9	290.6	N/A	387.5	N/A	N/A	387.5	431.8	345.0	N/A	
Class III (P)	319	590.8	N/A	788.0	N/A	N/A	788.0	878.1	701.7	N/A	
Class IV	381.1	706.1	N/A	941.5	N/A	N/A	941.5	1,049.1	838.4	N/A	
Class V	446.6	820.8	N/A	1,094.4	N/A	N/A	1,094.4	1,219.5	974.5	N/A	
Class VI	189.5	351.1	N/A	468.1	N/A	N/A	468.1	521.6	416.8	N/A	
Class VII	176.1	326.4	N/A	310.3	N/A	N/A	310.3	485.0	387.6+18 Tanks	96 Tanks	
Class VIII	186.5	345.6	N/A	460.8	N/A	N/A	460.8	513.5	410.3	N/A	
Class IX	177.1	444.0	N/A	592.1	N/A	N/A	592.1	659.7	527.2	N/A	
20' Container	10	60	N/A	120	N/A	N/A	120	80	80	N/A	
Water (gals)	Hippo	20,000	160,000	N/A	240,000	N/A	N/A	240,000	160,000	160,000	N/A
	SMFT	30,000	180,000	N/A	285,000	N/A	N/A	N/A	N/A	N/A	N/A
POL (gals)	TRM	25,000	120,000	N/A	300,000	N/A	N/A	300,000	200,000	200,000	N/A
	Semi-Tlr	N/A	N/A	500,000	N/A	240,000	360,000	N/A	N/A	N/A	N/A
463L Pallets	95	120	N/A	240	N/A	N/A	240	240	200	N/A	

Hippo and TRM are water (2kgal) and fuel (2.5kgal) LHS flatracks, respectively; Hippos are replacing SMFT (Semi-trailer Mounted Fabric Tanks).

Table 1-32: Army Truck Company Cargo Capabilities

The data in Table 1-32 are from the Logistics Management Institute (LMI) study AR738T1 of 2009. LMI looked at the weight of shipments to Kuwait for Operation Iraqi Freedom (OIF) from January to June 2003. Separating the data by class of supply allows cargo densities to be calculated. This data is currently used to determine truck company requirements. The data above assumed only one semi-trailer per truck-tractor and no MATV(s) except in the composite truck companies (see Table 1-31). Except in emergencies only MTV 5-ton cargo trucks (not truck tractors) may carry troops. MTV cargo trucks are found only in light-medium truck companies and composite truck companies. In a Ground Assault Convoy (GAC) configuration one MTV carries 10 troops. In a tactical repositioning configuration it carries 14. A light-medium truck company can carry an infantry battalion in GAC mode. A HET/trailer combination carries four passengers plus one Class 70 or two Class 30 or smaller vehicles. It will not normally carry any other cargo. See CASCOM, “Transportation Planning Factors” July 2014; ATP 4-11, *Motor Transport Operations* July 2013; and FM 4-01, *Army Transportation Operations* April 2014.

- **Contracting:** The Army’s Contract Support Brigade (CSB) is the primary agent for theater support contracting. When deployed, the CSB (or its subordinate battalions or teams) is normally OPCON to the TSC/ESC and supports the sustainment brigades. CSB elements will not be attached to a sustainment brigade unless it is the senior logistics headquarters in the theater. (See ATP 4-92, *Contracting Support to Unified Land Operations*, 2014)
- **General Engineering:** Although a TSC/ESC or sustainment brigade will not normally have OPCON over engineers they cannot function without them. Army quartermasters, for example, operate and maintain fuel farms but need engineers to build them. Engineers also build or repair MSR(s), airfields, ports, CRSP networks, TDC(s) and CSC(s) and provide prime power. Engineer support for theater sustainment usually comes from a functional engineer brigade or a theater engineer command.

Organizations

- **Personnel Services:**
 - **Human resources (HR) support:** This includes personnel management, strength/casualty reporting, postal operations and reception, replacement, redeployment, rest and recuperation, and return-to-duty (R5) operations. Brigade and battalion S1/G1 sections focus on personnel management. HR units, serving under a TSC/ESC or a sustainment brigade focus on casualty reporting, R5 and postal operations.
 - **Financial management (FM):** Mainly for disbursing and payment for contractual services. A sustainment brigade includes an FM support operations team and may have an FM company assigned or attached.
- **Health Service Support:** This is discussed in Paragraph 4003h.

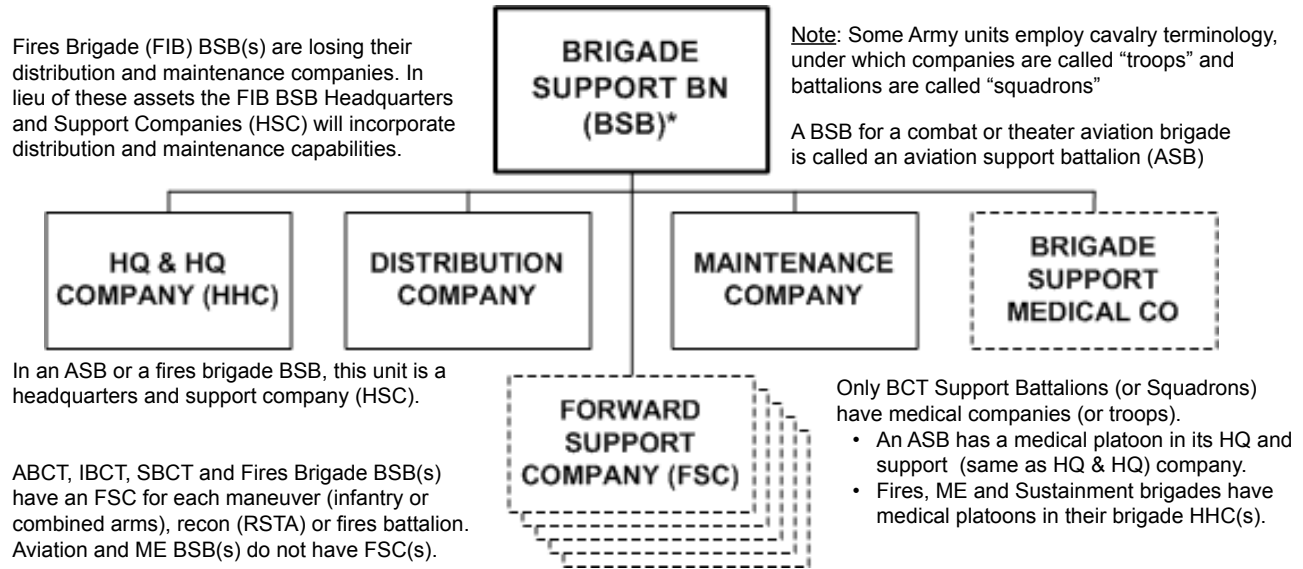


Figure 1-56: Brigade Support Battalion Organization

Brigade Support Battalion (BSB): (See ATP 4-90, *Brigade Support Battalion* 2014 and see also FM 4-90.7, *Stryker BCT Logistics*, 2007). This is an organic component of every BCT and of each fires, aviation, or ME brigade (Battlefield Surveillance Brigades [BFSB] have support companies in lieu of battalions). It does not exist in functional brigades. The BSB is the Army’s tactical level primary combat service support organization. It plans and executes logistics operations in support of its parent brigade and is the brigade’s primary interface with its supporting sustainment brigade. Figure 1-56 shows a notional BSB.

A BSB handles all classes of supply but focuses on the rapid replenishment and distribution of Class III (B) and Class V, to sustain its parent brigade’s operational tempo. When required, a supporting sustainment brigade may augment a BSB with transportation or other assets to support specific replenishment operations. A BSB operates the brigade support area (BSA) and its parent brigade’s primary interface with its supporting sustainment brigade. The elements of the BSB function as follows:

- The headquarters and headquarters company (or detachment) provides command and control.
- The distribution company consists of a supply platoon, a fuel and water platoon and a transportation (or distribution) platoon. The supply platoon has separate sections for general supply, ammunition handling and transfer point (ATHP – not present in an ME brigade BSB or a BFSB BSC), and Class IX (spare parts). The fuel and water platoon’s fuel section includes a “mobile fuel farm” (using flatrack fuel tanks or fuel tank semi-trailers etc.). Its water section has its own purification systems. The transportation (distribution) platoon has the majority of the (non-fuel tanker) trucks and sends LOGPAC (“push-pull”) convoys forward to replenish the forward support companies or (if there are none) other supported units.
- The functions of the (field) maintenance and medical companies should be self-explanatory. A BSB has a medical company only if it is serving as part of a BCT. Otherwise, it or its parent brigade headquarters company will have a medical platoon (see Figure 1-56). For more on brigade-level medical units, see Paragraph 1014j below.
- Forward support companies (FSC) exist in BSB(s) that support BCT and FIB brigades. It consists of a “field feeding” (mess) section and maintenance and distribution platoons. It replaces the old service and maintenance platoons formerly organic to maneuver, fire support and reconnaissance battalions. An ME brigade BSB will have an FSC only if it includes a TCF

k. The Army’s Health Service Support (HSS) System

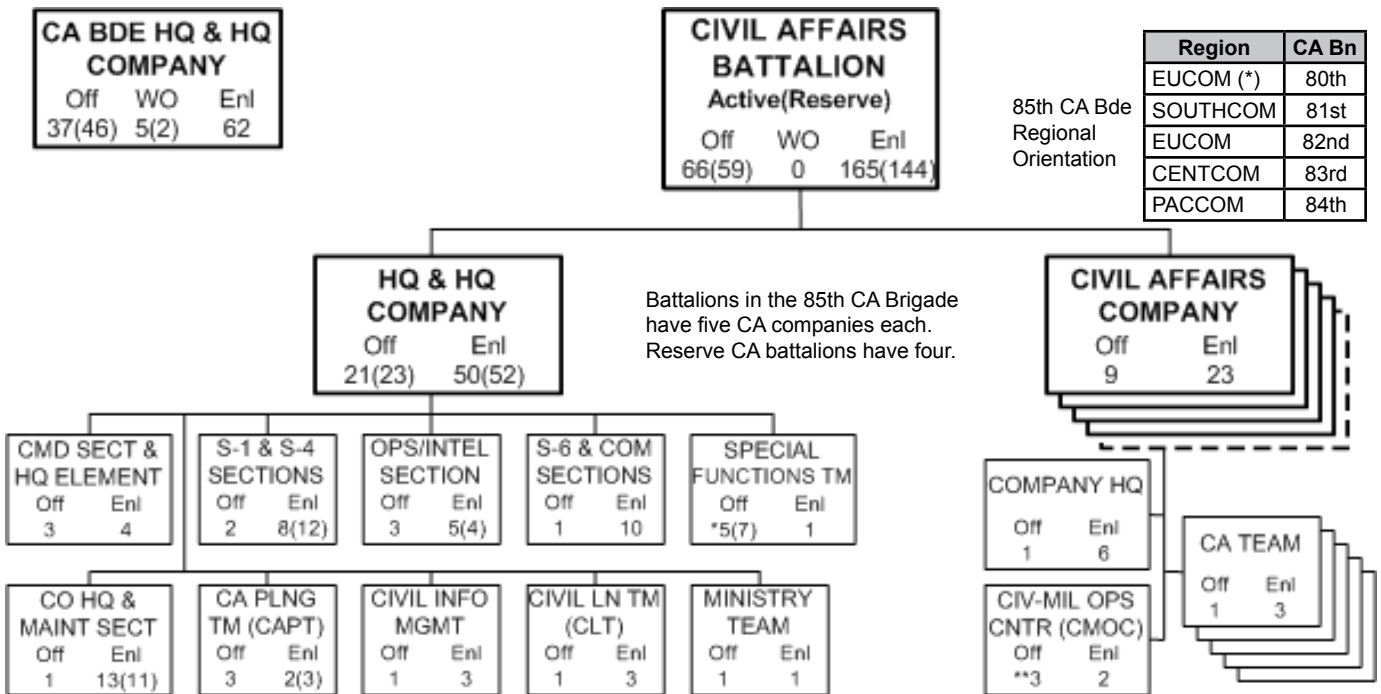
See Paragraph 4003g.

I. Army Civil Affairs and Psychological Operations Forces

The US Army is the primary provider of civil affairs (CA) and psychological operations (PSYOPS) forces to the Department of Defense. Prior to FY07 all Army CA and PSYOPS units were under the US Army Civil Affairs and Psychological Operations Command (Airborne) or

USACAPOC (A). USACAPOC (A) itself was under the Army Special Operations Forces (ARSOF). All its units were Army Reserve except one active CA battalion and one active PSYOPS battalion. Between FY07 and FY09 ARSOF expanded the active battalions to a brigade and a group, respectively;. It then detached both from USACAPOC (A) and detached the rest of USACAPOC (A) from ARSOF. Henceforth USACAPOC(A) would only support the non-ARSOF Army and other military Services. In FY11 the Army activated the 85th Civil Affairs Brigade to give the non-ARSOF Army an active component civil affairs capability. Its five battalions were all active by September 2013.

Civil Affairs: When it detached from ARSOF, USACAPOC (A) had four CA commands (CACOM), seven CA brigade headquarters and 28 CA battalions. Each CACOM is associated with a regional combatant commander and commands all civil affairs units attached or assigned to that commander. Table 1-33 shows the regional orientation of the CACOM(s) and their subordinate brigades and battalions. There is no assigned CACOM for AFRICOM but a new CA brigade headquarters (the 361st) and a new battalion (the 457th) oriented on Africa have been activated in Germany. Though part of the Army Reserve they are not under USACAPOC (A). A CA brigades supports a corps-level command. A CA battalion supports a division-level command. (A USMC CAG is somewhat smaller than an Army CA battalion but supports a MEF rather than a division.) An Army CA company supporta a BCT or equivalent while an Army CA team (CAT) supports a battalion.



* Both Active and Reserve Special Functions Teams include law, med/vet preventive medicine specialists and a senior medic. An Active Army team has engineer and environmental science officers. An Army Reserve team has civil supply and public safety/works officers.
 ** A Reserve CA company CMOC includes a public works officer (an active company has another civil affairs officer instead)

Figure 1-57: Civil Affairs Battalion (and CA Brigade HHC), for Active Army and USACAPOC (A) Organization

Figure 1-57 depicts CA battalion/brigade organization for both the USACAPOC(A) the newly activated Regular Army 85th CA Brigade. It also shows the regional orientation of the active battalions. Apart from being larger (five CA companies per battalion, vice four) the active battalions lack civil supply/administration/infrastructure specialists. Such skills are not resident in the active force. The civil-military operations center has been de-emphasized and now exists only in CA companies and not battalions or brigades. A CMOC serves as a coordination interface between US forces and the locals, the humanitarian, non-government and inter-governmental organizations and USG civilian agencies. It also develops, manages, and analyzes the civil inputs to the COP.

REGION	CACOM	CA BDE	ARMY RESERVE CA BATTALIONS
SOUTH-COM	350th	321st	413th, 451st, 486th, 490th
			402d, 410th, 436th, 478th
PACOM	351st	358th	416th, 425th, 426th, 492d
		364th	405th, 440th, 445th, 448th
CENTCOM	352nd	354th	401st, 414th, 422nd, 437th
		360th	412th, 431st, 450th, 489th
EUCOM (& AFRICOM)	353rd	304th	403d, 404th, 411th, 443d
		308th	407th, 415th, 418th, 432d
8th US Army (Korea)		322d	No subordinate battalions; this bde HQ is 8th Army liaison to civil relief agencies

Table 1-33: USACAPOC(A) Civil Affairs Unit Regional Orientation

Military Information Support Operations (PSYOPS): The Army is currently redesignating its two USACAPOC (A) Psychological Operations Groups (POG) as Military Information Support Groups (MISG). The Active Army's ARSOF POG has already become the 4th Military Information Support Operations (MISO) Group. Each of the Reserve MISG(s) consists of a small headquarters and four battalions organized as shown in Figure 1-58. It conducts tactical MISO/PSYOPS, meaning that it and its subordinate companies and battalions operate in forward areas under a corps-level or lower headquarters. They employ vehicle mounted and man-pack loudspeakers and design and print leaflets, flyers, handbills, etc. A company can support a division in conventional combat but in irregular or urban combat when large numbers of civilians are present a division requires at least a MISO/PSYOPS battalion. One company from that battalion supports each of the division's brigade combat teams.

Organizations

USACAPOC (A) also has one strategic dissemination company (the 306th) which is attached to 7th MISOG (POG). Unlike tactical MISO units this company operates above the corps echelon. It produces audio, audiovisual, print and television propaganda and it can operate indigenous printing, TV or radio facilities. Its print plant can produce printed books or up to 1.6 million leaflets in 24 hours.

NOTES:

1. The Army has redesignated its tactical PSYOPS battalions and companies as military information support units, though the term "PSYOPS" is still widely used.
2. Army tactical MISO companies are separately numbered units specializing in specific geographic regions. Assigned to specific battalions in peacetime they may be cross-attached as needed to meet mission requirements.

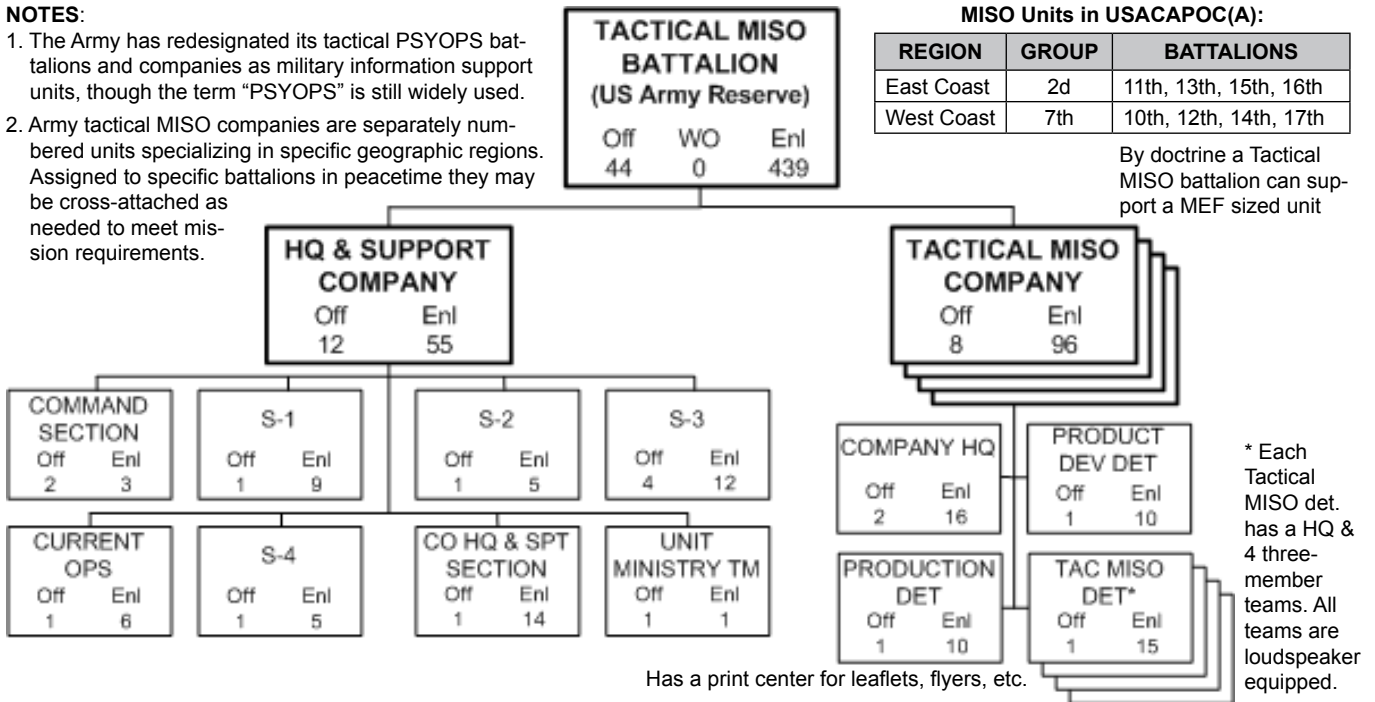


Figure 1-58: Tactical MISO (PSYOP) Battalion, USACAPOC(A) Organization

ARSOF: ARSOF now includes one civil affairs brigade and two MISO (PSYOPS) Groups (see Figure 1-59, below).

ARSOF's 95th Civil Affairs Brigade is similar to the Active Army 85th CA Brigade in that each of its five CA battalions are oriented towards a specific regional combatant commander. Like other 85th Brigade the 95th lacks specialists in civil infrastructure, supply and administration. Its subordinate companies are stronger, having six CA teams each rather than five. Each battalion HHC includes separate S-2 and S-3 sections (rather than a combined section), larger S-1 and S-4 sections, a targeting and fusion center, a medical section (in addition to preventive medicine specialists) and a much larger planning section. The brigade HHC also has enhanced intelligence capabilities (with R&A or research and analysis, all source production/collection management and dissemination sections and a non-kinetic targeting and fusion cell), an engineering section, augmented civil affairs planning and liaison sections.

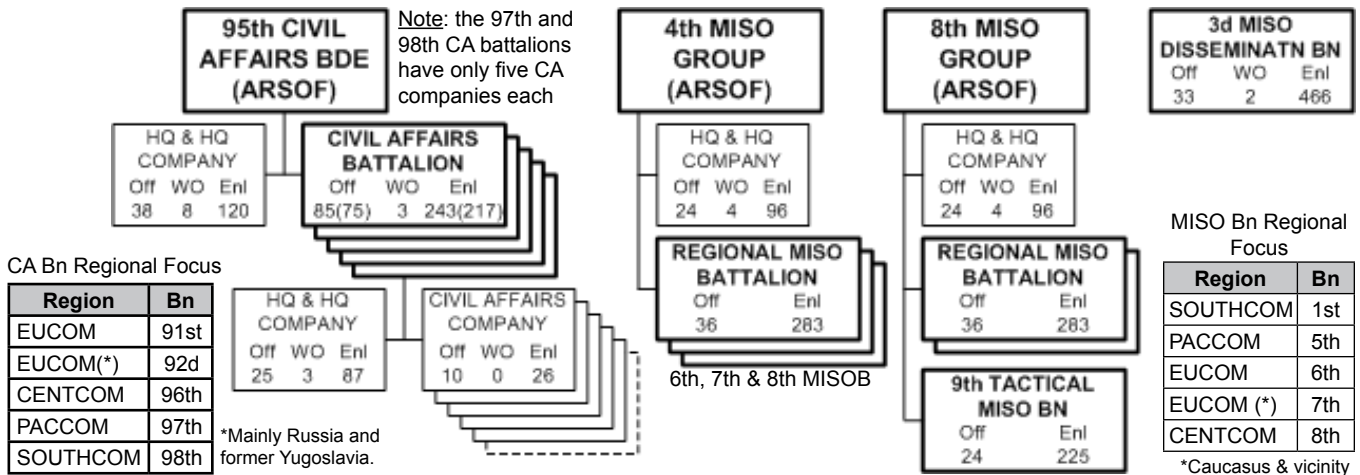


Figure 1-59: ARSOF Civil Affairs and MISO (PSYOPS) Units

Until FY13 all seven ARSOF MISO battalions were under the 4th MISO Group (or MISOG, formerly 4th POG). In FY14 ARSOF activated the 8th MISOG and moved the 1st and 5th (Regional) and 9th (Tactical) MISO battalions (MISOB) under it. The regional MISOB(s) each have two product development designing material to support a specific combatant commander. The tactical MISOB has regionally focused companies. The strategic dissemination MISOB, like the USACAPOS(A) 306th PSYOPS Company produces and distributes the products the regional battalions design. The FY14 reorganization added a tactical MISO company to each regional MISO battalion but reduced the tactical MISO battalion from five companies to two. ARSOF tactical MISO companies were also reorganized to have three larger (six teams each) tactical MISO detachments and reduced product development and production elements.

References: FM 3-53, *Military Information Support Ops* 01-2013; FM 3-57 *Civil Affairs Ops w/C2* 04-2014; ATP 3-57.10 *Civil Affairs Support to Populace and Resources Control*, 08-2013; ATP 3-57.30 *Civil Affairs Support to Nation Assistance* 05-2014; ATP 3-57.50 *Civil Affairs Information Mgmt* 09-2013; ATP 3-57.60 *Civil Affairs Planning* 04-2014; and ATP 3-70, *Civil Military Ops Center (CMOC)* 05-2014.

1014. Military Police Forces

a. Military Police units organic to the MEF

The FY08 reorganization of FMF military police consolidated military police personnel into one MP company per MEF MSC and one MP support company (with military working dog teams and other specialists) per MEF CE. The Force Structure Reorganization Group (FSRG) further consolidated all these elements (after reducing each MP company from four platoons to three) into an MP law enforcement (LE) battalion in each MHG. FSRG also cut the number of MWD(s) per MEF from 60 to 46 but added MWD(s) to MARFORRES and MARFOR-SOC. As of FY16, further manpower reductions have necessitated the deactivation of one MP platoon of Company "C" in each of the three active LE Battalions. Finally, FSRG consolidated all MARFORRES MP assets into a 4th MP LE Battalion. This unit resembles an active battalion but it has four MP companies ("A" through "D") rather than three and it also has an MP support company. The support company does not normally operate as a unit but instead provides detachments from its three reinforced (four squad) MP platoons (lettered "A," "B" & "C") and its additional administrative and logistic personnel to augment deployed MP organizations. The support company also includes a separate (13th) MP squad trained as a rapid action team (see Figure 1-60).

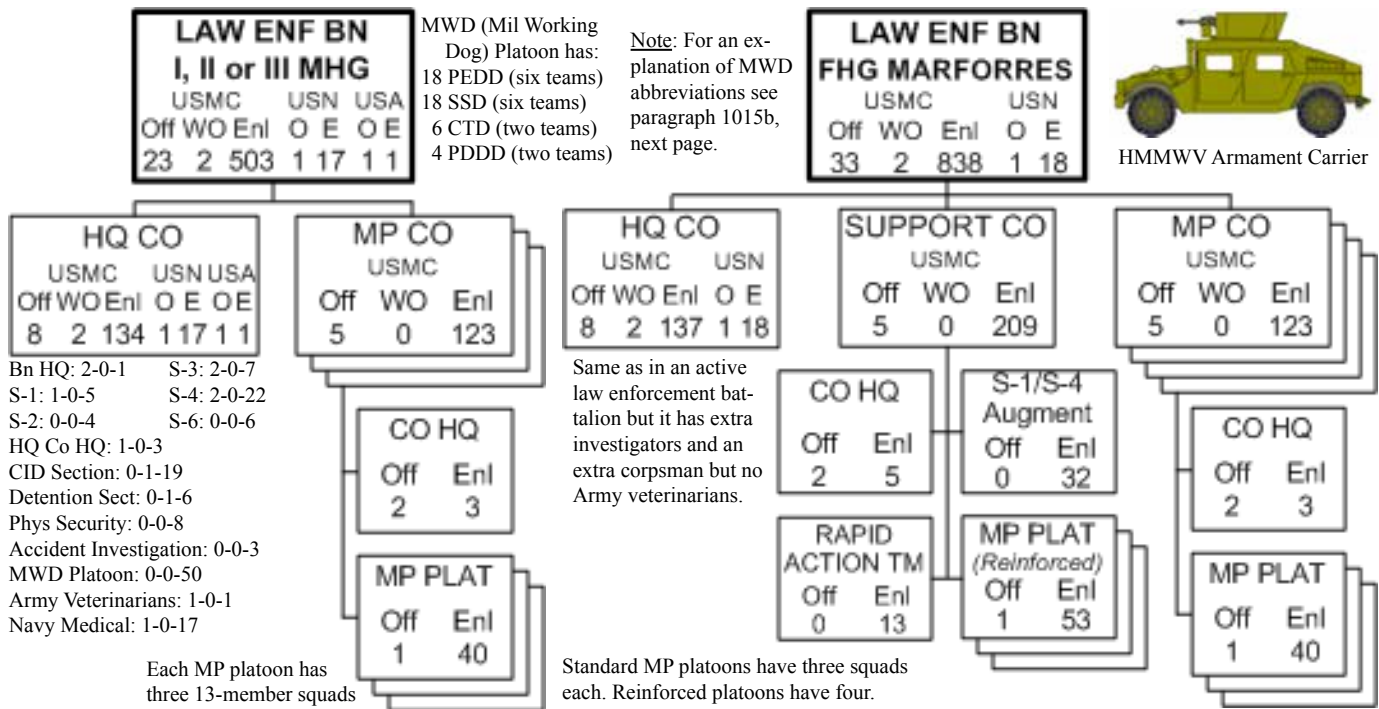


Figure 1-60: MHG and FHG USMC Military Police Law Enforcement Battalion Organizations

TAMCN	Description	Quantity	TAMCN	Description	Quantity
D0003/0198	MTVR 7-ton cargo truck AMK/MK-23 (2 per MP co)	9	E0025	M32A1 multi-shot GL (MSGL) (8 per MP co)	24
D0016	Cargo trailer, 1.25-ton M1102 LTT-H (16 per MP co)	57	E0892	M203A2 grenade launcher (GL) (27 per MP co)	81
D0022	M1152A1 Utility/Shelter HMMWV (2-door) (Bn HQ co)	2	E0960	M249 5.56mm SAW light machinegun (27 per MP co)	95
D0030	M1151A1 Armament Carrier HMMWV (25 per MP co)	79	E0980	M2 .50-cal heavy machinegun (9 per MP co)	32
D0031/0034	M1165/1165A1 C2 HMMWV (4-dr) (1 per MP co)	9	E0989	M240G 7.62-mm machinegun (13 per MP co)	45
D1158	M1123 Utility HMMWV (2-door) (13 per MP co)	45	E0994	MK-19 40-mm grenade machinegun (9 per MP co)	32

Table 1-34: Selected equipment items, MHG Law Enforcement Battalion UIC(s) M20151 to M20154

The greater efficiency gained by consolidating all MAGTF MP assets under a battalion command is unlikely to fully offset a 25% overall reduction in (nominal) MEF MP strength. To ensure essential MP tasks are accomplished a MEF or MEB will frequently have to augment its MP assets from MARFORRES and/or the Army (see 1015b).

b. Army Military Police

For its military police forces the US Army uses a modular organization under which battalions and larger units are task forces of independent MP companies and detachments. The Army's 12 (five active) MP brigades with two to five battalions may support units as small as a division. However, they are much more likely to be under a corps, theater army, JTF, CJTF, JFLCC, CFLCC or MP command headquarters.

Organizations

Missions: Until the publication of the current FM 3-39, Army doctrine has organized the military police mission into five “functional” areas.” The new FM 3-39 regrouped these functional areas into three “disciplines.” These disciplines are as follows:

Police Operations: Covers basic law enforcement, traffic management/enforcement, criminal investigations, and straggler, customs and border control. Law enforcement and Civil Investigation Division detachments provide most of the specialists needed to effectively implement this discipline, but combat support companies furnish most of the manpower (see below).

Security and Mobility Support: Covers movement control support, enforcement of traffic plans, route reconnaissance, movement/resettlement of refugees, population/resource control, area, security, defense against small (Level 1 or 2) enemy unit/terrorist threats, protection of high risk personnel (HRP), physical security, area surveillance, etc. This is the primary discipline for the MP combat support companies (see below).

Detention Operations: These were known as “internment/resettlement” (or I/R) operations until the publication of FM 3-63 in 2014. They are conducted mainly by specialized MP detention and guard units (see below). Combat support MP companies have only limited capabilities in this area.

All these disciplines also include the training and/or supervision of host nation personnel.

Combat Support Military Police Company: This is the standard military police general purpose operating unit. It has capabilities in all three discipline areas (see Figure 1-61 and Table 1-35). The Army has 184 of them (55 in the active force) and most serve under the Army’s 45 combat support MP battalions (14 are active). They have capabilities across the range of MP disciplines. Examples are as follows:

Police Operations: Incident response patrols for up to 75,000 troops. Provides multi-functional MP support for up to 50 miles (80 km) of main or alternate supply route. Limited criminal/traffic investigation capabilities.

Security and Mobility Support: Establishes traffic control points and holding areas; conducts route reconnaissance/surveillance patrols and controls stragglers and displaced persons to ensure unimpeded traffic flow through movement corridors. Also:

- Area security out to five km from an MSR in rural or one km in urban terrain; outside a designated mobility corridor can control up to 2,000 square km or rural or 800 square km of urban terrain or 1,000 square km around an air force base or up to 400 km of POL pipeline.
- Point security for up to three critical sites (such as ammunition supply points, fuel farms, and Army airfields) or nine smaller sites; two platoons can protect an MSC headquarters or an APOD or two thirds of an SPOD. Can provide protective details to high risk individuals.

Detention Operations: Mainly concerned with the escort/transportation of detainees from collection points and holding areas to theater internment facilities. One CS MP platoon can operate a holding area for up to 250 detainees or it can guard an interrogation center.

A CS MP battalion with four CS MP companies and an L&OD supports an Army division or a USMC MEF. Two CS MP companies can support a USMC MEB. One CS MP company supports an Army BCT operating independently.

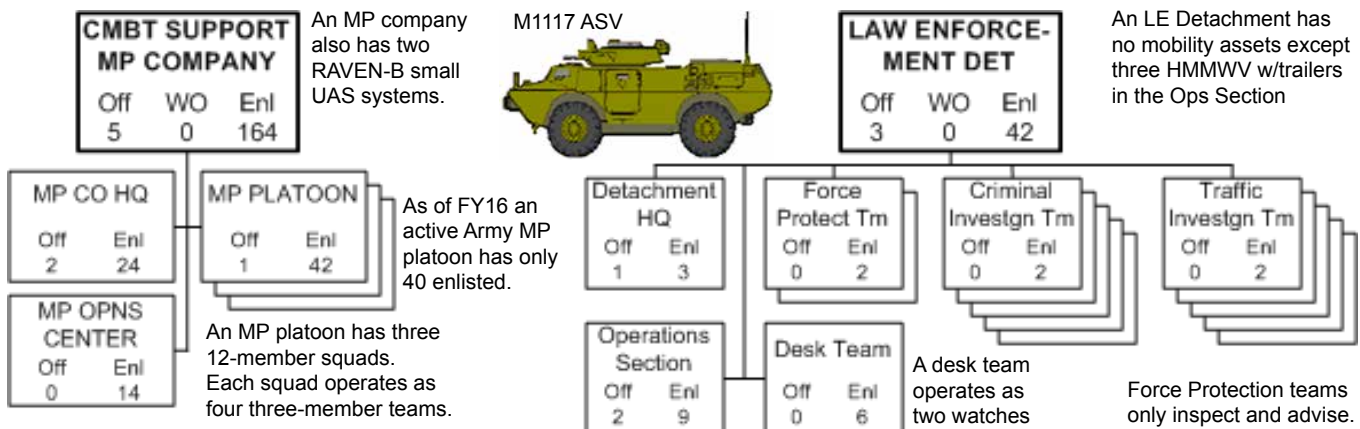


Figure 1-61: Army Combat Support MP Co. Organization

Figure 1-62: Army MP Law Enforcement Det. Organization

Equipment End Item	Quantity	Equipment End Item	Quantity
Mine detector portable AN/PSS-14	6	Mdm trailers (one LMTV flat-bed & one M1112 water trailer)	2
2.5-ton 4x4 M1078A1 cargo LMTV incl. one M1079A1 van	3	MKT field kitchen mounted on an M103A3 1.5-ton chassis trailer	1
5-ton 6x6 M1083A1 MTV cargo truck	1	Light trailers M1102 (LTT) incl. 1 generator trailer (6 per MP Platoon)	23
10-ton 8x8 M984A4 Heavy Wrecker	1	Heavy machineguns (25 .50-cal, 29 MK-19) (including ASV wpns)	54
M1117 Armored Security Vehicle (ASV) (*) (5 per platoon)	15	M203 grenade launcher (four per squad or one per team)	47
M1151A1/M1114 HMMWV Armament Carrier (8 per platoon)	26	M249 5.56-mm light machinegun (SAW) (four per squad or one per tm)	47
M1152A1/M1165A1 HMMWV troop/cargo carrier (2-door)	3	M240B 7.62-mm machinegun (one per MP squad)	9

* As of FY14 the Army has completed the issue of M1117 Armored Security Vehicle (ASV) to its CS MP companies. The ASV is a 4x4 15-ton vehicle armored against 12.7-mm AP. It has a crew of three and a one-man turret with a MK-19 and an M2 .50-cal, similar to the 40-50 turret on the AAV. In each CS MP platoon the first squad has two ASV and two armored HMMWV armament carriers. The other two squads each have one ASV and three armored HMMWV(s). The platoon headquarters has one ASV only.

Table 1-35: Selected Equipment Items, Army Combat Support Military Police Company

MP Law Enforcement Detachments (LE Det): These are platoon sized task forces of investigators and law enforcement specialists (see Figure 1-62). One LE det supports an Army division or USMC MEF. The Army has 50 LE dets in all (30 active). Fifteen active LE dets are permanently assigned to Army bases (12 in CONUS). The rest are assigned to MP brigades, which sub-assign one to each of their battalions.

MP Military Working Dogs (MWD): The Army is the primary DoD provider and trainer of military working dogs (MWD). Each dog is trained only for specific functions. Patrol and Explosive Detector Dogs (PEDD) detect explosive material. Patrol and Narcotics Detector Dogs (PNDD) detect narcotics. Both are also patrol dogs supporting general police activities. The Marine Corps also uses Specialized Search

Dogs (SSD) and Combat Tracker Dogs (CTD). An SSD sniffs out explosives like a PEDD but can also search “off leash” so as to minimize risk to its handler. Neither SSD(s) or CTD(s) are trained as patrol dogs and cannot be used as such. Dogs can only work for limited periods of time so they and their handlers usually operate in teams of three. One dog works while the other two rest. Army MWD teams are grouped into 32 detachments totalling 180 three-dog teams (114 PEDD and 66 PNDD). These detachments are assigned to installations or MP brigades. The Army Engineer Branch also has three mine detecting dog (MDD) detachments (4 PEDD and 4 SSD teams each).

Detention Facilities and Detainee Classification: FM 3-63 has replaced the five detainee classifications formerly used in FM 3-39.40 with civilian internees (CI), “retained” personnel (RP) and enemy combatants (sub-divided into “lawful” and “unlawful”). Retained personnel may include US military prisoners. Detainees are confined in facilities of theater approved design but existing facilities (if available and suitable) may be used instead. An approved facility for “compliant” detainees consists of a compound of up to four separate enclosures. Each enclosure holds up to 2,000 detainees. Detainees live in GP tents or other temporary shelter. The facility would include a maximum security building with individual cells for the less compliant. Detainees of different classifications (or widely differing compliance levels) are normally housed in separate facilities. An approved facility for the seriously non-compliant (or those suspected of serious crimes) consists of a support area and up to three enclosures. Each enclosure houses up to 300 detainees in pre-fabricated individual cells assembled into blocks. To operate and secure these facilities the Army has 25 detention battalion headquarters (four active), 22 detention companies (six active), and 31 guard companies (all Reserve/National Guard). The capabilities of these units are as follows:

- An **MP Detention Battalion HHC** includes three 20-member enclosure operations sections. Each provides internal accountability, logistics and administration to one enclosure within a detention compound. Guard companies (see below) and/or detention company internment platoons provide guards. Table 1-36 shows common detention battalion configurations relative to the number and class of detainees.
- An **MP Detention Company** includes an enclosure section equivalent. This enables the company to operate one enclosure autonomously or provide the fourth enclosure section a detention battalion needs to operate a four-enclosure detention compound. The company’s two internment platoons (four squads each) may provide interior and/or perimeter guards.
- An **MP Guard Company** (three guard platoons of four squads each) has capabilities in all three MP disciplines. However, its lack of an operations center limits its ability to plan operations and organize reaction forces. Its reduced allowance of vehicles restricts its ability to conduct motorized patrols. The Army uses guard companies mainly to guard detention facilities. One company can provide perimeter security for a maximum sized detention facility or assist a detention company with interior security. It can also guard hospitals, headquarters, interrogation centers and other critical points. If not enough guard companies are available CS MP companies may be substituted, though they would be less efficient in a guard company role.

Detainee Type	Detention Bn. Structure			No. of Detainees
	Bn HHC	Det Co	Gd Co	
Non-Compliant	-	1	-	100-300
	1	1	2	300-900
	1	2	4	600-1,800
Compliant	1	1	1	4,000-8,000

Table 1-36: MP Detention Unit Capabilities
(Actual capabilities are highly situation dependent.)

MP Civil Investigation Division (CID): CID personnel provide felony investigation and force protection services beyond LE detachment capabilities. Two group (theater level) and nine battalion headquarters control 32 active and 15 Army Reserve CID elements. One CID element supports up to 37,040 troops (only 14,608 if they are in echelons above division). It consists of a headquarters (three WO, three enlisted), Section A (three WO, six enlisted), Section B (two WO, four enlisted) and a drug suppression team (five enlisted).

MP Logistics: MP companies have limited organic sustainment assets such as field feeding and Role I medical services. However, they still rely on higher/supported headquarters for legal, personnel/administrative and religious services, generator maintenance, and supplemental Class III and V supply. MP detachments have no organic sustainment assets and must rely on higher/supported headquarters for everything.

References: FM 3-39 *Military Police Operations* (08-2013); FM 3-63 *Detainee Ops* (04-2014); ATP 3-39.20 *MP Intel Ops* (07-2010); ATP 3-39.10 *Police Ops* (01-2015); ATP 3-39.30 *Security and Mobility Support* (10-2014); and ATP 3-39.34 *Military Working Dogs* (01-2015). FM 3-63 replaced FM 3-39.40 *Internment and Resettlement Ops* (02-2010) due to bad publicity following the leak of FM 3-39.40 to the press in 2013. Its basic doctrine remains valid, however.

1015. Special Operations Forces

a. Marine Corps Forces Special Operations Command (MARFORSOC)

Although the US Special Operations Command (USSOCOM) has existed since 1986, no Marines were assigned to it until 2003 when the Secretary of Defense ordered CMC to send a detachment of Force Recon Marines to serve with SOCOM in Iraq. On 24 February 2006, CMC activated MARFORSOC at Camp Lejeune, NC. MARFORSOC joined SOCOM in July and made its first deployment in August.

MARFORSOC recruits, trains, equips and sustains its own personnel. It provides task organized Special Operations (SO) capable forces worldwide in support of SOCOM and/or Geographic Combatant Commanders. Its core capabilities are foreign internal defense (FID), counterinsurgency (COIN), direct action (DA), special reconnaissance (SR), counterterrorism (CT) and support to information operations (IO).

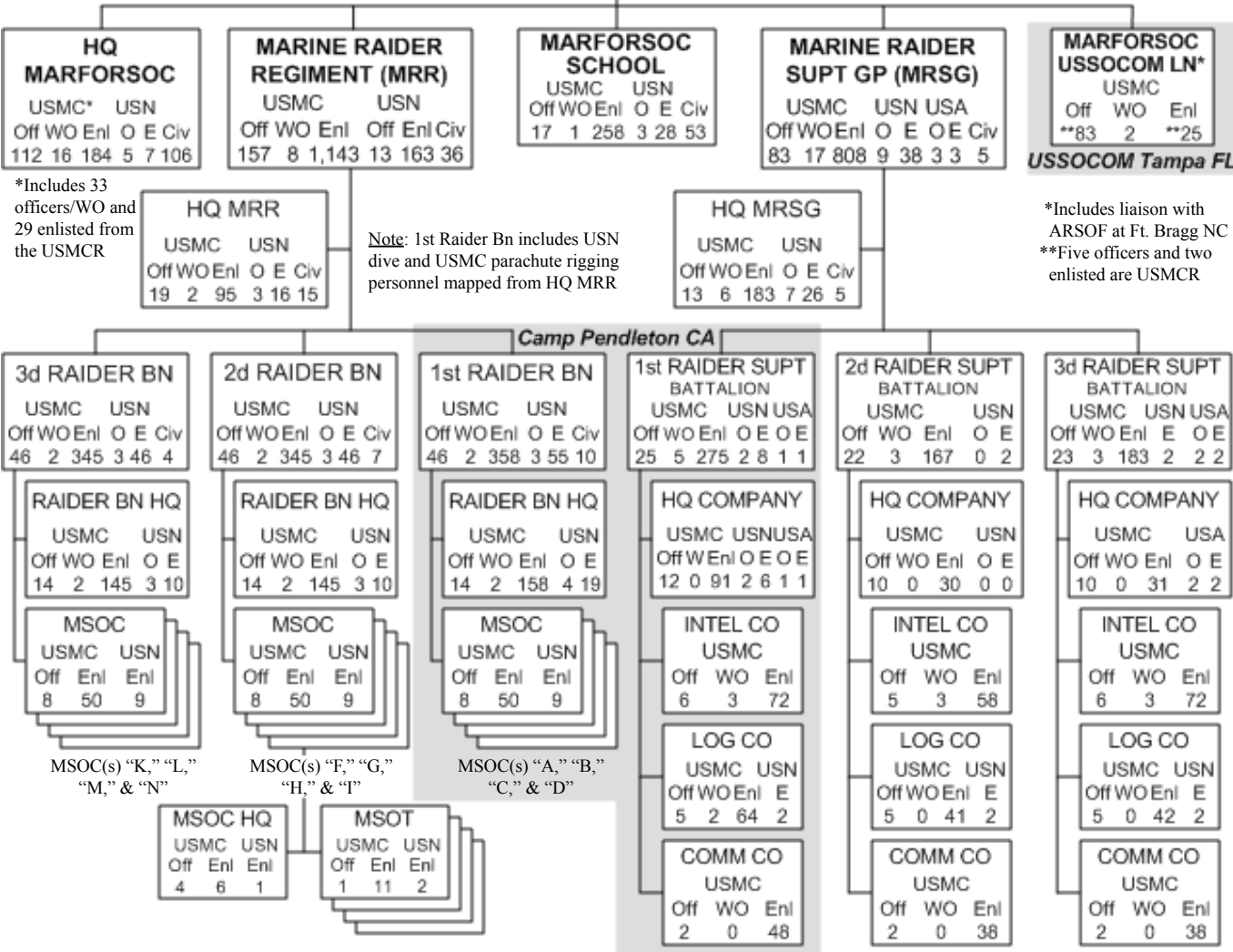
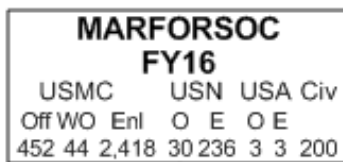
At first, MARFORSOC consisted only of a small staff and a Foreign Military Training Unit (FMTU - activated in 2005). The FMTU then became the Marine Special Operations Advisory Group (MSOAG). In early FY07, MARFORSOC took most of the personnel from the 1st and 2d Force Reconnaissance Companies and reorganized them as the 1st and 2d Marine Special Operations Battalions (MSOB). These battalions could act as separate SOTF-level commands or augment an existing Joint Special Operations Task Force (JSOTF). They specialized mainly in SR and DA. MARFORSOC stationed its 1st MSOB (plus support detachment) at Camp Pendleton, CA and the rest of MARFORSOC mostly at Camp Lejeune, NC. At about the same time, MSOAG reorganized as the 3d and 4th MSOB(s). These battalions provided teams, as directed by SOCOM, to conduct regionally focused FID and develop unconventional warfare (UW) capabilities.

Negative experiences in early MARFORSOC deployments to Afghanistan led to a restructuring. In 2009, MSOAG became Headquarters, Marine Special Operations Regiment (MSOR) and took over all existing MSOB(s). In FY13 the 3d and 4th MSOB(s) combined into a new

Organizations

All MARFORSOC elements are based at Camp Lejeune NC except as indicated in the gray shaded areas.

Note: MRSNG maintains 18 MWD(s) with handlers and 29 fire support personnel (two Marine and one Navy officers and 26 Marine enlisted) to support the Marine Raider Regiment.



*Includes 33 officers/WO and 29 enlisted from the USMCR

Note: 1st Raider Bn includes USN dive and USMC parachute rigging personnel mapped from HQ MRR

*Includes liaison with ARSOF at Ft. Bragg NC
**Five officers and two enlisted are USMCR

Figure 1-63: MARFORSOC Organization

MSOC HQ: 1 Commanding Officer (Maj) 1 Executive Officer (Capt) 1 Air Officer (Capt.) 1 Intel. Officer (Capt.) 1 1st Sgt 1 Ops Chief (MSgt) 1 Asst Ops Chief (GySgt) 1 Log Chief (GySgt) 1 Comm. Chief (GySgt) 1 Radio Operator (Sgt) 1 IDC (HMC)	Four MSOT (each): 1 Team Leader (Capt) 1 Team Chief (MSgt) 1 Ops Chief (GySgt) 1 Asst Ops Chief (SSgt) 2 MSOE Leaders (SSgt) 2 Asst. MSOE Ldrs (Sgt) 4 MSOE Members (Sgt) 2 Corpsmen (HM1 & HM2)
--	---

Figure 1-64: MSOC Organization

3d MSOB. In FY15 the MSOR became the Marine Raider Regiment (MRR). The three MSOB(s) became Marine Raider Battalions (MRB) (Figure 1-63).

The three MRB(s) each have four special operations companies (MSOC). Each MRB headquarters includes an EOD section. Marine Raiders are trained to perform any SO mission but are best suited for SR, DA and FID.

In FY07 one MSOC consisted of a DA/SR platoon (eight five-man teams) and a security element (two rifle squads and a machinegun squad). In FY10 MARFORSOC replaced all these elements with four Marine Special Operations Teams (MSOT). The MSOT is now the basic combat element of MARFORSOC (Figure 1-64). It may operate independently when not serving as part of an MSOC. When

necessary (especially when conducting SR missions) it can split into two Marine Special Operations Elements (MSOE).

The Marine Raider Support Group (MRSNG) provides combat support and combat service support to the MRR. During FY13 it expanded to regimental size and organized the "Support" battalion (formerly "Detachment West") at Camp Pendleton and the "Combat Support" and "Logistics" battalions at Camp Lejeune. In FY15, these units became the 1st, 2d and 3d Raider Support Battalions, respectively. A realization that it would almost never be necessary to support all 12 MSOC(s) simultaneously led to a partial reorganization that eliminated 323 MRSNG enlisted billets. This left the MRSNG able to support no more than nine MSOC(s) at one time. MRSNG provides a direct support intelligence team (DST), a communication team, and a landing support team plus supply, maintenance, and fire support personnel per supported MSOC. MRSNG also provides Intelligence Support Teams (IST) for up to two MRB headquarters plus a total of 18 military working dogs (MWD).

A MARFORSOC “operator” is a volunteer, screened through a two-to-three week assessment program. After 43-45 weeks’ individual training, he joins a MSOT where he receives specialty training. This may include weapons, communication, leadership, medical, explosives, sniper and special reconnaissance courses. As of April 2010 some 258 MARFORSOC Marines had received significant foreign language training. The Defense Language Institute (DLI) conducted this training and focused it mainly on European languages, particularly Spanish. Only 30 of these 258 Marines achieved a Level 3 or higher proficiency in the language studied. More recent figures are unavailable but MARFORSOC foreign language capabilities, especially in Asian and Middle Eastern languages, are likely to remain weak.

b. US Army Special Operations Forces (ARSOF)

ARSOF or US Army Special Operations Command (USASOC) provides some 30,000 of SOCOM’s 58,000 personnel. ARSOF doctrine recognizes nine missions for ARSOF forces. These are unconventional warfare (UW), foreign internal defense (FID), direct action (DA), special reconnaissance (SR), counter-terrorism (CT), psychological operations (PSYOPS), civil affairs (CA), counter-proliferation of WMD and support to information operations (IO). The principal ARSOF elements are shown in Figure 1-65. They are briefly described as follows:

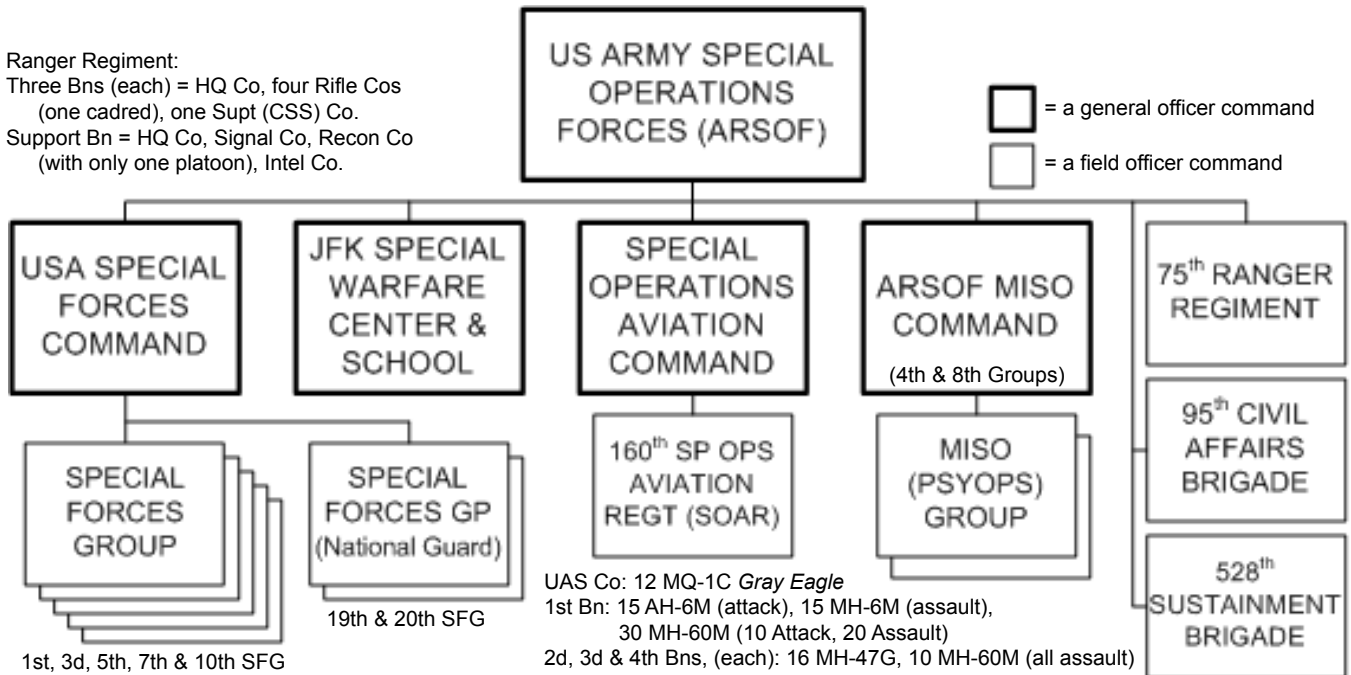


Figure 1-65: ARSOF Organization

The **95th Civil Affairs Brigade and 4th and 8th MISO (PSYOPS) Groups** are discussed in paragraph 1014I, above (see also Figure 1-59). These organizations can support FID and IO as well as MISO (PSYOPS) and civil affairs operations.

The **John F. Kennedy Special Warfare Center and School**: Like MARFORSOC, ARSOF recruits its own personnel and trains many of them. The JFK Center trains civil affairs, MISO and special forces personnel.

The **75th Ranger Regiment** is a rapidly deployable airborne force of three light infantry battalions. It conducts DA operations for a CCDR with or in support of other SO or non-SO assets. Rangers can also fight as conventional infantry.

The **Special Operations Aviation Command** consists of the 160th Special Operations Aviation Regiment (SOAR) plus training, support, system integration and maintenance elements. It supplies detachments to the joint force special operations component commander (JFSOCC) that can infiltrate, resupply, and exfiltrate SOF elements engaged in all SO core tasks. SOAR has no AH-64 attack helicopters of its own but it can arm any AH-6M or MH-60M as an attack helicopter with M134 7.62mm six-barrel miniguns and/or 2.75-inch rocket pods. SOAR helicopters in an assault role can carry M134 miniguns or M240 machineguns (but an MH-6M in assault mode is normally unarmed).

The **528th Sustainment Brigade** is a command element exercising OPCON over ARSOF and non-ARSOF sustainment assets when they support ARSOF operations. This brigade has no real assets of its own. Sustainment assets organic to ARSOF include the support (sustainment) battalions or companies organic to Special Forces groups, the 160th SOAR and the 75th Ranger Regiment.

The **Special Forces Command** is still the core element of ARSOF. The Army organized its Special Forces (SF) in June 1952 to conduct unconventional warfare (UW) against a Soviet invasion of Western Europe. SF could also assist with the Foreign Internal Defense (FID) of friendly governments menaced by insurgents or other internal threats. UW differs from FID and other forms of irregular warfare (IW) in that it directly uses US trained/led/materially supported indigenous or surrogate personnel to accomplish US objectives. SF used its UW/FID doctrine for the first time in Vietnam. The Army has since expanded SF missions to include DA, SR and CT.

The Special Forces Command has five active and two National Guard Special Forces Groups (SFG). An active Army SFG is shown in Figure 1-66 (next page). In FY15 each active SFG reorganized its four SF battalions (three companies each) into three SF battalions (four companies each) plus a special troops battalion. The latter provided additional intelligence and communication assets. Each active group had already ex-

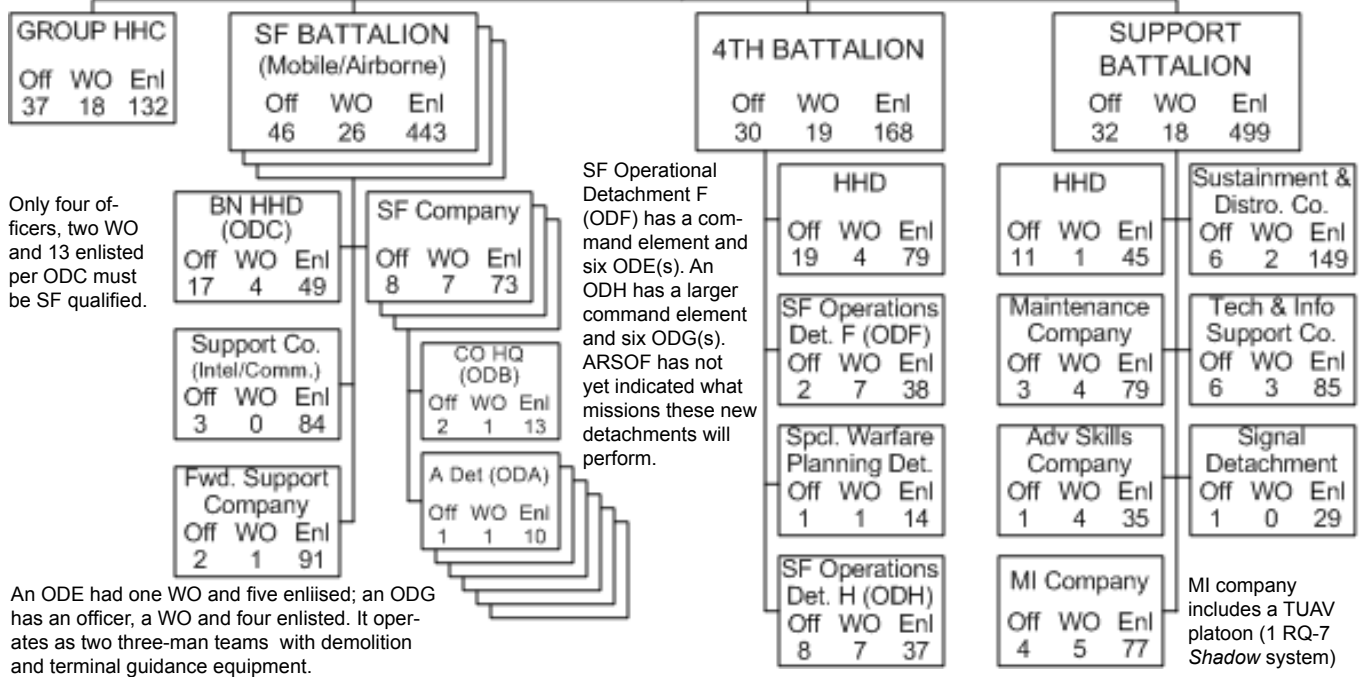
Organizations



Note: The 10th SFG differs from the other SFG(s) in that its 2d Battalion has four SF companies rather than three and its 4th Battalion has two special warfare planning detachments rather than one.

USA SPECIAL FORCES GROUP (Mobile/Airborne)		
Off	WO	Enl
237	133	2,128

National Guard SF Groups are smaller. Each has three SF battalions with three companies in each. In lieu of 4th Battalions, they have special troops companies. Their group HHC(s) and battalion support companies are substantially smaller. NG SFG support battalions have logistical functions only. Forward support companies of NG SF battalions belong to the Group support battalion.



Only four of-ficers, two WO and 13 enlisted per ODC must be SF qualified.

An ODE had one WO and five enlisted; an ODG has an officer, a WO and four enlisted. It operates as two three-man teams with demolition and terminal guidance equipment.

Figure 1-66: US Army Special Forces Group (SFG) Organization

panded its support company into a support battalion. In FY16, however, the Army, as part of its force reduction program, cut all but one of its remaining SF battalions back to three SF companies each. It also incorporated most of the special troops battalion's assets into the support battalion and created a new 4th Battalion. The 4th Battalion establishes, operates and supports a Forward Operating Base (FOB). It can also create a Special Operations Command and Control Element (SOCCE) to support a corps (or MEF) or higher level headquarters.

Each SF battalion or SFG (active or National Guard) is supposed to specialize in the cultures, languages and operating environments of a specific geographic region. However, the wars in Iraq and Afghanistan have forced most SFG(s) to focus on Central Asia and the Middle East. Table 1-37 shows the nominal regional orientation of each SFG.

SF Gp	Region	Team/Billet	ODA	ODB
1st SFG	Asia/Pacific	Team Leader	CPT	MAJ
3d SFG	Africa	Team XO	CWO2	CPT
5th SFG	Central Asia	Ops Officer		CWO3
7th SFG	Latin America	Co. Sgt Maj		1 E9
10th SFG	Central Europe (2d & 3d Bns also Levant)	Operations	1 E8	1 E8, 1 E6
		Ops/Intel	1 E7	1 E7
19th SFG*	Korea (1st & 2d Bns) SW Asia (3d Bn)	Comm.	1 E7, 1 E6	1 E7, 1 E6
		Medical	1 E7, 1 E6	1 E7, 1 E6
20th SFG*	Latin America	Engineer	1 E7, 1 E6	1 E6
		Weapons	1 E7, 1 E6	1 E6
		CBRN*		1 E5
		Supply*		1 E5, 1 E4

*National Guard

Table 1-37: Special Forces Group Regional Orientation

*Billets do not require SF qualification

Table 1-38: Special Forces Operational Detachments "A" & "B"

The basic tactical fighting element of the SF is the Operational Detachment "A" (ODA or "A" Team - see Table 1-38). Its 12 members include specialists in communications, engineering (mainly demolition), light and heavy weapons (including sniper weapons) and medical. Team members also cross train. For a UW mission the team can serve as cadre for a guerrilla company. For SR and DA missions it can operate as two six-man elements. One team (ODA) in most SF companies specializes in military free fall (MFF) parachuting and another in combat diving operations (CDO). One company per SF group includes two MFF teams but no CDO team. The remaining ODA/teams train in other specialties relevant to their parent company's overall mission or operating region. Such specialties may include mountain, maritime or urban operations, or certain types of infiltration.

An SF operational detachment "B" (ODB - see Table 1-38) usually serves as an SF company headquarters though it can conduct operations on its own. As a company headquarters it commands and supports up to six ODA(s). In the field it usually deploys in a rear area but may deploy forward if it is exercising tactical C2 over two or more ODA(s). An ODB is similar to an ODA but because of its command/support role is stronger in operations, planning and logistics but weaker in weapons and engineering.

An SF operational detachment "C" (ODC) serves as an SF battalion headquarters and headquarters detachment (HHD). It rarely deploys forward. With the assistance of the battalion support company and forward support company it provides its subordinate SF companies with plans, C2, training, intelligence and logistics. Like the new 4th Battalion, it can establish, operate and support a forward operating base. It can also create a SOCCE (see above). However, the 4th Battalion may partly or entirely replace it in these roles.

Part II

Equipment Capabilities

2001. Ground Weapons and Tactical Vehicles

a. Armored Vehicles and Associated Weapon Systems

System	Weapons	Ammo Load	Effective Range	Practical Rate of Fire	Combat Wt. Speed Fuel/Range/etc.	Crew + Pax	Number per Organization FY16
M1A1 Main Battle Tank	120-mm gun	40	2,500 meters	6-8 rpm	68 STONS 42 mph on roads 30 mph off roads 505 gal/289 miles	4 + 0	14 per Tank co. 2 per Tank Bn H&S CO 87 per Army ABCT
	.50-cal M2	1,200	1,800 meters	40-80 rpm			
	two 7.62-mm M240	10,800	900 meters	100-200 rpm			
	Smoke GL	24	30 meters	N/A			
M88A2 Recovery Vehicle	.50-cal M2	1,300	1,800 meters	40-80 rpm	70 STONS 30 mph maximum 400 gal/280 miles	3 + 0	2 per Tank co 4 per Tank Bn H&S co 8 per Ordn Maint co 2 per MAC (1st /2d CEB) 22 per Army ABCT
Assault Breaching Vehicle	.50-cal M2; Mine Plow; Dozer Blade	1,300	1,800 meters	40-80 rpm	63 STONS 42 mph on roads 30 mph off roads 505 gal/289 miles	4 + 0	7 (only six crews) per MAC (1st /2d CEB) 6 per Army ABCT BEB
	Two Line Chg Demolition Systems						
AVLB	Armored vehicle launched bridge (unarmed)	an M60 series tank hull carrying an MLC-85 scissors bridge able to span a 60' gap; alternatively, may carry two MK-155 triple MICLIC systems			56.5 STONS 30 mph on roads 10 mph off roads 375 gal/290 miles	2 + 0	5 per MAC (1st /2d CEB) 6 per Army Engineer Mobility Augment'n Co 2 per Army ABCT BEB
LAV (25)	25-mm M242	600	1,700 meters	200 rpm (high)	13-14.2 STONS 62 mph on roads 6 mph in water 71 gal/410 miles Each LAV carries 8 smoke grenade launchers with 16 grenades (range 30 meters).	3 + 6	14 LAV(25), 4 LAV(AT), 2 LAV(M), 1 LAV(C2), 3 LAV(L) & 1 LAV(R) per LAR Co 4 LAV(25), 4 LAV(C2), 4 LAV(L), 2 LAV(R) per LAR Bn H&S Co
	two 7.62-mm M240	1,320	900 meters	100-200 rpm			
LAV (AT)	Twin TOW turret	16	3,750 meters	1 to 3 rpm		3 + 0	
	7.62-mm M240	1,000	900 meters	100-200 rpm			
LAV (M)	81-mm mortar M252	99	5,700 meters	10-20 rpm		5 + 0	
	7.62-mm M240	1,000	900 meters	100-200 rpm			
LAV (C2)	7.62-mm M240	1,000	900 meters	100-200 rpm		2 + 4	
LAV (L)	7.62-mm M240	1,000	900 meters	100-200 rpm		2 + 1	
LAV (R)	7.62-mm M240	1,000	900 meters	100-200 rpm		3 to 5	
AAVP7	40-mm MK-19	864	1,600 meters	40-60 rpm		31 STONS 45 mph on roads 6 mph on water 171 gal/200 miles (up to 7 hours in water)	
	.50-cal M2	1,200	1,800 meters	40-80 rpm			
	Smoke GL	8	30 meters	N/A			
AAVC7	7.62-mm M240	1,000	900 meters	100-200 rpm	3 + 10		
AAVR7	7.62-mm M240	400	900 meters	100-200 rpm	3 to 5		
M9 ACE	Armored Combat Earthmover (high-speed unarmed bulldozer)	n/a	n/a	n/a	27 STONS (ballasted) 18 STONS (travel) 30 mph/3 mph in water 134 gal/230 miles	1 + 0	12 per CEB; 4 per ESB 4 per Army Mobility Augmentation Co 2 per Army ABCT BEB
MK-154	Mine Clearing Line Charge (MICLIC); rocket propelled; makes 100 x 16 meter lane through minefield. MK-155 has 3 MICLIC.				1 MICLIC in M353 trailer	n/a	38 per CEB
MK-155					3 MICLIC on an AAV	n/a	12 per AAV BN H&S Co
M2A2/A3 Infantry Fighting Vehicle (IFV)	Twin TOW launcher	7	3,750 meters	2 rpm	33.75 STONS (37 with armor tiles) 38 mph (w/o tiles) 250-265 miles (w/o tiles) 175 gal Thermal imaging (to 2,000 meters)	3 + 7	138 M2A2/A3 ICV/CFV (including 12 Engineer & 13 FIST variants) per Army ABCT
	25-mm M242	930	1,700 meters	200 rpm (high)			
	7.62-mm M240	2,340	900 meters	100-200 rpm			
	Smoke GL	16	30 meters	N/A			
M3A2/A3 Cavalry Fighting Vehicle (CFV)	Twin TOW launcher	12	3,750 meters	2 rpm		3 + 2	
	25-mm M242	1,705	1,700 meters	200 rpm (high)			
	7.62-mm M240	2,340	900 meters	100-200 rpm			
	Smoke GL	16	30 meters	N/A			
M3A3 FIST Variant	M3A3 CFV variant equips a fire support team (FIST) to acquire and laser designate targets for terminally guided munitions.					3 + 2	

Equipment Capabilities

System	Weapons	Ammo Load	Effective Range	Practical Rate of Fire	Combat Wt. Speed Fuel/Range/etc.	Crew + Pax	Number per Organization FY16
M1126 ICV Inf Cmbt Veh	Remote Weapons Station (RWS) with a .50cal M2 or 40-mm MK-19 heavy machine-gun	200 ready + 2,000 (M2)	1,800 meters (area fire)	40-80 rpm	Stryker Combat Vehicle System (US Army only) 20.41 STONS 63-mph/roads 40-mph/cross country 53-gal/310 miles 16 M6 smoke grenade dischargers	2 + 9	US Army only A Stryker Infantry Bn has: 42 M1126 ICV 4 M1127 SRV (Recon) 10 M1129 MCV-B (mrtr) 4 81mm & 6 60mm mtrs 5 M1130 SCV (C2) 4 M1133 MEV (medical) A Stryker RSTA Bn has: 39 M1127 RV (Recon) 1 M1126 ICV 12 M1128 MGS (105gun) 9 M1134 ATGM ATV 6 M1129 MCV-B 9 M1130 SCV (C2) 4 M1133 MEV A Stryker Bde Engr Bn has: 12 M1132 ESV 3 M1126 ICV 1 M1130 SCV A Stryker Bde Artillery Bn has: 1 M1130 SCV 13 M1131 FSV
M1132 ESV Eng Sqd Veh		35 ready + 430 (MK19)	1,600 meters (area fire)	40-60 rpm		2 + 5	
M1127 SRV Recon Veh		105mm M68	18	2,000 meters		10 rpm	
M1128 MGS Mobile Gun System	.50-cal M2	1,200	1,800 meters	40-80 rpm	3 + 0		
	7.62-mm M240	2,000	900 meters	100-200 rpm			
M1129 MCV-B Mortar Carrier Veh	120-mm M121 mortar	48	7,200 meters	16 rpm (rapid)	M1132 ESV has several possible MEP (Mission Equipment Packages) including mine plows/rollers & obstacle blade M1129 MCV-B may carry either a 60-mm or 81-mm mortar in addition to its 120-mm mortar; 60/81-mm mortars must be fired from the ground; if no other mortar is carried the 120-mm ammo load increases to 60 rounds	5 + 0	
	81-mm M252 or	35	5,700 meters	30 rpm (rapid)			
	60-mm M224 mortar	77	3,490 meters	30 rpm (rapid)			
	7.62-mm M240	2,000	900 meters	100-200 rpm			
M1130 SCV Command V.	.50-cal M2 (in RWS)	200 ready + 2,000	1,800 meters (area fire)	40-80 rpm		2 + 3	
M1131 FSV Fire Spt C2						4 + 0	
M1133 MEV Medevac Veh	Hull modified to create additional space; no RWS; Carries four to six patients (4 litter; or 6 sitting; or 2 litter and 2 to 4 sitting)					3 + 4/6 patients	
M1134 ATGM AT Vehicle	TOW II ATGM	2 + 10	3,750 meters	1 rpm	4 + 0		
	7.62-mm M240	2,000	900 meters	100-200 rpm			
M1135 NBC Recon Veh	.50-cal M2 (in RWS)	200 ready + 2,000	1,800 meters (area fire)	40-80 rpm		2 + 2	

Table 2-1: Armored Vehicles and Associated Weapon Systems

b. Crew-Served Weapons (towed or portable)


Weapon (TAMCN)	Range (m)		Rate of Fire (rpm)	Ammunition	Remarks
	Min	Max			
60mm mortar M224/M224A1(1) (E1065)	70	3,490	30 (max) 20 (sust)	HE, Smoke, WP, Illum, Illum IR (normal load = 48 rounds; an 8-round can weighs 44#)	3 per USMC Rifle co. 2 per USA Infantry or Stryker co.
<i>Notes:</i> (1) M224 weighs 46.5# complete; M224A1 is 20% lighter but same performance; (2) hand-held mode (without bipod; weight = 18 lbs)					
81mm mortar M252** (E1095) (firing wt = 93#)	83	5,702	20 (max) 15 (sust)	HE, SMK, WP, SMK RP, Illum IR, Illum (normal load = 78 rounds; a 3-round can weighs 55#)	8 per USMC Inf or LAR Bn 4 per USA Infantry or Stryker Bn
<i>Notes:</i> Range, rate of fire and ammunition data for 60-mm and 81-mm mortars are quoted from FM 3-90.22, <i>Mortars</i> 12-07					
120mm M327 rifled mortar (E1070) EFSS	1,222 RF* 478 SB*	7,900 RF 6,700 SB	4 (max) 2 (sust)	Typical ammunition trailer load is 25 HE (M1101), 2 WP (M1103) & 2 Illum (M1105)	6 EFSS per USMC 155-mm bn
<i>Notes:</i> *Ranges are for rifles and smoothbore modes. An EFSS consists of two M1163 ITV (Table 2-4) towing one M327 mortar (firing wt = 1,798#) & one M1164 (30-round) ammo trailer (Table 2-7). WP ammunition requires a tail charge assembly (DODIC DWGU).					
155mm howitzer M777A2 (E0671) (wt = 9,840#) (MCIP 3-16.01)	24,000 (w/o RAP); 30,000 (w/RAP); 40,000 (<i>Excalibur</i>)		5 (max) 2 (sust)	HE, RAP, ICM, Smk ILLUM, DPICM, ADAM, WP, RAAMS, CPHD, Excalibur (guided projectile - only M777A2 can fire Excalibur)	18 M777 per USMC 155-mm bn
HIMARS M142 (six-tube MRL on an MTV 5-ton truck) (E1500)	15,000 (GMLRS)	80,000+ (GMLRS)	6-round pod in 25 sec	M30 (GMLRS DPICM - 404 bomblets per rocket; anti-personnel & light armor) M31 (GMLRS unitary 200# HE warhead)	6 per USMC HIMARS battery 16 per USA Fires (HIMARS) Bn
<i>Notes:</i> A six-round rocket pod takes up to 10 minutes to load. The US Army also has MLRS, a tracked armored vehicle carrying two HIMARS type rocket pods. ATACMS (one rocket per pod), is a long range guided weapon with a 500# HE warhead for HIMARS/MLRS. It is only used by the US Army (but USMC can use) and is no longer in production. It will remain in use until existing supplies are exhausted.					
83mm Rocket launcher MK-153 SMAW (E0915)	500m (area) 250m (1 x 2 m tgt)		1-2 (max)	Mk-3 HEDP (weight 13#), MK-6 HEAA (7.2#) & Mk-80 SMAW-NE (19#)	6 per USMC Rifle Co 9 per USMC Cmbt Engr Co (CEC)
<i>Notes:</i> Launcher weighs 16.6#; HEDP is anti-bunker/light armor; HEAA is antitank; SMAW-NE has a HEAT warhead & follow-through grenade (anti-bunker/lt armor); there is also thermobaric round; SMAW II (IOC 2013?) will have a laser range finder & thermal sights					
M98A2 Javelin (FM 3-22.37) (E0207)	150 (top) 65 (dir)	2,500	1-2 (max)	Javelin missile (in launch tube weighs 51#); top or direct attack modes available	8 per USMC Infantry Bn 24 per USA Infantry Bn
<i>Notes:</i> Man-portable "fire and forget" system with command launch unit (CLU) with FLIR (weight 14.16#) and missiles					
M41A7 Saber TOW launcher w/FLIR etc. (E0055) total wt. 565.7#	65	4,200	1-2 (max)	BGM 71E-3b TOW 2A tandem WH (75#) BGM 71F-1 ITOW-2B top attack (64#) BGM 71H-1 TOW bunker buster (61.4#)	8 per USMC/USA Infantry Bn 26 per USMC Tank Bn fired from tripod or HMMWV

Table 2-2: Crew-Served Indirect Fire and Anti-Armor Weapons

Automatic Weapons	Effective Range (meters)		Rate of Fire (RPM)		Remarks
	Point Fire	Area Fire	Sustained	Cyclic	
M27 5.56mm IAR (E0100)	550	800	36	700-850	IAR = Infantry Automatic Rifle; SAW replacement; weighs 7.9# empty; uses 30-rd magazines only; no drum
M249 5.56mm SAW (E0960)	800 (w/tripod) 600 (w/bipod)	1,000 (w/tripod) 800 (w/bipod)	50	650-850	Gun weighs 16.41#; tripod (if provided) weighs 16#; 200-round drum weighs 6.9#
M240B 7.62-mm (FM 3-22.68) E0989	800 (w/tripod) 600 (w/bipod)	1,800 (w/tripod) 800 (w/bipod)	100	650-950	Suppressive fire only beyond 1,100m; gun weight = 27.6#; tripod = 20#; one 200-round can = 16#
M2/M2A1 0.50-cal (FM 3-22.65)	1,500	1,830	40	450-550	M2A1 has quick-change barrel, fixed head space & rail mount; gun weight = 84#; one 100-round can = 32#
MK-19 40-mm grenade MG (FM 3-22.27)	1,500	2,200	40	325-375	Gun weighs 78#; 143# w/tripod; M430 grenade (HEDP - defeats 2" armor and has HE effects); M383 (HE - 15m effective casualty radius); 32-round can = 45#; 48-rnd can = 62#
Minimum grenade arming distance = 18 to 36m					

Table 2-3. Crew-Served Automatic Weapons

c. Tactical Vehicle Summaries

Vehicle Type	TAMCN	Length (in)	Width (in)	Height (in)		Curb Wt (w/BII)	Payload (lbs)			Remarks
				Norml	Min		Road	Off Rd	Towed	
ITV (Internally Transported Vehicle) - <i>Rebuilt M151 jeep able to fit inside an MV-22 or a CH-53; Data common to all ITV</i> : Speed: 65 mph (102 kph); Fording depth: 30" (no kit); Fuel: two 10-gal tanks Diesel/JP; 17mpg or 3.5-gallons/hour at 60 mph										
M1161 LSV	D1161	164	59.5	74.5	59	4,750	2,000	2,000	2,750	LSV (Light Strike Vehicle); for patrol/recon
M1163 PM	D1162	121.2	59	74.5	57.6	3,960	2,000	2,000	2,750	PM (Prime Mover); for EFSS
Notes: The LSV variant replaces the Interim Fast Attack Vehicle (IFAV). The PM is the mobility component of the expeditionary fire support system (EFSS). An EFSS consists of an M327 120-mm mortar, an M1164 ammunition trailer (able to carry up to 30 mortar rounds) and two M1163 PM. One M1163 carries a driver and one passenger and tows the mortar. The other carries a driver and two passengers and tows the ammo trailer.										
		HMMWV (High Mobility Multipurpose Wheeled Vehicle) - <i>Data common to all HMMWV</i> : Fording depth: 30" (60" w/kit); Fuel: 25-gal Diesel/JP; troop, cargo, C2 and shelter carrier variants can assume either a 2-door or 4-door configuration. Four-door vehicles have four seats (for the driver and three others) and a hard top. Armament and TOW carriers have four doors, are armored and have a ring mount (with or without gunner protection) for a machinegun (M2, MK-19 or M240) or TOW launcher. Two-door vehicles in troop carrier configuration can carry the driver (and one other crew member, or 1+1) in the cab and up to eight passengers on the cargo bed aft. In the cargo/troop carrier configuration a HMMWV can carry four passengers besides the driver. Alternatively, it could carry a shelter plus one or two crew members (see TB 9-639 with Change A, April 2001).								
M997A2	D1001	204.5	86	102	102	7,770	2,530	2,530	4,200	armored 2-door ambulance for 4 litter or 8 sitting patients
M1035A2	D1002	182.5	86	72	56	6,100	4,200	4,200	4,200	unarmored 4-door ambulance for 2 litter or 3 sitting patients
Each ambulance carries a driver (Marine) and a Hospital Corpsman (Navy); Speed: 55-mph; fuel consumption: 14 mpg or 4.3-gallons/hour at 60 mph										
M1097A2	D0187	190.5	86	74	56	5,900	4,400	4,400	4,200	Heavy shelter carrier replacing M1037, M1042 & M1097
M1123	D1158	182.5	86	73.5	56	5,850	4,450	4,450	4,200	Troop/cargo/C2/utility vehicle replacing M998 & M1038
M1152	D0022	194	86	75	56	6,440	5,100	5,100	4,200	ECV (expanded capacity vehicle) replaces the M1097
Older HMMWV variants currently being phased out; they still serve as temporary substitutes for newer vehicles and are also included in the TAMCN(s) of certain C2, survey, target acquisition, intelligence, shop maintenance, fire fighting and air defense systems. Vehicle weights given above are without armor; an armor kit adds 3,500 to 3,800 lbs. to a vehicle's curb weight and reduces its payload by the same amount. M1097A2 and M1123 road speed is 55-mph; fuel consumption is 14 mpg or 4.3-gallons/hour at 60 mph; for the M1152 road speed is 70-mph and 10.26 mpg or 5.85-gallons/hour at 60 mph										
M1151A1B1	D0030	194	91	96.25**	73	10,300*	3,950	1,800	4,200	ECV Armament carrier w/B1 integrated armor pkg (IAP)
*12,400# with B1 IAP, MCTAGS (Marine Corps Transparent Armor Gun Shield) and Frag kits (reduces on/off road payload by 2,100#); **with GPK (Gunner Protection Kit - 80" without) or 107.68" with MCTAGS; speed: 70-mph; fuel use: 10.26 mpg or 5.85-gal/hour at 60 mph (replaces M1043A2 & M1114); an armament carrier carries a ring mounted machinegun (M2/M2A1 or MK-19 or M240 or SAW) with GPG or MCTAGS and 360-degree traverse.										
M1152A1B2	D0033	194	90.5	75	75	8,760*	3,340	3,340	4,200	ECV Troop/shelter carrier w/B2 IAP (replaces M1097A2)
2-door configuration; speed: 70-mph; fuel consumption: 10.26 mpg or 5.85-gal/hour at 60 mph. *9,670# w/Frag kits (reduces on/off road payload by 910#)										
M1165	D0031	194	86	75	75	6,550	4,950	4,500	4,200	C2/utility ECV 4-door; no IAP; used mainly by MARSOC
An applique armor package is available (B3? 3,320#); road speed: 70-mph; fuel use: 10.26 mpg or 5.85-gal/hour at 60 mph (replaces M1123 & M998/1038)										
M1165A1B3	D0034	194	90.8	77	75	7,230*	4,970	4,870	4,200	C2/utility ECV (4-door) w/B3 IAP (mainly underbody)
*9,870 lbs w/Frag kits (reduces on/off road payload by 2,540 lbs); design combines the M1097A2 4-door body with the chassis of the M1113 ECV (a C2/utility vehicle used by the Army); road speed: 70-mph; fuel use: 10.26 mpg or 5.85-gal/hour at 60 mph										
M1167A1B1	D0032	194	91	102**	80	11,250*	1,850	1,850	4,200	ECV TOW carrier w/B1 IAP (replaces M1045A2) (4-dr)

**w/TOW turret; carries six missiles (plus one in the launcher); similar to M1151A1; road speed: 70-mph; fuel use 10.26 mpg or 5.85-gal/hr at 60 mph

Table 2-4. The Light Fleet

Equipment Capabilities


HMMWV Marine Armor Kit (MAK)	
	<p>M1123 with MAK Armor.</p> <ul style="list-style-type: none"> • First fielded January 2005 • Bolt on 'zonal armor' to doors, side panels, flank kits, tailgate, roof, ballistic glass • Minimum protection = 1,800 lbs. • Maximum protection = 3,400 lbs. • Air conditioning.
HMMWV Fragmentation (Frag) Kits	
#1	Is Rocker & pillar armor (adds ~ 135 lbs.)
#1a	Increased Rocker & pillar protection
#2	Protection from IEDs at front wheel well (adds ~ 100 lbs.)
#5	Door over lays (replaces B Kits). Thicker glass (adds ~ 700 lbs.)
#6	Counters IEDs & explosively formed penetrators (EFP) (adds approximately 1,350 lbs.)
#7	Overhead Gunner Protection Kit (OGPK). Uses a combination of metal and transparent gun shields to stop small-arms fire. More recent versions are beginning to include some level of overhead protection. Many OGPK kits have an electric drive, to help the gunner move the turret quickly or against gravity when the vehicle is on an incline.

Table 2-5. Vehicle Armor kits

Vehicle Type	TAM CN	Length (in)	Width (in)	Height (in)		Curb Wt (lbs) (w/BI)	Payload (lbs)			Remarks
				Norml	Min		Road	Off Rd	Towed	
<p>MTVR (Medium Tactical Vehicle Replacement) - Built by Oshkosh for the Marine Corps to replace M900 series 5-ton trucks these 7-ton vehicles use an independent suspension system, electronically controlled engine and transmission, a central tire inflation system for increased off-road mobility and state-of-the-art commercial technology. With its maximum off-road payload an MTVR can climb a 60% grade or traverse a 30% side slope at up to 15 mph or a 40 percent side slope at up to 5 mph. Its mission profile is 70% off and 30% on hard surface roads. Fuel: 80-gal Diesel/JP; max road speed: 65-mph; fuel use: 4.6 mpg or 13.3-gallons/hour at 60 mph; fording depth: 60"; on-road cruising range: 300 miles; cab capacity: 1+1; the MAS (MTVR Armor System) is a kit providing 360-degree plus overhead and underbody protection for the MTVR cab. It is a permanent modification. In addition to their crews (1+1) some MTVR variants can carry passengers in folding seats on the rear cargo bed. The AMK/MK-23/25 carries 16; the AMK/MK-27/28 (extended cargo bed) carries 20; and the AMK/MK-29/30 (dump) carries 12. Other variants do not carry passengers except in combat emergencies (see TB 9-639 w/chg A, Apr 01).</p>										
MK-23 MK-25 MK-23A1 MK-25A1	D0198	314.9	98	142.2	98	27,753 28,642 27,900 29,100	30,000	14,200	22,000	Standard cargo variant with ISO bed and folding troop seats. MK-25 has a 20,000-lb capacity self recovery winch. MK-23/25A1 are designated RTAA (Ready To Accept Armor). They have a rebuilt cab and front suspension, armored flooring and air conditioning.
AMK-23 AMK-25 AMK-23A1 AMK-25A1	D0003 D0004 D0003 D0004	314.9	98	142.2	142.2 98	33,000 34,200 33,800 35,000	24,400	12,000	22,000	MK-23A1/25A1 cargo trucks with MAS; An armor kit to protect troops riding on the cargo bed is available. AMK-23A1/25A1 can reduce vehicle height to meet space restrictions on Navy ships.
MK-27 MK-28 MK-27A1 MK-28A1	D1062	386.5	98	142.2	98	30,067 30,955 30,600 31,700	30,000	14,200	22,000	Extended cargo bed/wheel base variant; MK-28 has a 20,000-lb self recovery winch. MK-27/28A1 are designated RTAA. They have a rebuilt cab and front suspension, armored flooring and air conditioning.
AMK-27 AMK-28 AMK-27A1 AMK-28A1	D0005 D0006 D0005 D0006	386.5	98	142.2	142.2 98	35,700 36,800 36,400 37,500	24,400	12,000	22,000	AMK-27A1/28A1 extended wheel base cargo trucks with MAS. An troop carrier armor kit is not available for these vehicles. AMK-27A1/28A1 can reduce their height to meet space restrictions on Navy ships.
MK-29 MK-30 MK-29A1 MK-30A1	D1073	315.4	96	135.5	98	30,400 31,300 31,800 32,500	28,000	12,200	22,000	Dump truck variant; MK-30 has a 20,000-lb self recovery winch. MK-29/30A1 are unarmored but designated RTAA (Ready To Accept Armor). They have a rebuilt cab and front suspension, armored flooring and air conditioning.
AMK-29 AMK-30 AMK-29A1 AMK-30A1	D0007 D0008 D0007 D0008	315.4	96	135.5	135.5 98	37,200 38,000 37,200 38,000	23,200	10,800	22,000	MK-29A1/30A1 dump trucks with MAS. A troop carrier armor package is not available. AMK-29A1/30A1 can reduce height to meet space restrictions on Navy ships.
MK-31 MK-31A1 AMK-31 AMK-31A1	D0009 D0013	296	98	141	98 98 141 98	27,200 32,800	67,000	94,000	N/A	Truck-tractor for MK-970 refueler semi-trailer. MK-31A1 is the RTAA version. AMK-31A1 has reducible armor. Max kingpin load (on-road) is 32,000# (MK-31/31A1) or 28,500# (AMK-31/31A1). Off-road it is 22,500#
AMK-36	D0015	387	98	141	125	54,000	61,100 flat tow	48,800 flat tow	48,800 lift & tow	Wrecker variant; crane lift capacity is 22,000# @ 9-ft or 3,960# @ 31ft; 14,000# lift capacity for lift & tow; self recovery winch 25,000# capacity; two recovery winches 32,000# capacity each. Unarmored MK-36 not in service.
MK-37/37A1 AMK-37A1	D1063	360	98	142	98 142	34,400 38,800	22,000 20,800	11,200 10,400	22,000	HIMARS ammunition vehicles; carries two HIMARS rocket pods on its cargo bed and tows two more on a MK-38 trailer. Has a material handling crane (MHC)

Vehicle Type	TAM CN	Length (in)	Width (in)	Height (in)		Curb Wt (lbs) (w/Bill)	Payload (lbs)			Remarks
				Norml	Min		Road	Off Rd	Towed	
LVSR (Logistics Vehicle System Replacement): The 10x10 LVSR replaces the LVS as the Marine Corps' primary surface transporter of heavy bulk, break bulk and liquid (fuel or water) cargo, 20' ISO containers, flatracks and bridging. It is based on the Army's PLS (pallitized load system) heavy truck and is compatible with PLS flatracks and trailers. The cab has integral armor on the floor to protect it against mines. A removable armor kit protects the cab from small arms/IED. Cab capacity is 1+2; max speed: 65-mph; 166-gallon fuel tank (Diesel/JP); fuel consumption: 2.5-mpg or 20 gallons/hour at 55-mph; fording depth: 60." LVSR variants will not carry passengers except in a combat emergency.										
MKR-15	D1214	458	98	102	102	77,806	10,000	10,000	53,000	Wrecker variant with two rear recovery winches (78,000# combined), a forward self-recovery winch (20,000#) and an MHC (with 15,000# lift @ 11-ft or 7,820# @ 23-ft); can flat tow vehicles LVSR and lighter.
AMKR-15	D0054		109.7	106		87,504				
MKR-16	D0887	415.5	98	102	102	50,170	10,000	N/A	125,000 ?	Truck-tractor/5th wheel variant; primarily tows M870A2 or A2E1 semi-trailers; has a 60,000# self-recovery winch that can winch cargo onto the semi-trailer
AMKR-16	D0053		109.7	106.7		63,850				
MKR-18	D0886	432.2	98	139	102	54,052	45,000	45,000	53,000	Cargo variant equipped with the Load Handling System (LHS) for self-loading ISO 20' containers, PLS compatible flatracks and ribbon bridge components. *Vehicle height with 20' container on board is 161"
AMKR-18	D0052		109.7	149.2		84,125				

SOURCES: USMC TM 11240-ODA *Principal Characteristics of USMC Motor Transport Equipment*, dated March 2010 and <http://www.mar-corsyscom.usmc.mil/sites/GTES/PM%20MT/default.asp>

Table 2-6. Medium and Heavy Tactical Trucks



Figure 2-1: MTRV Medium Truck Variants



(Above) LVSR MKR-18 taking on board an (empty) MK-1077 Flatrack
(Left) LVSR MKR-18 cargo truck with HIPPO LHS compatible Water Tank on board

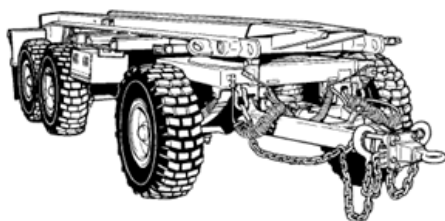


LVSR MKR-15 Wrecker

LVSR MKR-16 Truck Tractor (w/o semi-trailer)

Equipment Capabilities

Types (with TAMCN)	Dimensions in inches; Weights in lbs					Tow Speed (mph)		Remarks
	Length	Width	Height	Curb Wgt	Payload	Road	Off Rd	
Tactical Lunette Trailers: All are single axle (two-wheel) trailers except where indicated								
M1164 (D0840)	70.3	60	57.6	925	1,800	50?	30?	ITV ammo Trailer (ITV-AT) for the M1163 ITV-PM; part of EFSS; Carries 30 rounds for M327 mortar; fording depth 30"
M116A3 (D0085) M101A3 (D0850)	147 145.7 147	73.5 81.5 73.5	35 36 36	1,340	1,500 2,360 1,500	50	30	M101/116 series are Korean War era trailers designed for 3/4-ton trucks; used as interim trailers for HMMWV series trucks M1102 series trailers are replacing them. M116 is a chassis trailer; M101 has a cargo bed & tailgate; fording depth: 30"
M1102-H (D0016) M1102 LCC (D0017)	135	87.5	52.5 40.5	1,460 1,175	2,740 3,025	50	20	Light tactical trailer series replacing M101/116 series (M1101 is used only by the Army; same as M1102 but payload only 1,250#); M1102 LCC is a chassis trailer (for generators); M1102-H (Heavy) has cargo bed & tailgate; fording depth: 60"
M-353 (D0080) MK-353 (4-wh) (D0081)	187.5 200	95.9 97.6	48.25 111*	2,650 10,705	7,000 8,000	50	25	Chassis trailer for medium trucks; carry generators and MK-153 mine clearing launchers; MK-353 is replacing M-353; fording depth: 30" (M-353); 60" (MK-353); *height reducible to 59.15"
M-105A2 (D0860) MK-593 (4-wh) (D0862)	165.5 198	83 97	98 125*	2,694 11,140	3,000 8,000	65	30?	General cargo trailers for medium trucks; both have tailgates and cargo beds. The MK-593 is designed for the MTRV and is replacing the M-105A2; fording depth: 30" (M-105A2) or 60" (MK-105). *height reducible to 68"
MK-38 (4-wh) (D0861)	314.4	98	88	10,000	12,000	65	30?	HIMARS ammunition trailer towed by a AMK/MK-37 HI-MARS re-supply truck; carries two rocket pods; ford depth 60"
Note: M-149A2 (D0880) 400-gal water trailers for medium trucks are being phased out. Their MK-149 twin-axle (600 gal) (D0882) replacement (designed for the MTRV) is cancelled. The Marine Corps will in future transport bulk water on general cargo trailers.								
M1073 (4-wh) (D0885)	263.6	96	38.6	6,640	15,500	65	30?	Full Up Power Pack (FUPP) trailer; a flatbed designed to carry the power pack for the M11 power pack but can be used for other loads; towed by an MTRV or LVS/LVSR
Engr Equipment Trailer (B2565)	371.5	97	153	11,700	20,000	55	25?	A 2-axle flat bed trailer used to carry the Backhoe Loader (BHL), Light-Capability Rough Terrain Forklift (LRTF), or ammunition.
Semi-Trailers: (Fording depth for both types is 30")								
MK-970 (D0215) AMK-970 (D0215)	359	96	104.5	19,000 22,970	34,700 30,730	35	15?	A 5,000-gal. semi-trailer for over/under wing aircraft refueling; AMK-970 is armored. The prime mover is the MK/AMK-31. May use a 5-ton tractor if fuel load limited to 3,000-gallons
M-870A2 & A2-S (D0235) M-870A2-E1 (D0002)	508 507	96 120	101.3 48	19,600 23,360	80,000 100,000	35	15?	LVSR-towed goose-neck 3-axle flat-bed semi-trailer ("low boy") used mainly to transport engineer equipment. The A2-S with a leaf spring suspension and is replacing the A2. The A2-E1 can carry an AAV or a 621B armored scraper.
PLS (Pallitized Load System) & LHS (Load Handling System) Equipment: Compatible with Army PLS/HEMTT series and Marine Corps LVSR heavy tactical trucks and ISO compliant. LHS and interchangeable flatracks enable an LVSR driver (with or without a PLS trailer) can load or unload a cargo from his truck in less than one minute, and both truck and trailer in less than five minutes. No forklifts or other MHE are required.								
M-1076 PLS Trailer (D0035)	333.7	96	60	16,520	33,000	55	25?	A three-axle lunette trailer that carries the same cargo flatrack as the LVSR; curb weight includes an empty MK-1077 flatrack. The prime mover is the LVS/LVSR. Fording depth: 48"
MK-1077 PLS Flatrack (D0195)	248.5	96	62.48	2,900	33,000	N/A	N/A	A 20' x 8' flat welded steel cargo platform with a lifting point at one end; it can carry break bulk cargo or a 20' ISO container. It can be self-loaded on board an LVS/LVSR cargo variant and/or PLS trailer. Unlike the earlier M-1077 flatrack the MK-1077 has no hydraulic, air or electrical connections or equipment.
Flatrack Refueling Capability (FRC) (D0211)	240	96	96	15,400	18,000	N/A	N/A	2,500-gal fuel tank with 250-gal/minute diesel pump mounted in an ISO 20' frame with a flatrack base; fully self-contained it tactically re-fuels vehicles and aircraft in an expeditionary environment; compatible LVS/LVSR trucks, LHS & PLS
LHS Water tank M105 (Hippo)	240	96	68	9,060	16,882	N/A	N/A	2,000-gal water tank with 125-gal/minute pump in an ISO frame with flatrack base; it is essentially the water carrying version of the FRC and furnishes potable water in an expeditionary environment; compatible LVS/LVSR trucks, LHS & PLS
SOURCES: USMC TM 11240-ODA <i>Principal Characteristics of USMC Motor Transport Equipment</i> , dated March 2010 except as noted.								



M1076 PLS Trailer

Table 2-7: Tactical Trailer Summary



M1102-H Cargo Trailer

Figure 2-3: Tactical Trailers



Flatrack Refueler (FRC)

Fuel and Water SIXCON Planning factors for the SIXCON fuel/water modular system:

- One SIXCON fuel or water module holds 900 gallons of fuel or water
- Diesel fuel weighs approximately 7.7 pounds per gallon; water weighs 8.3 pounds per gallon.
- An empty SIXCON fuel or water module weighs 2,600#
- A full SIXCON fuel module weighs 9,550#; a water module weighs 10,000#
- A SIXCON fuel or water pump module weighs 2,300#
- The maximum cross-country load for an MTVR is 14,200#

A cross-country load for an MTVR is one full SIXCON fuel/water module and one pump module or two fuel/water modules with reduced (600-gal) loads.

d. Mine Resistant Ambush Protected (MRAP) and Countermine Vehicles

TYPE	Manufacturer	TAM CN	Length (in)	Width (in)	Height (in)	Curb Wt (lbs)	Payload (lbs)	Cab	Fuel (gals)	Miles/gal (roads)	Notes
Cougar A1 ISS CAT I (4x4)	GDLS-FPI	D0025	253	102	112	38,000	5,000	2+4	70	6.0	Fuel includes a 10-gallon reserve; An A2 version exists but USMC uses the A1 with ISS (independent suspension system). The <i>Cougar</i> Cat II is modified to carry and operate specialized route clearing equipment (as a "poor man's <i>Buffalo</i> " see 4019) (1)
Cougar CAT II (6x6)	GDLS-FPI	D0051	295 294	107 108	119 124	42,500 48,000	7,500	2+8	70	5.0	
Buffalo A2 CAT III (6x6)	GDLS-FPI	B0035	323	106	156	53,500	22,500	2+4	85	3.8	Armored but unarmed vehicle with a specific engineering mission; it should not be used without local security.
MRAP-ATV (MATV) (4x4)	Oshkosh	D0036	246.8	98.1	105	27,500	4,000	2+3	46 (usable)	9.3 (@45-mph)	New design utilizing MTVR components and an independent suspension system; for CAT I missions in close terrain (2)
Note: M-ATV offers superior cross country mobility to other MRAP(s) and armor protection better than an armored HMMWV but less than other MRAPs. Ambulance and "stretched" variants are available.											
Husky Mk. III	CSI	B0093	289	99.6	123.7	18,400	7,000	1+0	40	12.0*	Max speed = 45-mph
Husky Vehicle Mounted Mine Detector (VMMD) System is centered on the <i>Husky</i> 4x4 mine detector vehicle (MDV). A Route Clearing Platoon (RCP - see paragraph 4019 below) includes two <i>Husky</i> MDV equipped with <i>Husky</i> Mounted Detection Systems (HMDS) that includes ground penetrating radar (GPR). The <i>Husky</i> 2G or Mk. IV is an Army only variant with seating for a second crewmember. If a <i>Husky</i> sustains mine damage it is easily repaired using a "Redpack" parts trailer. One <i>Husky</i> can clear a corridor three meters wide at speeds up to 5-mph. See: http://c-s-i.com/Products/vmmd.asp											

Table 2-8: Mine Resistant Ambush Protected (MRAP) and Countermine Vehicles in Marine Corps Use



Figure 2-4: MRAP Vehicles

MRAP(s) are armored trucks designed to protect their occupants from mines, IEDs, small arms and explosively formed penetrators (EFP). Most are based on vehicles developed by the apartheid era South African government to counter insurgent IED(s). The post-Afghanistan Marine Corps now uses MRAP(s) only for EOD and route clearing missions. DoD classifies MRAP(s) in three categories as follows:

- **Category I** vehicles weigh 7 to 15 tons, are usually twin axled (4x4), and carry a crew of two plus two or more passengers (Table 2-8). The Marine Corps is acquiring 1,352 *Cougar* 4x4 MRAPs. Most will be in war reserve. Each route clearing platoon equipment set will have two (see paragraph 4019). Each EOD company will have 15 (only 14 in 9th ESB/III MEF) and each MWSS EOD squad has one. The Marine Corps is also acquiring 705 Oshkosh All Terrain Vehicles (MATV). Most will be in war reserve or prepositioned in Kuwait. The headquarters battalions of 1st and 2d Marine Divisions and headquarters battery 12th Marines will each have 10.
- **Category II** vehicles weigh 15 to 25 tons and carry a crew of two plus up to eight passengers. They are usually three axled (capable of 6x6 operation but normally using 6x4 on hard-surface roads). The Marine Corps retains only 46 CAT II MRAP(s) (all 6x6 *Cougar*

Equipment Capabilities

variants see Table 2-8) or two per route clearing platoon equipment set (see 4019). The Army retains the CAT II MRAP RG-33L for its engineer mine clearing units and as a design base for its new family of Medium Mine Protected Vehicles (MMPV).

- **Category III** vehicles weigh 25 tons or more. Their mission is to carry and support EOD teams and their equipment for mine and route clearance operations. The only CAT III MRAP in DoD service is the *Buffalo* (Table 2-8), manufactured by Force Protection Inc. This 6x6 vehicle has a hydraulic operating arm with a camera and a “claw” for investigating suspected mine locations and/or removing or pre detonating mines. The *Buffalo* is huge, expensive and difficult to transport. By 2017 the Marine Corps will have 68 of which 23 will be in route clearing platoon equipment sets (see 4019). The rest will be in war reserve or stored overseas.

All MRAP(s) have shock absorbent seating and v-shaped (monocoque) hulls to direct underbody blast away from occupants. Top speed is 65-mph. Forging depth is 39 inches (unprepared) for all models. CTIS and run flat tires are good for 30 miles at 30 mph in run flat mode on a level road. All types can negotiate a 60% grade at 2 mph. Category I and II vehicles may mount a machinegun and accept a GPK (gunner protection kit) or a transparent armor gun shield. On- and off-road payloads do not differ. All MRAP(s) can tow trailers though they seldom do so. Towing weights are not normally published but a CAT I MRAP will tow a load of at least 4,500 pounds.

2002. Fixed Wing Aircraft

A/C Type and Missions	Speed & Endurance (1)	Weapon Capabilities (representative)	Combat Radius & Range (2)	Comments
(1) Varies significantly with ordnance load and mission profile. Information from MCTP 3-20F (ex-MCWP 3-25) (2) Most have unlimited range when refueling. Range then limited by pilot fatigue, ~ 8 hours.			Source: Global Security web site	
AV-8B Harrier II+ (= Harrier Two Plus) Offensive Air Support (OAS) Anti-air warfare (AAW)	MAX endurance: 230 KIAS (Knots In Air Speed) Maximum 585 KIAS	STANDARD: GAU-12U 25mm cannon OPTIONAL: AIM-9M Sidewinder, AIM-120 AMRAAM MK-82/83/84 bombs; GBU 10/12/16 LGB AGM-65F Maverick IR & Laser Versions AGM-84 Harpoon Anti-Ship CBU-99 cluster munitions LITENING Targeting pod; JDAM, Napalm	100 nm with 20 minutes loiter time <i>Unrefueled range:</i> 686 nm	AN/APG 65 radar enables the Harrier to launch AIM -120, AMRAAM, AIM-7, and AGM-84 mis-siles.
F-35B Lightning II strike fighter - will replace AV-8B Offensive Air Support (OAS) Anti-air warfare (AAW)	MAX endurance: data not yet available Maximum: Approximately 1,030 KIAS	OPTIONAL: (2 wpns bays, 4 hardpoints) 1 GAU-12 25mm (220 rds) external pod 2 AIM-120 AMRAAM 2 AIM-132 ASRAAM (weapons bay only) 2 AIM-9X Sidewinder (hardpoints only) AGM-65 Maverick IR & Laser Versions AGM-158 JASSM; AGM-88 HARM GBU 10/12/16/24 LGB GBU-31/32/38 JDAM; GBU-39 SDB CBU-87/89; CBU-103/104/105 WCMD CBU-99/100 Rockeye II Storm Shadow; Brimstone	F-35B combat radius about 450nm (but probably little or no loiter time at that distance) <i>Unrefueled range:</i> approxi-mately 1,080 nm	AN/APG-81 AESA Radar AN/AAQ-37 Dis-tributed Aperture System (DAS) Electro-Optical Tar-geting Sys (EOTS)
F18A/B Hornet OAS/AAW version C/D Models OAS, AAW, tactical air coord-inator (airborne) [(TAC(A)], forward air con-troller (airborne) [(FAC(A)] recon (RECCE) suppression of enemy air de-fenses (SEAD)	MAX endurance: 250 KIAS Maximum Sources vary: 1,100 KIAS is low end of all.	STANDARD F/A 18: M61A1/A2 Vulcan 20mm cannon OPTIONAL: AIM-7 Sparrow; AIM-9 Sidewinder AIM-120 AMRAAM MK-80 series GP bombs GBU-10/12/16 LGB AGM-65F Maverick IR & Laser Versions AGM-84 Harpoon Anti-Ship CBU-59 cluster munitions AGM-88 HARM; SLAM/SLAM-ER Joint standoff weapon (JSOW) Joint direct attack munition (JDAM) 2.75" and/or 5" Rockets	200 nm with 30 minutes loiter time <i>Unrefueled range:</i> 2,000+ nm C/D Models radii: <i>Fighter:</i> 366 nm <i>Attack:</i> 415 nm (Figures from Navy Library on-line)	A&C models are single seat, B&D are two seaters. All models have AN/AAS-38 FLIR, LITENING II pods, GPS, NVG. C/D Models also have an advanced tactical airborne reconnaissance sys-tems (ATARS) pod.
EA-6B Prowler Airborne Electron-ic warfare (EW), C2 & SEAD	MAX# endur-ance: 470 KIAS Max: 560 KIAS	ALQ-99 Tactical jamming System (TJS) AGM-88 HARM	<i>Unrefueled range:</i> 850 nm 425 nm mission radius <i>Ferry range:</i> (5 drop tanks) 1,747 nm.	Has counter IED capability EA-18G is replac-ing it
EA-18G Growler Airborne Elec-tronic Attack (AEA) & SEAD The Growler has 90%+ parts com-monality with the standard F-18E/F <i>Super Hornet</i> .	MAX endurance: 250 knots indi-cated air speed (KIAS) Maximum 1,100+ KIAS	In surveillance only configuration: 2 AIM 120 for self defense For stand-off/escort jamming missions: 2 AGM 88 HARM 2 AIM 120 In a strike configuration: 2 AGM-99 HARM 2 AGM 154 JSOW, 2 AIM 120	Range: 2,000 nautical mile (nm) on interdiction mis-sion w/ 4 x 1, 000 bombs & 2 AIM 9 missiles and 2 drop tanks. Ferry Range: 5,600 nm	The EA-18G will be the only dedicated EW A/C in the US force and in NATO

A/C Type and Missions	Speed & Endurance (1)	Weapon Capabilities (representative)	Combat Radius & Range (2)	Comments
Notes for the EF-18G: (1) Block 1 has up to 3 AN/ALQ 99 radar jamming pods w/ AN/ALQ-218 digital radar warning receiver and AN/ALQ communication countermeasures system (2) Block 2 has APG 79 multi-mode radar w/ passive detection mode and active radar suppression, ALQ 218, and ALE 47 countermeasures dispenser.				
KC-130J Aerial refueling Assault Support Emergency MEDEVAC Cargo lift Special Operations Support Radio relay Battlefield Illumination	Cruise speed ~ 348 KIAS Maximum 355 KIAS	The weaponized KC-130J is the HARVEST HAWK (Hercules Airborne Weapons Kit): First deployed to Afghanistan in OCT 2010; first combat was 4 NOV 2011. The HAWK includes an AN/AAQ-30 targeting system used on the AH-1Z Cobra. Allows the aircraft to identify and use laser-designation at max weapons range AND a pallet mounted fire control console in the cargo compartment. See notes below	Tanker Mission: 1,000 nm radius TANKER: 8,455 gallons (gals) in wing & external tanks plus 3,600 gals in a specially configured removable internal fuselage tank. Can transfer fuel at ~ 360 gal/minute	Cargo Mission: 3,062 nm radius CARGO: 4,500 cu ft usable volume; max. payload is 37,216 lbs. e.g. Two HMMWV, or one M113, or 6 pallets or 74 litters or 92 passengers or 76 combat equipped paratroopers.
The HAWK kit can be installed/removed in less than a day. When the Kit (detailed above) is installed the right wing retains all of its refueling capability but the left wing retains none. A KC-130J can still deliver fuel while equipped with the kit. Capability I included adding the AN/AAQ-30 thermal sighting system (TSS) sensor package (As on AH-1Z Cobra) and fire control electronics. With TSS the HH can ID/laser designate at max weapons range.		Capability II included mounting the missile rack (four AGM-114 Hellfire missiles) in place of left most refueling pod. Capability III added the Battle Management System and a pod of ten AGM-175 Griffin missiles (fired through the rear door). <i>A Harvest HAWK can remain airborne for over 10 hours.</i> <i>An F/A-18 (unrefueled) can do so for only 1.5 hours</i>		
KC-130 F/R/T. As of June 2010. The last F model was retired in FEB 08. The T model is only in the USMC reserves.				
MV-22 Assault Support (Medium lift)	Max cruise speed 250 KIAS	Some are armed with M240G machine gun on the back ramp. Also some have a remotely operated weapon turret, based on the remote guardian system (RGS) located in a belly mount with a GAU-17 7.62mm minigun. This provides 360° coverage.	With a payload of 6,000 lbs or 24 troops range is 430 nm With a payload of 8,300 lbs range is reduced to 220 nm. Normal operating range is 1,100 nm Ferry range is over 2,100 nm.	Up to 24 troops or 20,000 lbs internal cargo or up to 15,000 lbs external cargo (ideal conditions) It has largely replaced the CH-46E

Table 2-9. General Fixed-Wing Aircraft Capabilities

AN/AAQ-30 thermal sighting system (TSS) on the left wing. Allows the HH to ID and laser designate at max weapons range



Four AGM-114 Hellfires (shown) or 16 70mm direct attack guided rockets (DAGR) may be carried on left wing



A pod of ten launchers for AGM-175 Griffin Air-to-ground missiles on the rear ramp of a KC-130J



Cargo Aircraft Type	Configuration	Example Payloads	
		Passengers / Combat Equipped troops	Cargo Pallets
KC-130J air land delivery of cargo / personnel	Optimized for Cargo	0 / 0	6
		92 / 76	1
		52 / 33	3
		24 / 16	5
	With Fuselage Fuel Tank	40 / 0	1
		24 / 0	2
	Aero-Medical Evacuation	Litter Patients + In-Flight Attendants	N/A
70 + 6		N/A	
74 + 2		N/A	



(Right) Fire Control Center mounted on a cargo pallet and secured in the cargo bay. Fire Control Officers (FCO) are KC-130, AV-8B, F/A-18, or AH-1 pilots
<http://www.youtube.com/watch?NR=1&v=DZ8kWDNSzJk> 37 slide brief (CAC required) at:
<https://www.intranet.tecom.usmc.mil/sites/mawts1/departments1/default.aspx> Go to TACAIR, KC-130. Capes brief under Harvest Hawk



KC-130 variants: As of June 2014: All active USMC units fly the KC-130J. The VMGR-234 is still flying the older "T" version but is transitioning to the "J". This transition s/b complete o/a June 2015. The VMGR-452 will continue to fly the KC130T for the foreseeable future.

Figure 2-5: KC-130J Harvest Hawk

Equipment Capabilities

2003. Rotary-Wing Aircraft

Type	Missions	Speed (KIAS)	Armament	Radius (R) / Endurance (E)	Remarks (Notes 1 & 2)
CH-53E <i>Super Stallion</i>	Assault Support CASEVAC, TRAP	150	up to 3 GAU 15/16/21A (.50-cal) - two door guns & one (optional) rear ramp gun	R: 55 nm w/max payload; 270 nm w/8,000# payload E: 4 hours	20,000# internal or up to 24,800# external cargo; or up to 55 combat equipped troops MEDEVAC: 24 litters & two attendants; capable of in-air refueling from a KC-130
UH-1Y <i>Venom</i>	Primary C2 & MEDEVAC; but also assault support, FAC(A), CAS, TRAP, SAR	164 (dash)	1 or 2 door guns (GAU-16 .50-cal, GAU-17 M-134 7.62-mm minigun or M240D) or 1 GAU-2A/B (forward firing GAU-17); 2 hardpoints for LAU-68 (7 tube) or LAU-61 (19-tube) "Hydra" rocket launchers (Note 3)	R: 130-nm with 2,200# payload E: 3.3 hours (max)	up to 2,000# (UH-1N) or 3,200# (UH-1Y) internal (excluding fuel) or 5,000# (UH-1N) or 6,000# (UH-1Y) external; up to 12 personnel, including 2 to 4 crew (pilot, co-pilot, crew chief and/or gunner), or 6 litters (+ 2 crew)
The UH-1Y replaces the UH-1N. It uses new four-bladed all composite, ballistically tolerant main and tail rotors.					
AH-1Z <i>Viper</i> or <i>Zulu Cobra</i>	CAS	200 max 155 cruise	One M197 20mm cannon (750 rounds) in a "chin" turret, plus four universal hardpoints for external stores. The AH-1Z also has two wingtip hard points for one AIM-9 "Sidewinder" missile each.	R: 125 (110 hot day) nm with 2,500# payload E: 3.3 hours	Payload up 2,900# (2,176# hot day); crew of 2. Has improved electronics and survivability. It also uses new four-bladed all composite, ballistically tolerant main and tail rotors; this gives it a greater range & payload. The <i>Viper</i> began to replace the <i>Super Cobra</i> in 2009.
AH-1W <i>Super Cobra</i>	Armed Recce/ Escort Limited anti-air defense	170 max 132 cruise	External stores may include any combination of (1) M272 4-tube AGM-114 "Hellfire" missile launchers; (2) LAU-68 (7-tube) or LAU-61 (19-tube) "Hydra" rocket launchers (see Note 4); (3) AIM-9 "Sidewinder" air-to-air missiles; (4) fire or practice bombs or flares; (5) 77- or 100-gal drop tanks.	R: 58 nm (standard day with external stores) E:	Payload up to 2,465# (hot day?); crew of 2 The AH-1W carries the same types of external stores as the AH-1Z, but it also has the option to carry 2-tube TOW ATGM launchers (one per universal hardpoint) or 4-tube "Zuni" (5-inch) rocket launchers (one per hardpoint) The last <i>Super Cobra</i> is to be replaced by, or upgraded to, a <i>Viper</i> in FY2020
AH-6M MH-6M "Little Bird" (ARSOF only)	Reconnaissance, CAS; limited troop/cargo lift (in MH configuration only)	125 (max) 90 (cruise)	(AH) Four pylons: Two normally carry guns: one M230 30-mm chain gun or two .50-cal GAU-19 or two 7.62-mm M134 miniguns; other two may carry 12- or 19-tube 70-mm rocket launchers; or (per outer pylon) four AGM-114 "Hellfire" (MH) no standard armament	R: 116 nm (internal) 266 nm (w/auxiliary) E: 80 min (internal) up to 3 hours (w/auxiliary)	carries a 1,500# payload or up to six passengers (four external) or two litter cases (external) in addition to a pilot and optional co-pilot day/night detection capabilities out to 10-km and a laser rangefinder Operational only with 1-160th SOAR (see 1015b)
UH-60L/M MH-60M <i>Blackhawk</i> (US Army)	Assault Support (mainly troop lift), C2, TRAP, aerial minelaying (Volcano)	156 (max) 115-120 (cruise)	UH-60: 2 M240H 7.62-mm MG; SOF (MH-60) 2 M134 miniguns; SOF (MH-60/DAP) 2 M134 + 2 pylons, each able to carry a M230 30-mm gun, or LAU-61/68 rocket pod, or four AGM-114 "Hellfire" VOLCANO scatterable mine delivery system (no guns can be carried with Volcano) HH-60: unarmed air ambulance	R: (UH) 120 nm (internal fuel only) E: (UH): 2 hours (w aux tanks: 4 hours) (MH): 90-100 min (w/aux tanks: 4 hrs) Fuel: (UH) 362-gal (internal); two aux. tanks (200-gal ea) burns 178-gal/hr	up to 9,000# external cargo or 11 combat equipped troops (16 if seats are removed) or VOLCANO system (takes 8 hours to install, limits crew to two pilots and one operator and limits speed to 80 kts when scattering mines). Crew: 2-4 (2 pilots, crew chief, gunner); DAP = Defensive Armed Penetrator (armed escort)
HH-60L (US Army)	MEDEVAC				up to 9,000# external cargo; 600# rescue hoist; can carry up to 6 litter or ambulatory patients; crew = 2 pilots, crew chief & 3 medics
CH-47D/E MH-47G <i>Chinook</i> (US Army)	Assault Support (heavy lift) CASEVAC	170 (max) 145 (cruise)	(CH) 3 M240H 7.62-mm MG - 2 door guns, 1 rear ramp gun (MH) 2 M134 7.62-mm miniguns (forward doors/windows) 2 M240H 7.62-mm MG (aft windows)	(internal fuel only) R: 50 nm (w16,000#) 100 nm (33 trps) E: 2 hours (514-gal per hour); carries 1,030-gal total	33 combat equipped troops; for CASEVAC may carry 24 litter + 1 ambulatory or 31 ambulatory patients; max sling load = 26,000# Crew: 3-6 (two pilots, flight engineer, crew chief, two gunners) With auxiliary tanks can ferry to 1,056 nm
AH-64D/E <i>Apache</i> (US Army)	CAS (attack) and armed reconnaissance	140-145 (max continuous) 110-120 (cruise)	1 30-mm M230E1 chain gun; max eff. range = 1.5 to 1.7-km standard ammo load is 1,200 rounds but if the 100-gal auxiliary internal tank is used it falls to 300 or to 100 if the 130-gal auxiliary tank is used 4 universal pylons (two per wing); each can carry 4 AGM-114 "Hellfire" missiles (range = 8-km) or one LAU-61/68 "Hydra" rocket launchers (see Note 4) or a 230-gal fuel tank (ferry missions only); also has wingtip pylons for FIM-32 "Stinger" air-to-air missiles (range; 200-m to 4.5-km) - or AIM-9 "Sidewinder" AAM?	R: 120 nm (normal fuel only) E: 2 hours (standard); burns 175-gal/hour; standard fuel load = 370-gal; may carry an internal auxiliary fuel tank with either 100 or 130-gal	Ordnance carried will not normally exceed 2,500#; crew = 2 (pilot, co-pilot/gunner) Modernized target acquisition and designation system (MTADS) for day/night. TV laser designates tank size target to 6,000 meters. MTADS/forward looking infrared (FLIR). Modernized pilot night vision system (MPNVS), (night weather and obscurants) Fire control radar can detect, classify, and prioritize targets w/o line of sight or in limited visibility for Hellfire engagements. RF Interferometer identifies and prioritizes radar emitters. Keeping these systems operational requires a very high maintenance effort.

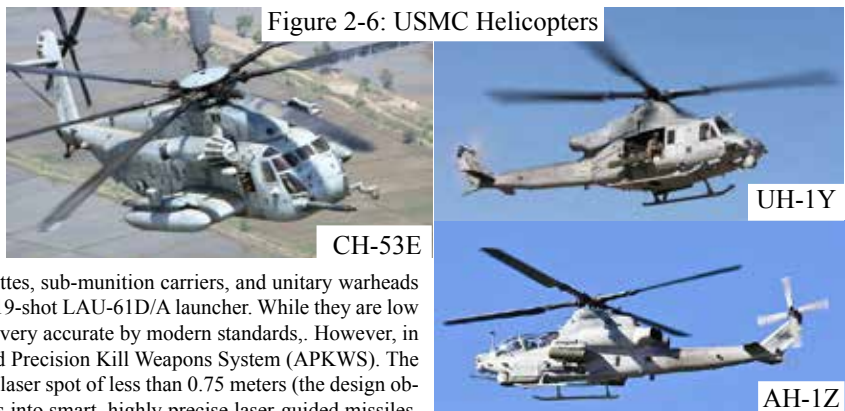
Type	Missions	Speed (KIAS)	Armament	Radius (R) / Endurance (E)	Remarks (Notes 1 & 2)
SH-60B/F <i>Seahawk</i> (USN)	ASUW (Anti-Surface Warfare); ASW (Anti-Submarine Warfare)	168 max 146 cruise	Up to three MK-46/54 torpedoes; four AGM-114 <i>Hellfire</i> missiles (except MH-60S, which can carry eight); 1 (SH/HH) or 2 (MH only) M240H or M134 (GAU-17) miniguns or .50-cal GAU18; may carry one AGM-119 in ASUW role; may also carry <i>Stinger</i> SH-60B/F and MH-60R/S may carry a 30-mm Mk 44 gun & other equipment for counter-mine warfare	R: 450 nm (internal fuel only)	Carries a crew of four plus 8-12 troops or 4,000-lbs cargo (internal) or (if equipped with cargo hook) 6,000-lbs (external); MH-60R crew may be up to six. SH-60B operate from CG, DDG, and LCS; SH-60F operate from CVN; also called <i>Ocean Hawk</i> ; its primary mission is ASW; HH-60H is also called <i>Rescue Hawk</i> . MH-60R is replacing SH-60B/F; MH-60S replaces CH-46 in the cargo lift role but can execute other missions (ASW, ASUW, MCM etc.); also called <i>Knight Hawk</i> .
HH-60H (USN)	ASUW; CSAR (Combat Search & Rescue); NSW (Naval Special Warfare)				
MH-60R/S (USN)	ASUW, ASW, MCM (Mine Countermeasures & cargo lift)				
MH-60G (USAF)	Special Operations & CSAR	195 max 159 cruise	2 M134 (GAU-17) miniguns or 2 .50-cal GAU-18	R: 324 nm (internal fuel only) or 441 nm (w/external tanks)	Max crew is 6 (4 is normal); plus 8-12 troops; also called <i>Pave Hawk</i> . The Air Force also retains about 50-60 UH-1N <i>Twin Huey</i> for use as utility aircraft.
HH-60G (USAF)	CSAR				

Table 2-10: Rotary-Wing Aircraft Capabilities

NOTE 1: Combat radius/endurance varies with temperature, humidity, wind, aircraft configuration, and mission requirements. Specific performance must be calculated for every mission.

NOTE 2: Sources: MCTP 3-20E (ex-MCWP 3-24) *Assault Support*, ATP 3-18.10 *Special Forces Air Operations* (02-2016) and FM 3-04 *Army Aviation* (07-2015) plus Global Security and other on line resources.

NOTE 3. The Hydra 70 (70mm or 2.75 inch) is a family of unguided rockets offering a variety of warhead configurations, from smoke and illumination rounds, to flechettes, sub-munition carriers, and unitary warheads up to 317 pounds. Are fired from the 7 shot Lau-68C/A or 19-shot LAU-61D/A launcher. While they are low cost weapons, and easy to carry in quantity, they are not a very accurate by modern standards,. However, in April 2010 the Navy approved production of the Advanced Precision Kill Weapons System (APKWS). The APKWS has hit an average distance from the center of the laser spot of less than 0.75 meters (the design objective was 2 meters). This transforms the standard rockets into smart, highly precise laser-guided missiles. The APKWS initially deployed with the AH-1W.



Aviation Glossary			
AAM	air to air missile	IR	Infrared
AAS	advanced airborne sensor	JDAM	joint direct attack munitions
AAW	anti-air warfare	JSOW	joint stand off weapon
AGM	advanced guided munitions; air-to-ground missile system	KC	airborne fuel tanker/cargo
AIM	air intercept missile	LGB	laser-guided bomb
ALQ	A = Airborne, L = Countermeasures, Q = Special Purpose	MEDEVAC	medical evacuation
AMRAAM	advanced medium-range air-to-air missile	MK	mark
AN	analog nonsecure	MV	Marine Corps variant
APG	aim point graphic	nm	nautical mile
ATARS	advanced tactical airborne reconnaissance system	NTS	night targeting system
AV	attack/vertical	NVD	night vision device
CAS	close air support	NVG	night vision goggles
CBU	cluster bomb unit	NWP	Naval Warfare Publication
CH	cargo helicopter	OAS	Offensive Air Support
CV	Air Force variant	OBS	On Board System
DASC(A)	direct air support center (airborne)	OH	Observation Helicopter
EA	electronic attack	Pax	Passengers
EW	electronic warfare	RECCE	Reconnaissance
F/A	fighter/attack	SEAD	suppression of enemy air defenses
FLIR	forward looking infrared radar	SLAM	stand off land attack missile
GAU	aircraft gun unit (not necessarily a complete gun system)	SLAM-ER	stand off land attack missile - expanded response
GBU	guided bomb unit	SOF	Special operations forces
GP	general purpose	TAC(A)	Tactical Air Coordinator (Airborne)
GPS	global positioning system	TJD	Tactical Jamming System
HARM	high speed anti-radiation missile	UH	Utility Helicopter

Table 2-11. Aviation Glossary

Equipment Capabilities

2004. Unmanned Vehicle Systems

a. Unmanned Aircraft Systems (UAS)

DoD categorizes UAS by “groups” based on the characteristics and capabilities shown in Table 2-12 below. The Marine Corps uses Group 1 UAS at company or battalion/squadron level. Marine Unmanned Aerial Vehicle Squadrons (VMU) operate Group 3 systems. Currently, Group 2, 4 or 5 UAS are Army and/or Air Force systems (*Fire Scout* is also a Navy system) but they may support Marine Corps operations.

Group	Max. Gross Takeoff Wt.	Normal Operating Altitude (ft.)	Knots Indicated Air Speed (KIAS)	Representative Systems (Programs of Record or POR)
Group 1	Under 20 lbs	Under 1,200 AGL	Under 100	USMC Systems RQ-11B <i>Raven</i> , RQ-12A <i>Wasp</i> , RQ-20A <i>Puma</i>
Group 2	21 to 55 lbs	Under 3,500 AGL	Over 250	No USMC POR
Group 3	56 to 1,320 lbs	Under 18,000 MSL		USMC Systems: RQ-7B <i>Shadow</i> , RQ-21A <i>Blackjack</i>
Group 4	Over 1,320 lbs	Over 18,000 MSL	Any	MQ-1 <i>Predator</i> & MQ-9 <i>Reaper</i> (USAF); MQ-1C <i>Gray Eagle</i> (Army)
Group 5				RQ-4 <i>Global Hawk</i> (USAF); MQ-4C (USN <i>Global Hawk</i>)

Table 2-12: UAS Group Characteristics


RQ-12A WASP IV AE (All Environment)		
	Category	Group 1 UAS
	Payload(s)	Gimbaled dual mode Electro Optical (EO) / Infrared (IR).
	Specs	Takeoff Weight: 3 lb. Wing span: 3.3 ft. Endurance: 50 mins Range 5 km / 2.6 nm (line-of-sight). Speed: 40-65 km/h (21-35 kts). Operating Altitude: 500-1000 AGL
	Datalinks	Digital Data & Video (CONUS): 1.755 – 1.850 GHz Digital Data & Video (OCONUS): 1.625 – 1.725 GHz
	Remarks	Serves mostly with MARSOC. Uses the same ground control stations as <i>Raven</i> and <i>Puma</i> . Fully waterproof.

Table 2-13: Unmanned Aircraft System – *Wasp* (USMC/USAF/SOCOM)


RQ-11B RAVEN Digital Data Link (DDL)		
	Category	Group 1 UAS
	Payload(s)	EO or IR with infrared pointer.
	Specs	Takeoff Weight: 4 lbs Wing span: 4.5 ft Range: 6 miles Speed: 30-60mph Endurance: 60-90 mins (rechargeable battery) 80-110 mins (single use battery) Operating Altitude: 500 – 1000 AGL
	Datalinks	Analog C2: 371.75 – 395.1 MHz Video: 1.7175 – 1.84 GHz Digital C2/Video CONUS 1.755 – 1.850 GHz C2/Video OCONUS 1.625 – 1.725 GHz
	Remarks	Uses the same ground control stations as <i>Wasp</i> and <i>Puma</i> . Not an All Environment (AE) system.

Table 2-14: Unmanned Aircraft System – RQ-11B *Raven* (USMC/USA/USAF)


RQ-20A PUMA DDL AE (All Environment)		
	Category	Group 1 UAS
	Payload(s)	EO/IR with infrared pointer, SIGINT, laser pointer
	Specs	Takeoff Wt: 13 lbs. Wing span: 9.2 feet. Range: 15 km 8 nm Speed: 37-83 km/h (20-45 kts) Endurance: 120 minutes. Operating Altitude: 500-1000 AGL
	Remarks	Part of USMC Small UAS (SUAS) program of record. Its ground control station is interoperable with <i>Wasp</i> and <i>Raven</i> .

Table 2-15: Unmanned Aircraft System – *Puma* AE (USMC/USA)


RQ-21A Blackjack		
	Category	Group 3 UAS (for the VMU squadrons)
	Payload(s)	EO/IR/Laser Range Finder/IR Marker in the forward turret. Modular mission payloads in the fuselage support battlespace awareness, force application, and net-centric capabilities.
	Specs	Takeoff Wt: 135 lbs Wing span: 16 ft. Payload: 37.5 pounds Endurance: 24 hours Speed: 55 kts (cruise); 80+ kts (max) Ceiling: > 15,000 feet
	Datalinks	C2: 1.350 – 1.390 GHz Video: 1.755 – 1.850 GHz (L-Band) 2.200 – 2.4835 GHz (S-Band)
	Remarks	Each VMU has nine RQ-21A systems (five air vehicles plus ground control stations, etc. per system). A MEB detachment has three RQ-21A systems; a MEU detachment has one. Payload bay is designed for “plug-and-play” multi-mission payloads and rapid fielding of new technologies. Can operate ashore without a runway or at sea from LHD and LPD class ships.

Table 2-16: Unmanned Aircraft System – RQ-21A (USMC/USN/SOCOM)


RQ-7B SHADOW		
	Category	Group 3 UAS
	Payload(s)	EO/IR/Laser Designator/Laser Rangefinder/IR pointer. VHF communications relay (30-88 MHz).
	Specs	Takeoff Wt: 460 lbs Wing span: 20.4-ft Payload: 45-80 lbs Speed: 90 kts (cruise); 110 kts (max) Endurance: 9 hrs Range: 67-nm/125-km Operating Altitude: 15,000 MSL
	Datalinks	Primary C2: 2.400 – 2.485 GHz (S-Band) Secondary C2: 340 – 400 MHz (UHF) CONUS Video: 4.400 – 4.950 GHz (C-Band) OCONUS Video: 5.250 – 5.850 GHz (C-Band)
	Remarks	Each VMU has three RQ-7B systems (four air vehicles, nine HMMWV plus trailers, ground control stations etc. per system). A MEB detachment gets one RQ-7B system. Replacement by a Group 4 system is planned for the FY18 timeframe.

Table 2-17: Unmanned Aircraft System – RQ-7B Shadow (USMC/USA)


MQ-8B FIRE SCOUT		
	Category	Group 4 UAS (rotary wing)
	Payload(s)	(550-lbs) EO/IR w/ laser designator or other sensor packages; can also carry weapons or up to 200# emergency supplies
	Specs	Takeoff Weight: 3,150 lbs Speed: 115-kts (max) Range: 110 nm (5 hours on station) Operating Altitude: 20,000 MSL
	Remarks	The Navy initially developed the RQ-8A to operate from ships and replace the fixed wing RQ-2 Pioneer. After the Navy lost interest in the RQ-8A the Army developed the RQ-8A into the RQ-8B by replacing its three-blade rotor with a four-blade. This greatly increased lift and payload. Adding stub wings able to carry Hellfire missiles, Viper Strike laser guided GBU(s) or Advanced Precision Kill Weapon System (AP-KWS) 70-mm guided rockets converted the RQ-8B into the MQ-8B. The Army's successful development efforts led the Navy to procure the MQ-8B for sea-based operations. (Not a MAGTF asset)

Table 2-18: Unmanned Aircraft System – MQ-8B Fire Scout (USN/USA)

Equipment Capabilities



Figure 2-7: Predator Variants

Predator Variants (Group 4 UAS)								
MQ-1 (USAF/OAG)			MQ-1C (US Army)			MQ-9 (US Air Force/ SOCOM)		
Production stopped 3 MAR 2011. Between JUL 94 and MAR 2011 the series flew over 900,000 flight hours and maintained a fleet fully mission capable rate over 90 percent. Total 268 produced)			Frequently called "Warrior" or "Sky Warrior" or the ERMP (extended range, multi-purpose) but <i>Grey Eagle</i> is the official program of record. It replaces the MQ-5B <i>Hunter</i> .			A JFACC-owned theater asset for ISR and target acquisition in support of a JTF. SOCOM flies the MQ-9 <i>Reaper</i> , and has its own MQ-1 Predator program.		
Medium-altitude, long-endurance, (MALE) remotely piloted aircraft. Its primary missions are CAS, AI, & ISR								
CRAFT	Wing span	Length	Takeoff Weight	Sensors	Armament	Endurance / range	Speed	Ceiling
MQ-1 Predator	55 ft	27 ft	2,250#	MTS-A EO/IR, Lynx® Multi-mode Radar, SIGINT/ESM system	Two AGM-114 Hellfire OR equivalent	40 hours 770 miles(1)	Cruise ~ 100 MPH (120 KTAS)	25,000 ft
MQ-1C Grey Eagle	56 ft	28 ft	3,600#	EO/IR Lynx® SAR/GMTI Communications relay	Four AGM-114 Hellfire OR equivalent	30+ hour endurance. Distance not stated.	Cruise ~ 130 mph (150 KTAS)	29,000 ft
MQ-9 Reaper (formerly called Predator B)	66 ft	36 ft	10,500#	MTS-B EO/IR, Lynx® Multi-mode Radar Multi-mode maritime radar Automated Identification System (AIS) SIGINT/ESM system Communications relay	Combination of: AGM-114 Hellfire GBU-12 Paveway II GBU-38 JDAMS	30 hours 1,150 miles (1)	Cruise ~ 210 MPH (240 KTAS)	50,000 ft

All specs from: <http://www.bga-aeroweb.com/Defense/MQ-1-Predator-MQ-9-Reaper.html> (1) Miles per US Air Force Fact sheet

Table 2-19: Unmanned Aircraft System – Predator (USAF/USA/ SOCOM - not a MAGTF asset)

Predator series aircraft are employed in combat air patrols (CAP) of three to four aircraft each to facilitate continuous surveillance of a given area. Operating a CAP requires at least 171 personnel, including seven pilots and seven sensor operators for the mission and six more of each for landings and takeoffs.

RQ-4 GLOBAL HAWK (Group 5 UAS)			
Specifications	RQ-4A	RQ-4B	MQ-4C (see note)
Wing span (ft / m)	116 / 35.3	130.9 / 39.8	130.9 / 39.8
Length (ft / m)	44 / 13.4	47.6 / 14.5	47.6 / 14.5
Weight (lbs)	11,350	14,950	14,950
Max takeoff weight	26,750	32,250	32,250
Speed (mph/kts)	390 / 340	357 / 310	370 / 330
Range (nm)	9,500	8,700	9,950
Ceiling (ft / m)	60,000 / 18,288 (11.3 miles)		

NOTE: The MQ-4C is part of the Navy's Broad Area Maritime Surveillance (BAMS) UAS. As of 2009 the MQ-4A was providing more than 50% of the total maritime ISR to USCENTCOM. The first flight of the MQ-4C Triton was May 2013. Projected IOC DEC 2015. The BAMS UAS provides persistent ISR within 2,000nm and allow the P-3A and the P-8A* to focus on Anti-surface ship, anti-submarine, and Multi-intelligence (INT) operations.
* Operational with VP 16 NOV 2013. Sources: RQ-4A & 4B USAF FactSheet. MQ-4C <http://www.naval-technology.com/projects/mq-4c-triton-bams-uas-us/>

Table 2-20: UAS – RQ-4 Global Hawk (USAF/USN - not a MAGTF asset)



Figure 2-8: Global Hawk Variants

Unmanned Systems Glossary			
ABIR	airborne infrared	ISAR	inverse synthetic aperture radar
AEHG	advanced extremely high frequency	ISR	intelligence, surveillance, and reconnaissance
AIRES	airborne infrared system	JDAM	joint direct attack munitions systems
AESA	active electronically steered array	LPI/LPD	low probability of intercept or detection
AGL	above ground level	LRE	launch and recovery element
AGM	air to ground missile system	M	multi-role (can carry ordnance)
AI	air interdiction, artificial intelligence	MAC	multi-aircraft control
AIS	automated identification system	MALE	medium altitude long endurance
AWAPSS	airborne wide area persistent surveillance system	MCE	mission control element
ASIP	airborne signals intelligence payload	MFAS	multi-function active sensor
ATDL	advanced tactical data link	MPRF	maritime patrol and reconnaissance force
ATLC	automatic take off and land capability	MR-RTIP	multi-platform radar technology insertion program
BAMS	broad area maritime surveillance UAS	MQ	multi-role, unmanned
(B) LOS	beyond line of sight	MSL	mean sea level
CDL	common data link	MTS	multi-spectral targeting systems
CSP	common sensor payload	MUSIC	manned unmanned systems integration capability
EMARSS	enhanced medium altitude reconnaissance surveillance system	NAS	national airspace system
EO	electro-optical	OCA	offensive counter air
ESM	electronic surveillance measures; electronic support measure	PPSL	predator primary satellite link
EISS	enhanced integrated sensor suite	Q	unmanned
ETOS	effective time on station	OODA	observe, orient, decide, and act
FSS	fixed satellite service	R	reconnaissance
FOR	field of regard	RQ	reconnaissance, unmanned
GBU	guided bomb unit	SADL	situation airborne data link
GCS	ground control station	SAR	synthetic aperture radar
GIG	global information grid	SEI	specific emitter identification
GMTI	ground moving target indicator	STUAS	small tactical unmanned aircraft system
HAA	high altitude airship	SUAS	small unmanned aircraft system
HALE	high altitude long endurance	TAG	tactical auxiliary ground control
IMINT	imagery intelligence	TAS	true air speed
IOC	initial operational capability	U&W	unmanned aviation and strike weapons
IR	infrared	VMU	Marine unmanned aerial vehicle squadron

Table 2-21: Unmanned Aircraft System – Glossary

The glossary above far exceeds the manual and is provided for the edification of the readers. The majority of it is drawn from the “USAF Unmanned Aircraft Systems Flight Plan 2009-2047” (Dated 19 May 2009). The manual and a 44-slide PowerPoint presentation is available on line at <http://www.defense.gov/dodcmsshare/briefingslide/339/090723-D-6570C-001.pdf>

b. Unmanned Ground Vehicle Systems

The USMC has been evaluating US Army developed SUGVs for their suitability for USMC applications. It has also been independently developing UGV(s) on its own. The items on these pages are merely a sampling.

Route Reconnaissance and Clearance [R2C] Capability Set (CapSet) Robot (TAMCN B0048): This is the PackBot (manpack robot) -510, built by the iRobot Corporation. It is a commercial off the shelf (COTS) system being procured for the capability (equipment) sets for the route clearance platoons (RCP) of the mobility assault companies of the 1st and 2d CEB. These robots provide remote stand-off confirmation and reduction of explosive hazards (EH). Their operating range is about 300 meters line-of-sight (LOS) from the operator in a wireless mode or 220m in a (tethered) wired mode. The batteries used can support about 4 hours’ continuous operation. Each robot has a manipulator arm capable of grasping and lifting 10 pounds at full extension or 30 pounds at minimal extension while traveling on flat, level ground. Weight fully loaded is about 53 pounds. Maximum ground speed is about 5.7 mph.



Figure 2-9: PackBot -510



Figure 2-10: SUGV-310

Small Unmanned Ground Vehicle (SUGV) 310 (TAMCN E0110): This robot is used in lieu of the PackBot -510 in the modified R2C capability equipment set (ModSet) used by MEU engineers. It is also used by EOD and MARFORSOC. The SUGV-310 has an operating range of approximately 300 meters with an LOS from the operator. The robot can continually operate for about 4 hours before the operator must change or recharge the battery. The robot’s manipulator arm is capable of grasping and lifting a 5 pound load that is up to 12 inches away from the robot while traveling on flat, level terrain. Weight is 34.4-lbs.



Figure 2-11: MTRS Mk. 1

Man Transportable Robotic System (MTRS) Packbot Mk. 1 (TAMCN E0064): This system and the Mk 2 MTRS “Talon” (see below) are the two basic robotic systems in Marine EOD teams. However, the Marine Corps is now also issuing SUGV-310 (above) to EOD squads as a third “ultra light” robotic option. At 58-lbs (robot only) the Mk. 1 is the lighter of the two basic systems. It is a rugged robot designed to conduct EOD reconnaissance, and other search and surveillance

Equipment Capabilities

tasks. It can employ EOD tools to safely disrupt IEDs, military ordnance, and other hazardous devices. It operates within a 300 meter LOS distance from its control unit. One is issued per EOD squad.

MTRS Mk. 2 “Talon” (EOD) (TAMCN E0066): At 115 pounds (specific mission profiles may increase this) the TALON is the heavier of the Marine Corps’ two basic EOD robot systems. A standard EOD squad has two. TALON is an all-terrain, all-weather robot platform with day/night capability. It is controlled through a two-way RF or fiber optic link from an attaché-sized Operator Control Unit (OCU). It uses a two-stage arm that can reach a length of 64 to 72 inches and a gripper attachment to manipulate hazardous materials or ordnance. Maximum speed is 5.2 mph and its obstacle capabilities enable it to climb stairs or operate in up to 15 inches of snow. Its cable lets it operate up to 300 meters from the operator but it can operate wirelessly at up to 800 meters. Its operating arm can lift up to 20-lbs (10-lbs at maximum extension). It has three infrared cameras.

Figure 2-12: MTRS Mk. 2 Talon



The Dragon Runner 10 (DR-10) (TAMCN B0134): This is a Micro Unmanned Ground Vehicle (MUGV) weighing 10 lbs. Is a a multi-mission remote platform that can be thrown over a wall, through a window, up or down a stairway or from a moving vehicle. It will right itself after landing. DR-10 has front & rear cameras, microphone, and infrared illuminators & sensors. Using a wearable controller, a Marine can send a DR-10 to scout ahead of his small unit. Specifically designed for dismounted small units to enhance reconnaissance missions, early warning, and overall situational awareness. Will fit inside an assault pack. Has day and night sensors. The CE(s) of I and II MEF each have 60 of these systems for issue as needed. CE III MEF has 20.

Figure 2-14: Recon Scout XT



Figure 2-13: Dragon Runner 10

Recon Scout XT (TAMCN B0140): An ultra-lightweight robot that can be thrown over obstacles, onto rooftops, and into uncleared structures or tunnels to provide reconnaissance support for dismounted troops. Its infrared optical system automatically activates when ambient light is low, allowing operations in darkened environments. It weighs about a pound. As with the B0134, there are 60 each in I and II MEF and 20 in III MEF. However, each MARFOR-SOC Raider Battalion has 20 (in addition to 4 MTRS Mk. 1, 10 MTRS Mk. 2 and 16 SUGV-310).

2005. Marine Air Command and Control System Radars

	3D/2D	Max. Range	Max. Altitude	Frequency	Ballistic Trajectories	MACCS Agency	Authorized per MEF
AN/TPN-31(V)7	2D	60 nm ASR* 10 nm PAR*	30,000 ft. 10,000 ft.	S-band X-band	No	MATCD	3 (2 in III MEF)
AN/TPS-59A (V)3	3D	400 nm	500,000 ft.	L-band	Yes	TAOC/EWC	2
AN/TPS-63B	2D	160 nm	40,000 ft.	L-band	No	TAOC/EWC	2
AN/TPS-80 (G/ATOR)	3D	Data unavailable (to replace TPS-63 & TPN-31)			Yes	TAOC/EWC/MATCD	6 (5 in III MEF)

*ASR = area surveillance radar; PAR = precision approach radar

Table 2-22: Marine Air Command and Control System Radars

2006. Marine Air Defense

Platform	Employment	Air-to-Air/ Surface-to-Air	Data Link	Radar	Comm. & Security
F/A-18A/C/D Hornet (F-35 to replace in 2017?)	AAW-OAAW SEAD, Escort OAS-CAS/DAS TAC(A) (“D” only) Interdiction Night Attack	- M61A1/A2 Vulcan 20mm cannon - AIM-7 Sparrow(1) - AIM-9 Sidewinder - AIM-120 AMRAAM	TADIL-C	- AN/APG-73 with increased speed/memory - AN/AAR-50 thermal imaging navigation set - AN/AAS-38 Nite Hawk FLIR targeting pod - GEC Cat’s Eyes pilot’s night vision goggles - LITENING II Targeting Pod system	2 x AN/ARC-210 UHF, VHF, SINCGARS, Have Quick II, KY-67
AV8-B Harrier II+ (F-35 to replace in 2017?)	AAW-OAAW SEAD, Escort OAS-CAS/DAS Interdiction Night Attack	- 25mm cannon - AIM-7 Sparrow (1) - AIM-9 Sidewinder - AIM-120 AMRAAM (1) Being replaced by the AIM-120.	Digital targeting data link	- AN/APG-65 - Digital targeting data link, - Global Positioning System, - LITENING II Targeting Pod system	2 x AN/ARC-182 UHF, VHF, KY-58 Upgrade: 2 x AN/ARC-210 UHF, VHF, SINCGARS, Have Quick II
MANPADS	Low Altitude	FIM-92D Stinger Missile		N/A	VHF Tactical Radios

Table 2-23: Marine Air Defense Capabilities – Weapons

Platform	Mission	Type/Data Link/Mode	Band	Range	Altitude
AN/TPN-31(V)7	Air traffic control surveillance radar	2d JREAP	S	60 nm	30,000 ft.
AN/TPS-59 (V)3	Long range surveillance (ABT/TBM) GCI	3D PPDL to ADCP	L	400 nm	500,000 ft.
AN/TPS-63B	Medium range (gap-filler) surveillance (ABT) GCI	2D Remote Radar (VHF)	L	160 nm	60,000 ft.
AN/TPS-80 (G/ATOR)	Ground/Air Task Oriented Radar to replace TPS-63, MPQ-62, UPS-3, TPQ-46 and TPN-31	3D	S	Data unavailable see para. 4011a	No data available

Table 2-24: Marine Air Defense Capabilities – Sensors

Agency	Mission	C2 System	Data Link	Comm/Sec	Reference
TACC	Senior agency of MACCS; ACE Cmdr's CP	MSCS;CTAPS	TADIL A, B; NATO Link 1 CTT	HF, UHF, VHF Satcom; Have Quick, YES	MCRP 3-30F.2 (ex-MCWP 3-25.4)
TAOC	Control intercept of hostile aircraft & missiles; Surveillance & ID of a/c within assigned sector; Tactical ATC	AN/TYQ-23	TADIL A, B & J; ATDL-1 NATO Link 1 CTT	HF, UHF, VHF; Have Quick, YES	MCRP 3-30F.6 (ex-MCWP 3-25.7)
MATCD	Air Traffic Control BDZ	AN/TYQ-164 ADLS	JREAP	HF, UHF, VHF, SATCOM, YES	MCRP 3-30F.7 (ex-MCWP 3-25.8)

Table 2-25: Marine Air Defense Capabilities – Command and Control

2007. Communication Equipment

a. Ground Single-Channel Radio

The Marine Corps has migrated to a new “family” of single-channel tactical radio systems that feature improved encryption and text messaging capabilities. These systems are summarized in Table 2-26.

Freq. Band	Receiver-Transmitter	Configuration (power shown in Watts)				Frequency Range	Typical Applications
		TAMCN	Configuration	TAMCN	Configuration		
HF to VHF	RT 1694D (AM/FM) (HF/VHF) (note 1)	A2042	AN/PRC-150C (20W)	A0067	AN/MRC-148 (60/150W)	1.6-60 MHz	Radio line of sight + long rg (30+ miles)
		A0266	AN/VRC-104 (150W)	A0139	AN/TRC-209 (60/150W)		
VHF to UHF	RT-1523 (VHF) (note 2)	A2079	AN/PRC-119F (4W)	A1957	AN/MRC-145A (2x50W)	30-88 MHz	(VHF) Radio line of sight and relay or retransmission SATCOM (PRC-117F or G & VRC-103 or 114)
	(AM/FM) (VHF/UHF) (note 3)	A2043	AN/PRC-148 (5W)	A0129	AN/PRC-152 (5W)	30-512 MHz	
		A0069	AN/VRC-111 (2x50W)	A0097	AN/VRC-110 (2x50W)		
	RT-1796 (note 4)	A2068	AN/PRC-117F (20W)	A0126	AN/VRC-103 (50W)	30 MHz - 2 GHz	
RT-1949 (note 4)	A0336	AN/PRC-117G (20W)	A0352	AN/VRC-114 (50W)			
UHF	Commercial (note 5)	A0118	AN/PRC-153 (5W)			380-470 MHz	Voice to 1 km

Table 2-26: Ground Single Channel Radio Capabilities

Sources: TM 2000-OD/2C Dec 05 & MARCORSYSCOM Communications and Network Systems (CNS) Programs and Equipment Facts Book 2011

Notes:

(1) The AN/PRC-150 is a half-duplex HF and VHF manpack replacement for the AN/PRC-104. It is the primary manpack system for recon and FAC communication. The AN/VRC-104 is a vehicle mounting for the PRC-150 (the radio is extra). Versions (V)3 and later are amplified. The AN/MRC-148 is a VRC-104 (radio included) installed in a dedicated HMMWV. The TRC-209 is a transit case and amplifier for one PRC-150 (the radio is extra).

(2) The AN/MRC-145A and PRC-119F are the last variants of the SINCGARS (single channel ground and air radio system) family of tactical radios. SINCGARS consists of the RT-1523 series receiver transmitter in a wide variety of configurations. The PRC-119F is a manpack configuration for the lighter weight RT-1523E. The MRC-145A is a dedicated HMMWV incorporating an AN/VRC-90D, (two heavier RT-1523C receiver-transmitters amplified to 50 watts). The Marine Corps is replacing the PRC-119F with the PRC-117F and 117G. The MRC-145B (TAMCN A0403) will replace the MRC-145A (TAMCN A1957)

(3) The PRC-148 and PRC-152 are competing hand-held radio designs from Thales Communications and Harris, respectively. The standard PRC-148 is the urban version but there is also a maritime (TAMCN A2044) version. It has already had several upgrades. Both systems offer capabilities (LOS range is up to 12 miles) that until recently were only available in larger man-pack radios. They include voice and text messaging, built-in encryption, GPS and VHF/UHF transmission. The VRC-111 is a vehicle mounted recharger/amplifier (50 Watts in current versions) for two PRC-148 (radios are included). The VRC-110 is the same but supports only one PRC-148. The VRC-110 (with two radios) and -112 (with one radio) are the equivalent systems for the PRC-152.

(4) The PRC-117F is a multi-band radio providing secure line of sight (LOS) and SATCOM communications from 300m out to 35 km. It replaces the AN/PSC-5, AN/PRC-113, AN/PRC-117D and AN/PRC-119. It is used mainly by the GCE for quick SATCOM link-up for voice/data transfer. It includes Electronic Counter Counter Measures (ECCM), frequency hopping and compatibility with SINCGARS, Have Quick and all



AN/PRC-117F

Figure 2-15: Ground Radio Configurations



AN/VRC-103



AN/VRC-104



AN/PRC-152



AN/PRC-148

Equipment Capabilities



AN/VRC-110



AN/PRC-117G



AN/VRC-111

other single channel VHF/UHF systems. It is compatible with legacy encryption systems and can translate between otherwise incompatible radios. The PRC-117G offers a much wider frequency range and a much faster data transfer rate (3.6 mbps vice 64 kbps). It can pass data, video and PLI (position Location Information) in near real time. Both radios can be configured as base stations or vehicle systems. The vehicle mounted versions are the VRC-103 (PRC-117F) and VRC-114 (PRC-117G). Both include radios and amplifiers. Both PRC-117F and G are designed so that technicians can upgrade hardware or software without opening the case.

(5) The PRC-153 is a hand-held transmitter/receiver with a headset described as a Personal Role Radio (PRR) or Integrated Intra-Squad Radio (IISR). It transmits data or voice in low intercept probability mode to 1 km. It is widely issued throughout the MAGTF. A rifle company rates 94; an infantry battalion 337.

b. AN/TRC-170(V)5 Multi-Channel Radio (Assets belong to the CE and the ACE) (TAMCN A2179)

Operating Mode	Line of sight (LOS) or troposcatter mode
Frequency Range	4.4 – 5.0 GHz
Bandwidth	3.5 or 7 MHz
Data Rates in kbps	2048, 4096, 8192, 10240, 12288, 16384
Output Power	1 KW
Operating Range	Up to 100 miles
Number of channels	32 full duplex
Transmission Types	Voice (digital or analog); data (digital or quasi analog)

NOTES: This system must be stationary and requires external power to operate. A HMMWV can transport it and tow a trailer (to carry the antenna group).

Table 2-27: AN/TRC-170 Multi-Channel Radio (CNS Factbook 2011)

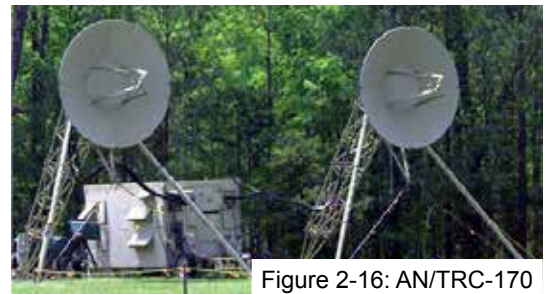


Figure 2-16: AN/TRC-170

c. AN/MRC-142 Multi-Channel Radio



Figure 2-17: AN/MRC-142 UHF Multi-Channel Radio

Variant (TAMCN)	Frequency Range	Band width	Channel Rate	Output Power	Operating Range	Orderwire Channel	Transmission Types	Antenna
MRC-142B (A1954)	1350 - 1850 MHz (UHF)	125 KHz	576 kbps	50 Watts	30 miles	Analog: 300 – 3400 Hz Digital: 16 kbps	Voice/data, wideband, digital	AS-4255 (2) 50 ft SMAK Antenna (1) 100 ft.
MRC-142C (A0153)	Band I 225 –400 MHz Band III 1350 - 2290 MHz (both UHF)	125 KHz	256, 512, 768, 1024, 1536, 1544, 2048, 4096, 8192, 12288, 13504, 14336, 16384 or 16640 kbps	Low: 300 Miliwatts (25 dbm) High: 3 Watts (35 dbm)	Up to 35 miles LOS	AEOW, DVOW	Voice/data, wideband, digital	AS-4255 (2) 50 ft; TEAMS (1) 112 ft –on a second HMMWV or an M1102 trailer

Remarks: Integrated HMMWV mounted multi-channel system with two radios providing two-way secure digital wideband transmission. The AN/MRC-142B is designed for ship to shore LOS communication and includes an RF amplifier and SMAK antenna. The MRC-142C has replaced the MRC-142A (A01955) as the primary mobile system for regimental level and higher communications. Any MRC-142 variant must be stationary when operating its communication equipment. As of FY14 the acquisition objective (AAO) for this equipment is 448 MRC-142C and 24 MRC-142B.

Table 2-28: AN/MRC-142 Multi-Channel Radio (CNS Factbook 2011)

d. AN/TSC-191 Wireless Point-To- Point Link, Version D (WPPL-D) (TAMCN A0278)

Operating Mode	Directional Line of sight (LOS)
Frequency Range	4.5 – 5.0 GHz (Harris radio) and 5.470 – 5.725 (Redline radio)
Bandwidth	1 MHz
Data Rates	Up to 80 mbps (Harris radio) Up to 108 mbps (Redline radio)
Operating Range	Up to 80 kilometers (LOS) (Harris radio) Up to 50 kilometers (LOS) (Redline radio)
Antennas	1 ft Sector – used for point to multipoint links under 25 km; 2 ft subscriber – used for point to point
Transmission Types	Digital Voice/data
Remarks	The WPPL serves a multi-channel transmission MAGTF-level (MEU or higher) communications system. <i>The TSSR is a great substitute for long cable runs or augments existing GMF satellite terminals?</i>

Table 2-29: AN/TSC-191 Wireless Point-To- Point Link, Version D (WPPL-D)

e. Lightweight Multi-Band Satellite Terminal (LMST), AN/USC-65(V)1 and (V)2

The MAGTF-level Lightweight Multi-band Satellite Terminal (LSMT), AN/USC-65 is a Super High Frequency (SHF), transportable, multi-band satellite ground terminal consisting of a 2.5-meter antenna and a group of transit cases that contain and protect the electronic equipment.

Technical Characteristics for AN/USC-65 (V)1 (A0806) or (V)2 (A0807)	Shipping weight on 463L Pallet System	9,735 lbs
	Weight in HMMWV-mounted configuration with antenna	7,482 lbs
	Technology	Digital
	Orientation/Range	Satellite/SATCOM
	Power	1-400 Watts (adjustable)
	Operational Mode	Voice, Data
	Encryption	KG-94A, KY-57, KY-99

Table 2-30: AN/USC-65(V)1 and (V)2 Lightweight Multi-band Satellite Terminal (LSMT)

The AN/USC-65(V)1 Hub provides up to seven simultaneous communication paths using two antennae. The (V)2 Mini-Hub provides the minimum set of communication interfaces for up to four simultaneous communication paths using one antenna. The system can be configured as a hub or mini-hub terminal in a satellite communications network. Recent upgrades have enabled this system to operate in quad band. It now offers full duplex in the military X and C bands and the commercial Ku and Ka bands. The LMST(V)1 provides two communication paths for support of a single antenna with redundant operations or dual antennae with no redundancy. A MEF CE rates two V(1) and six (V)2. A MAW rates three (V)2 The planned end of life for this system is FY15.

The system is transportable by truck, rail, ship, aircraft or helicopter or as netted cargo. It operates in the SHF spectrum including the C-band (3.625-6.425 GHz), X-band (7.25-8.4 GHz), Ku-band (10.95-14.5 GHz) and Ka-band (20.2-21.2 GHz).



Figure 2-18: LMST 2.5-meter Antenna

f. PHOENIX Tactical SHF Satellite Terminal (TSST), AN/TSC-156 (TAMCN A0122)



Figure 2-19: Phoenix TSST

The AN/TSC-156 *Phoenix* is a Quad band Tactical Super High Frequency satellite communications terminal mounted on an M1152A1 (HMMWV) vehicular platform. It is capable of operating over military X-and Ka-band satellites and C- and Ku-band over commercial satellites. *Phoenix* supports one network consisting of up to four ETSSP multiplexed full-duplex links and is configured to operate with either the system's internal antenna in C-, X-, Ku, and Ka-band, or with the AS-4429/TSC Large Aperture Antenna (LAA) in X-band, but not simultaneously. *Phoenix* operates in a world-wide military tactical environment and provides SHF SATCOM transmission of baseband signals at the MARFOR/MEF HQ for termination at MSC HQ, DISN STEP/teleport, naval vessels, and Services or JTF HQs. It provides SHF SATCOM transmissions to any size MAGTF and can be deployed as a "first in" communications resource. The USMC has postponed the end of life for this system from FY15 to FY20.

g. Global Broadcast Service (GBS) Transportable Ground Receiver Suite (TGRS) AN/TSR-9 (TAMCN A0090)

GBS is a smart-push/user-pull SATCOM system that provides large volumes of information to deployed, or garrison forces. It receives and disseminates broadcasts at up to 23 Mbps, and can process both classified and unclassified information products. These can include imagery, Video (NTSC and Digital), Theater message traffic, Joint and service-unique news, Weather and MWR programming. The AN/TSR-9 satisfies a Marine Corps requirement for a global, high-throughput, one-way flow of voice, video, and data to Marine Forces either deployed or in garrison. GBS provides the capability to quickly disseminate large amounts of information to MAGTF, and is deployed with MAGTF(s) as a "first in" wideband communica-



Figure 2-20: AN/TSR-9 GBS

Equipment Capabilities

tions resource. The TGRS will operate continuously, and while it does not require 24 hour-a-day manning, the TGRS requires the presence of a trained operator at certain critical times, to include initial installation and software configuration.

h. Extremely High Frequency Satellite Communications Terminal AN/TSC-154A Secure, Mobile Anti-Jam Reliable Tactical Terminal (SMART-T) (TAMCN A3232)

The Satellite Communications Terminal AN/TSC-154 Secure, Mobile Anti-Jam Reliable Tactical Terminal (SMART-T) (TAMCN A3232) is a Military Strategic, Tactical and Relay (MILSTAR) satellite-compatible communications terminal transported on an M1152A1B2 HMMWV. It allows long-haul tactical communications for Digital Transmission Groups (DTG), Digital Subscriber Voice Terminals (DSVT) and individual encrypted subscribers. It uses an offset-fed Gregorian antenna with a 4.5 foot composite reflector. By FY15 the USMC had converted all its TSC-154 into TSC-154A by giving them an Extended Data Rate (XDR) upgrade. This made them compatible with Advanced Extremely High Frequency (AEHF) satellites. SMART-T presents a low profile when mounted on the system's all-steel pallet. It resists biological and chemical attacks, Radio Frequency (RF) signal jamming/detection and electromagnetic pulse (EMP). Normally, the CE and GCE (regiment and higher) of a MEF use this system but the ACE and LCE do not.



Figure 2-21: AN/TSC-154A SMART-T

Technical Characteristics	Frequency Range	Transmit: EHF; Receive: SHF
	Aggregate Data Rates	Low Data Rate (LDR): four channels @ 75 to 2400 bps each or 9600 bps max system total. Mdm Data Rate (MDR): up to 1544 kbps per channel but max for all channels = 2240 kbps Extended Data Rate (XDR): up to 8192 kbps per channel; max for all channels = 9856 kbps
	Orientation & Distance	SATCOM
	Operational Mode	Voice/Data
	Encryption	Secret, TS/SCI
	Power Output	1 to 25 Watts
	Power Supply	MEP-003A or MEP-803A generator
	Operating Weight & Dimensions	8,600 lbs; 193" x 85" x 143" (84" high for shipping); 113.92 square feet; 1,357.6 cubic feet (797.5 for shipping);

Table 2-31: AN/TSC-154A SMART-T Satellite Communication Terminal (TM 2000-OD/2C Rev D)

i. Trojan Special Purpose Intelligence Remote Integrated Terminal - Lightweight Integrated Telecommunications Equipment (Trojan SPIRIT-LITE) AN/TSQ-226(V)1 (A0921)

Technical Characteristics	Technology	Digital	System offers enhanced voice, video and data communications at 64 kbps to 1.544 Mbps.
	Spectrum	C-Band, Ku-Band	
	Orientation & Distance	SATCOM	
	Operational Mode	Voice/Data	
	Encryption	Secret and TS/SCI	
	Power	120 VAC 50/60 Hz	



Figure 2-22: Trojan SPIRIT-LITE

Table 2-32: Trojan Special Purpose Integrated Remote Intelligence Terminal – Lightweight Integrated Telecommunications Equipment (Trojan SPIRIT-LITE) AN/TSQ-226(V)1 (TM 2000-OD/2C Rev D)

The Trojan Special Purpose Intelligence Remote Integrated Terminal Lightweight Integrated Telecommunications Equipment (Trojan SPIRIT-LITE) is a super high frequency (SHF) dual band multi-channel satellite communications terminal utilizing a 2.4 meter antenna. Its primary function is to feed intelligence information products to MAGTF command elements. It offered a considerable size and weight saving over the and now retired Trojan SPIRIT II AN/TSQ-190 (TAMCM A3235). The SPIRIT II needed two dedicated HMMWV and a trailer for the antenna. The SPIRIT LITE fits into 17-22 transit cases (11 for support equipment, including the power supply) weighs a total 2,200 pounds and uses 103 cubic feet of space. Any truck with a payload of 2,000-lbs or more can carry it. A MAW headquarters rates two SPIRIT LITE's, an intelligence battalion rates one and the 1st or 2d Radio Battalion rates six.

j. High Bandwidth Special Intelligence - Palletized Terminal (HBSI-PT) AN/TSQ-212 (A0438)

This system will replace the Trojan SPIRIT series after it reaches IOC (planned for 4th QTR FY15). The original Trojan SPIRIT replacement was the AN/TSQ-226(v)3 (TAMCN A0170). It was as large and unwieldy as the SPIRIT II. Following troop trials the Marine Corps rejected it and withdrew the handful of units it had issued. Another system (TAMCN A0356) was cancelled before it had even received a model number. The HBSI-PT is now the preferred solution. It offers full Trojan SPIRIT capabilities but packs out in only six transit cases (three for the inflatable spherical SATCOM antenna) weighing 414-lbs. The antenna will be available in Ku, Ka, X, and C-band configurations; and WGS (Wideband Global SATCOM) certified in X and Ka-bands.



Figure 2-23: HBSI-PT Antenna

k. Enhanced Position Locating and Reporting System (EPLRS) AN/VSQ-2C (A2152)

The Radio Set, Enhanced Position Locating and Reporting System (EPLRS) consists of an EPLRS Network Manager (ENM) and AN/VSQ-2D(V)1 Data Net radios. The laptop sized VSQ-2D radio is based on the UHF (420-450 MHz) frequency-hopping RT 1720 receiver-transmitter. It can be configured for man-pack (16 Watts power) or vehicle use (up to 100 Watts) and has a six-mile ground-to-ground range (with LOS) or a ground-to-air range of up to 200 miles. Although EPLRS remains in the inventory, it has fallen from favor in the eyes of the operating forces, which greatly prefer the AN/PRC-117G.

l. Secure Wide Area Network (SWAN)

SWAN Family of Systems (FoS) are an integrated commercial off the shelf (COTS) solution utilizing VSAT (Very Small Aperture Terminal - a two-way satellite ground station with dish antenna) and networking components. SWAN is an OTP (On-thr-Pause) communications asset and can be set up in 30 minutes or less. It fills a void of Beyond Line-Of-Sight (BLOS) capability within the MAGTF communications infrastructure. SWAN-D comes in three versions; small (with 1.2m antenna; AN/TSC-186 TAMCN A0234), medium (1.8m antenna; AN/TSC-180A A0241) and large (2.4m antenna; AN/TSC-181A A0242). It consists of a RF Package and a network package (A0243). The medium and large VSAT(s) can be used with a Master Reference Terminal (The network hub). System variants include the VSWAN (Video Support Wide Area Network, TAMCN A0008), HSWAN (Horn of Africa Support Wide Area Network, A0038), and GSWAN (General Support Wide Area Network, A0142). The program of record (which excludes the network package) is VSAT. It operates in Ku commercial band and will soon be upgraded to a Ka band.

m. MAGTF Modular Command and Control Center

MCRP 3-30B.2 (ex-MCWP 3-40.3), *MAGTF Communications Systems*, January 2010 p. 4-4 states “As Marine Corps operations in Afghanistan, Iraq, and the January 2005 post-tsunami operations in Southeast Asia demonstrated, there is a growing need to transform MAGTF C2, (and) warfighting, ... functions into a network centric environment. This is necessary to implement electronic and streamlined processes that allow decision to be made rapidly, transparently, and across disparate platforms, systems and domains”

An important step towards these desired capabilities is the AN/TSQ-239(V)2 Combat Operations Center (COC), command information Systems-C2 facilities. The AN/TSQ-239 is a combat operations center (COC) system made up of common components designed to be modular, scalable and supportable. It supports a Marine Corps- wide standard for COC(s).

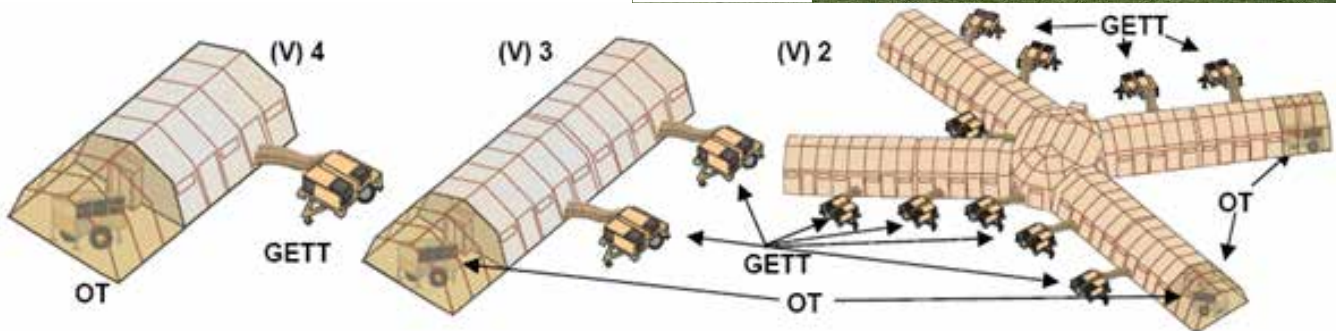


Figure 2-24: AN/TSQ-239 COC Configurations

“It is designed ... to provide mobile, modular command and control centres across the span of tactical command from battalion to divisional level. It provides tactical data and C2 systems to the headquarters, including manoeuvre, fires, intelligence, logistics and administration. The COC is designed for rapid deployment, includes a network of workstations supporting C2 applications, and has large-screen displays that can take input from any workstation. The system has been upgraded to incorporate the Command Post of the Future (CPOF) C2 application (see separate entry). Workspaces are pre-wired for quick set-up. The system integrates non-secure, secret voice and data communications, Voice over Internet Protocol (VoIP) capabilities and networked servers. Multiple networks (SIPRNET, NIPRNET, shipboard, coalition and Access Net{TM}) are used to provide security and accessibility among interoperable users. Network Distribution. The SIPRNET has two expandable rings, NIPRNET and Coalition one each, all with a 10 Gbyte fibre backbone. The scalable, modular system consists of three principle elements: Tents (dome and oblong) Trailers: GETT: Generator (20 KW), ECU (Environmental Control Unit), Tent Operational Trailer (OT). Common to CapSets II, III, IV. Contains communications and servers. Transit cases. Designed to contain all C2 components (routers, servers, switches, laptops); manportable two-man lift; fits through ship hatch. There are currently three variants, known as Capability Sets (CapSet), which are designed for different levels of command in the Ground or Air Combat Element (G/ACE) of the Marine Air/Ground Task Force (MAGTF). These are: AN/TSQ-239(V) 2 - CapSet IIAN/TSQ-239(V) 3 - CapSet IIIAN/TSQ-239(V) 4 - CapSet IV.” <http://www.janes.com/articles/Janes-C4I-Systems/AN-TSQ-239-V-Combat-Operations-Center-COC-United-States.html> May 2010

Source: <http://www.gdc4s.com/documents/COC%20Brochure7.pdf>

Equipment Capabilities

Notes:

- (1) A Generator ECU (Environmental Control Unit) Tent (GET) trailer is the chassis version of the M1102 1.25-ton light tactical trailer (LTT) carrying a 120,000 BTU COTS ECU with a 50-gallon fuel tank, a 21 KW tactically quiet COTS generator set and a Base-X model 305 tent.
- (2) An operational trailer is a M1102 LTT pre-wired and pre-loaded with hardware, servers, power supply etc. for both NIPRNET and SIPRNET.
- (3) Base-X Tent Model 305 is a 25 x 18 foot frame tent. The 8D36 is a 37 x 31 foot extended dome frame tent (carried on two GET trailers) that serves as a hub to connect 305 tents in the CSI or CSII configurations

n. AN/TSQ-227 Digital Technical Control (DTC) Van

The DTC provides a technical control function for the MAGTF Commander. It is the central management facility, terminating all terrestrial links and switch circuits for major commands. Data circuits and miscellaneous subscriber circuits are interconnected, as required. The DTC consists of an S-280 C/G shelter that is modified to accommodate COTS, GOTS, and NDI technical control and ancillary equipment. The DTC permits the technical controller to exercise effective operational control over the communications links, trunks, and groups within a deployed Marine Corps network and is located at the Marine Force Component, MEF, and MSC HQ C2 nodes. Within a MAGTF node, the DTC will connect to multiple transmission systems such as satellite systems, multi-channel systems, single channel radio systems, and cable. For the MEF user's perspective, the DTC provides the multiplexing and link management of switching traffic, voice/circuit switches, data switches, and dedicated circuits.



Figure 2-25: Digital Technical Control (DTC) Van

o. MAGTF Telephone/Message Switches

New Switch	Echelon Employed	Equipment Location	Terminal Devices
AN/TTC-62 DEOS	MEF/MSC/Regiment/Group	DTC	STE DSVT, DNVT
AN/TTC-63 RSAM	MEF/MSC/Regiment/Group or Battalion		

Table 2-33: MAGTF Telephone/Message Systems (1991+)

p. MAGTF Multiplexers

Multiplexers	Location Employed	Equipment Location
Promina 800E	MEF/MSC	DTC
AN/TTQ-5 DITS	MEF/MSC/Regt	
TAC 300	MEF/MSC/Regt/Battalion	MRC-142C
AN/TSQ-227 Digital technical control van (DTC)	MEF/MARFOR/MSC	

Table 2-34: MAGTF Multiplexers

q. MAGTF Data/Messaging

Data	Location Employed	Equipment Location
AN/TSQ-228 (Data Distribution System (DDS))	MEF/MSC/Regt/Battalion	
Defense Message Switching	MEF/MSC	

Table 2-35: MAGTF Data/Messaging Systems

Name	Symbol	Frequency	Wavelength	Applications
High Frequency	HF	3-30 MHz	10-100 m	Shortwave , amateur radio , citizens' band radio , skywave propagation
Very High Frequency	VHF	30-300 MHz	1-10 m	FM broadcasting , amateur radio , broadcast television , aviation , GPR , MRI
Ultra High Frequency	UHF	300 – 3000 MHz	10–100 cm	Broadcast television, amateur radio , mobile telephones , cordless telephones , wireless networking , remote keyless entry for automobiles, microwave ovens , GPR
Super High Frequency	SHF	3 - 30 GHz	1-10 cm	Wireless networking, satellite links, amateur radio , microwave links, satellite television, door openers
Extremely High Frequency	EHF	30 – 300 GHz	1-10 mm	Microwave data links, radio astronomy , amateur radio , remote sensing , advanced weapons systems, advanced security scanning

Table 2-36: Frequency Ranges

2008. Navy Surface ships

Type	Primary Role	Air Search Radar	Weapon Systems	ID Capabilities	Data Link Capabilities	Comm. Capabilities	Aviation Capabilities
Aircraft Carrier (CV/CVN)	Fixed-wing air operations	AN/SPS-48E (3D) AN/SPS-49 (2D)	NSSMS CIWS	Rotating IFF ACDS Block 0/1 (CV Auto ID) SEC, CEC	TADIL-A TADIL-J TADIL-C ADSI	HF, EHF UHF, SHF SATCOM	Fighter squadrons (4) SH60F: Plane guard, dipping sonar, SAR
Guided Missile Cruiser (CG)	Battle Group Air Defense	Primary: SPY-1B (3D) Secondary: AN/SPS-49 (2D)	TLAM, SM2 Blk 2/3 VL ASROC HARPOON 2 5" 54, CIWS SLQ 32 V3	Mast-mounted phased array IFF (Backup IFF mounted on SPS-49.), CEC	TADIL-A TADIL-J TADIL-C DNMFL HAWK Link	HF, EHF UHF SATCOM	2 SH60B: OTH targeting, SAR
Guided Missile Destroyer (DDG-1000) with Stealth Capability	Multi-Mission including Battle Group Air Defense	SPY-3 (3D) MFR- Performs horizon or volume search	TLAM, SM2 Blk 2/3 Mk57 VLS ASROC HARPOON 2 155mm AGS, MK46 30mm, SLQ 32 V3	No data available	No data available	HF, EHF UHF SATCOM	2 SH60B: OTH targeting, SAR 3 MQ-8 Fire Scout
Guided Missile Destroyer (DDG-51)	Air Defense	SPY-1B (3D) SPY-1D (DDG-79 & later)	TLAM, SM2 Blk 2/3 VL ASROC HARPOON 2 5" 54, CIWS (25mm replaces CIWS in DDG79+) SLQ 32 V3	Mast-mounted phased array IFF (Backup IFF mounted on SPS-49.)	TADIL-A TADIL-J TADIL-C DNMFL HAWK Link	HF, EHF UHF SATCOM	Flight deck support landing and refueling helicopters
Amphibious Helicopter Assault Ship (LHA-6)	Sea/air landing force assault	SPQ-9B SPS-48E SPS-49	NSSMS Sea Sparrow CIWS	Rotating IFF NTDS CEC	TADIL-A TADIL-J TADIL-C	HF, EHF UHF SATCOM	Helicopters (& V22) Harriers (Lightnings)
Amphibious Helicopter Dock Ship (LHD)		SPS-48 SPS-49 SPS-67	NSSMS CIWS	Rotating IFF NTDS CEC	TADIL-A TADIL-J TADIL-C	HF, EHF UHF SATCOM	Helicopters (& V22) Harriers (Lightnings)
Amphibious Command Ship (LCC)	Landing Force C2		CIWS	Rotating IFF NTDS	TADIL-A TADIL-J TADIL-C	HF, EHF UHF SATCOM	

Other Amphibious ships (not detailed) | Dock Landing Ship (LSD) *Whidbey Island* & *Harpers Ferry* Classes

Littoral Combat Ships (LCS): There are two LCS classes; the LCS-1 class starting with USS *Freedom*, commissioned in 2008) and the LCS-2 class starting with USS *Independence*, commissioned in 2010). The LCS-1 class (all the odd numbered ships) uses a conventional racing hull while the LCS-2 class (all the even numbered ships) uses an unconventional trimaran hull. Each class has both diesel engines (for cruising) and gas turbines (for speed).

Class	Hull	Length	Beam	Draft	Gas Turbine speed	Max. Diesel Speed (1,000 nm range)	Max Range (at 9 knots)
Freedom	Monohull	378 ft	57 ft	12.7 ft	official: 40+ knots	Actual: 14 knots (official: 17 knots)	3,500 nmi (16 days)
Independence	Trimaran	418 ft	104 ft	13 ft	official: 40+ knots	Actual: not disclosed (official: 13 knots)	4,300 nmi (20 days)

Comment: An LCS can operate up to three days at its maximum diesel speed. At its maximum gas turbine speed it will run out of fuel within a few hours.

Standard Armament: 1 x 57mm gun, RM-116 or SeaRAM ;2 to 4 .50-cal machineguns. **Aircraft:** 2 x H-60 equivalents

Unique to an LCS is its mission modules; none are ready for service. Examples follow:

<p>MINE Warfare Module (24 planned) AN/AES-1 Airborne Laser Mine Detection System (ALMDS) (carried on MH-60S helicopter) AN/ASQ-235 AMNS equipped mine killer UUV; USV towing AN/AQS-20A sonar</p>	<p>Anti-submarine warfare Module (24 planned) MH-60R helicopter or two MQ-8C VTUAV(s) Ship-towed SONAR; no torpedoes; no ASROC</p>
---	---

Surface Attack Module (16 planned): adds two 30-mm Mk46 guns & AGM-114L *Hellfire* antiship missiles.

Both LCS classes are still experiencing major reliability issues. <http://www.defenseindustrydaily.com/the-usas-new-littoral-combat-ships-updated-01343/>.

Table 2-37: Navy Surface Combatants



Figure 2-26: Navy Surface Combatants

Equipment Capabilities

2009. Amphibious Ships

Type	Name	Home Port	Max. Speed	Troop Capacity	Cargo Space	Well Deck Capacity	Aircraft Capacity	Weapons
Amphibious Transport Dock Mission: Transport and land Marines, their equipment and supplies by embarked landing craft or amphibious vehicles augmented by helicopters in amphibious assault.	San Antonio (LPD-17)	Norfolk	21 kts	702 Marines +95 surge	24,600 sq. ft for vehicles 36,000 cu. ft. for cargo	188' x 50' 2 LCAC or 1 LCU or 4 LCM-8 or 24? AAV	Two helicopter landing spots for V-22 equivalent	2 MK-31 RAM 2 30mm MK-46 2 .50-cal MK-26
	New Orleans (LPD-18)	San Diego						
	Mesa Verde (LPD-19)	Norfolk						
	Green Bay (LPD-20)	San Diego						
	New York (LPD-21)	Norfolk						
	San Diego (LPD-22)	San Diego						
	Anchorage (LPD-23)	San Diego						
	Arlington (LPD-24)	Norfolk						
	Somerset (LPD-25)	San Diego						
	John P. Murtha (LPD-26) (2016)	San Diego						
Portland (LPD-27) (2017?)	San Diego?							
Dock Landing Ship Mission: Support US Navy and Marine Corps amphibious operations including landings via Landing Craft Air Cushion (LCAC), conventional landing craft and helicopters, upon a hostile shore.	Whidbey Island (LSD-41)	Little Creek	20+ kts	402 Marines +102 surge	11,800 sq ft for vehicles 5,100 cu ft for cargo	440' x 50' 4 LCAC or 3 LCU, or 10 LCM-8 or 64 AAV	Two helicopter landing spots	2 25-mm MK-38 2 CIWS
	Germantown (LSD-42)	Sasebo						
	Ft. McHenry (LSD-43)	Little Creek						
	Gunston Hall (LSD-44)	Little Creek						
	Comstock (LSD-45)	San Diego						
	Tortuga (LSD-46)	Sasebo						
	Rushmore (LSD-47)	San Diego						
	Ashland (LSD-48)	Little Creek	20+ kts	402 Marines +102 surge	16,900 sq ft for vehicles 50,700 cu ft for cargo	180' x 50' 2 LCAC or 1 LCU, 4 LCM-8 or 24 AAV	Two helicopter landing spots	2 25-mm MK-38 2 CIWS
	Harper's Ferry (LSD-49)	San Diego						
	Carter Hall (LSD-50)	Little Creek						
	Oak Hill (LSD-51)	Little Creek						
	Pearl Harbor (LSD-52)	San Diego						
Amphibious Assault Ship Mission: Primary landing ships for major portions of the assault echelon of a MAGTF. Secondary role: sea control and limited power projection ship, equipped with AV-8B or F35B strike aircraft and H-60 anti-submarine helicopters.	Wasp (LHD-1)	Norfolk	22 kts	1,687 Marines +184 surge	15,702 sq ft for vehicles 125,198 cu ft for cargo	322' x 50' 3 LCAC or 2 LCU, 6 LCM-8 or 48 AAV	4 CH53, 12 V22 4 AH1, 3 UH1 6 F35B* or up to 22 V-22* or F35* equivalents 9 helo spots	2 NSSMS 3 CIWS 4 25-mm 4 .50-cal
	Essex (LHD-2)	San Diego						
	Kearsarge (LHD-3)	Norfolk						
	Boxer (LHD-4)	San Diego						
	Bataan (LHD-5)	Norfolk						
	Bonhomme Richard (LHD-6)	Sasebo						
	Iwo Jima (LHD-7)	Norfolk						
	Makin Island (LHD-8)	San Diego						
	America (LHA-6)	San Diego	22.5 kts	1,687 Marines +184 surge	160,000 cu ft for cargo (few vehicles)	No well deck	4 CH53, 12 V22 4 AH1, 3 UH1 6 F35B* 9 helo spots	2 NSSMS 2 Sea Sp 2 CIWS 7 .50-cal
	Tripoli (LHA-7) (2024)	San Diego						
LHA-6 & 7 have enlarged hanger decks but no well decks. LHA-9 & later will have well decks restored as per agreement between CMC & CNO.								
Amphibious Command Ship Mission: Provide C2 for major amphibious operations.	Blue Ridge (LCC-19)	Yokosuka Japan	23 kts	209 Marines	3,015 sq ft for vehicles 2,175 cu ft for cargo	No well deck	1 (Whitney) or 2 (Blue Ridge) SH-60	2 CIWS
	Mt. Whitney (LCC-20)	Gaeta Italy						

*actual mix varies with current mission requirements

NOTE: Planning speed for an amphibious task force is 12-13 knots (reduce by two knots if the ATF includes Army ships).

Table 2-38: Amphibious Ships

LSD-49 Class

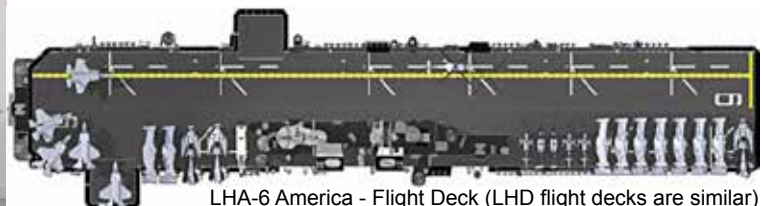


Figure 2-27: Amphibious Ships

LSD-41 Class



LHA-6 America



LHA-6 America - Flight Deck (LHD flight decks are similar)

2010. Landing Craft

Type	Length	Beam	Draft (loaded)		Cargo Deck Space	Cargo	Speed (loaded)	Endurance (loaded)	Crew	
			Fwd	Aft						
Log Spt Vessel (LSV) (US Army only)	273 ft	60 ft		12 ft	10,500 sq ft	21-24 M1 tanks or 50 20-ft ISO containers or 2,000 stons	11.5 kts	6,500 nm/11 kts (up to 30 days)	31	
LCU 2000 Class (US Army only)	174 ft	42 ft	4 ft	8.85 ft	3,800 sq ft	3 M1 tanks or 30 20-ft ISO containers or 350 stons	10 kts	6,500 nm/10 kts (up to 18 days)	13	
LCU 1646 Class	135 ft	29.5 ft	3.5 ft	6.85 ft	1,850 sq ft	3 M1 tanks or 10 LAV or 400 troops or 206 stons	11 kts	1,200 nm/8 kts	14	
LCM-8	(steel)	73.6 ft	21 ft	4.45 ft	4.85 ft	588 sq ft	200 troops or 60 stons	12 kts	190 nm/9 kts	5
	(aluminum)	74.5 ft	21 ft	3.85 ft	4.25 ft	714 sq ft	200 troops or 60 stons	12 kts	190 nm/9 kts	
LCAC	(on cushion)	87 ft	47 ft	n/a	n/a	1,809 sq ft	60 stons normal;	40+ kts	116 nm	5
	(off cushion)	81 ft	43.67 ft				up to 75 with reduced fuel			

NOTES: LCU and LCM require beach gradients of 1:20 to 1:60. Steeper slopes may cause broaching, but flatter slopes may cause grounding out. Except for emergencies or voyages of three hours or less Army water craft do not carry troops. Army LSV (8 in service) or LCU-2000 (34 available) have bow ramps and can self deploy between theaters. LSV-7 and 8 are longer; more seaworthy; and shorter ranged (5,500 nm/12 kts) than other LSV but carry the same payload. Sources: ATP 4-15 *Army Water Transport Operations*, 02-2011; MCTP 13-10A (ex-MCRP 3-31.A) *Employment of Landing Craft Air Cushion (LCAC)* 02-1997

Table 2-39: Landing Craft Capabilities

LCAC availability per Day (from a total of 54)	Day One – 52 Day Two – 49	Day Three – 46 Day Four – 43	Day Five – 40
Operating Time	up to 12 hours per day per LCAC		
Time per Sortie	Vehicle load: 6 hours, 8 minutes		Cargo load: 8 hours 36 minutes
Sorties per Day for Vehicles	2.6 Sorties per LCAC per day		Total = 104 LCAC sorties @ 40 LCAC per day
Sorties per Day for Cargo	1.86 Sorties per LCAC per day		Total = 74 LCAC sorties @ 40 LCAC per day
Personnel Capacity	180 troops with a personnel transport module (only 24 troops without a PTM)		
Sample Sortie Loads	Total Lift: 25 Stons (50 500-lb pallets)	1 M1 tank (overload) or 2 AAV or 4 LAV or 2 MTVR w/o trailers (loaded) or 2 MTVR w/M777 howitzers or	1 MTVR w/ MK-105/149 trailer & 1 HMMWV or 8 HMMWV (loaded) or 6 w/M1102 trailers
Time Details	45 NM @ 25 kts round trip = 216 min	Well deck Operations (load/unload): 62 min for vehicles or 120 min for cargo	Beach Operations: 30 min for vehicles or 120 min for cargo (add 60 min to vehicle or cargo loads for "friction")
Unit LCAC Sortie Requirements	Infantry Battalion	72 HMMWV (all types) + 8 trailers + 963 personnel = about 12-13 sorties	
	Tank Battalion (w/ 4 tank companies)	58 M1A1 tanks + 12 M88A2 ARV + 13 LVSR (all types w/2 M870A2 & 10 PLS trailers) + 37 MTVR trucks (all types w/27 trailers) + 123 HMMWV (all types w/30 trailers); 816 personnel = about 130 sorties	
	LAR Battalion (w/ 4 LAR companies)	114 LAV (all types) + 5 LVSR (all types w/1 M870A2 & 3 PLS trailers) + 36 MTVR (all types w/18 trailers) + 29 HMMWV (all types w/10 trailers); 961 personnel = about 62 sorties	

Table 2-40: Landing Craft Air Cushion Capabilities



Figure 2-28: Landing Craft Examples

Equipment Capabilities

2011. Navy Air Defense

a. Navy Platform Air Defense

Platform	Strengths	Weaknesses
CG-47 and DDG-51 Classes	<ul style="list-style-type: none"> ANSPY-1 multifunction, phased array, fire control quality radar. Very rapid transition from SPY-1 silent to full radiate and full situational awareness. Fast reaction, fully/semiautomatic combat systems. Initial detection to first missile movement in less than 10 sec. Salvo rate less than 2 sec per launcher (CG-52 and above with MK 41 VLS) Mix of multiple SM. Max field of fire and min blockage zones Must illuminate target only for a short duration prior to intercept. AN/SPY-1 radar variable sensitivity feature allowing radar sensitivity to be tailored to threat RCS, environment, and tactical situation. Weapons & ID doctrine capable of automatic and semiautomatic response/action. 	<ul style="list-style-type: none"> The system is designed for blue water and littoral operations however AN/SPY-1 configuration must be modified to look above the terrain to avoid causing excessive false targets from land clutter. These configuration changes may increase ship susceptibility to low and fast targets. Once a target is engaged and the initial salvo fired, WCS will not allow the target to be reengaged (second salvo) until a kill evaluation has been completed. AN/SPY-1 antenna height is lower than the AN/SPS-49 radar system resulting in reduced radar horizon. DDG-51 Class are not equipped with a AN/SPS-49 radar (no secondary air search radar) Must hold an AN/SPY-1 track. Cannot engage on a remote or AN/SPS-49 track unless equipped with CEC.
<p>NOTE: CG-47 through 51 have been decommissioned. For CRS Report RS22595 (1 Feb 07) concerning the Cruiser-Destroyer Modernization Program see http://www.dtic.mil/dtic/tr/fulltext/u2/a462506.pdf</p>		
CV/CVN	<ul style="list-style-type: none"> Adequate low-flyer detection with Mk 23 TAS/NSSMS FCR in sector search. Good long range 3D air search radar. Good overland/near land detection system (AN/SPS-48E and AN/SPS-49 with AN/SYS-2) Quick reaction modes. 	<ul style="list-style-type: none"> Self-defense shipboard weapon systems only.
E-2C Hawkeye	<ul style="list-style-type: none"> Can detect low altitude targets out to the radar horizon. Optimum over water detection and tracking capability. Large airborne target detection capability out to 350nm. Extensive IFF capability. JTIDS type 2 SATCOM capability. 	<ul style="list-style-type: none"> Limited concurrent, warfare area mission support (because of crew tasking). Degraded detection capability over land. Limited on-station time (3 to 4 hrs). No link simulcast capability
E-2D Advanced Hawkeye (FY-15 IOC)	<ul style="list-style-type: none"> Enhanced E-2C capabilities (glass cockpit, computer, IFF, JTIDS) Increased concurrent warfare area mission support (co-pilot will be able to double as fourth tactical operator) New APY-9 radar (scans electronically or mechanically, better detection of land/over land targets; extends ranges of missiles such as AIM-120/SM-6) Enhanced SATCOM (HF/VHF/UHF) 	<ul style="list-style-type: none"> Limited on-station time (five hrs); (five aircraft E-2D squadron gives better coverage than four aircraft E-2C squadron but still cannot sustain a 24/7 CAP) No aerial refueling capability before FY2020
F/A-18 Hornet	<ul style="list-style-type: none"> Multi-mission aircraft with NCTR/BVR capability. Medium PRF radar with good over land performance. 	<ul style="list-style-type: none"> No IFF interrogator. Limitation of one-man crew in high threat environment

Table 2-41: Navy Platform Air Defense Capabilities

<http://www.youtube.com/watch?v=WumIk1MwVPM> six minute video (posted 2009; still there as of July 2016) on CEC

b. Cooperative Engagement Capability (Example)

An Air Force [E-3 Sentry](#) AWACS, high over the landmass, detects, on the edge of its coverage, a fast-moving radar target consistent with the cruise missile type known to have been at the location where DSP detected the apparent launch. This message arrives aboard the group anti-air flagship, *USS Chosin* (CG-65) via [JTIDS](#) Link 16. CEC automatically searches for sensors and weapons in areas applicable to the new threat.

It determines that *USS Normandy* (CG-60), a *Ticonderoga* class cruiser, returning to a shore base to get more long-range missiles, is the closest to a point on the predicted missile track. CEC has that ship train her [AN/SPS-49](#) long-range search radar, and gets confirmation of the missile track. *Chosin* now has a confirmed inbound threat, and passes that information, via CEC, to the other AEGIS vessels of the group.

The next ship to acquire the track is the [Burke-class destroyer](#), *USS Winston Churchill* (DDG-81) along the path, which is not equipped with the AN/SPS-49 radar aboard the *Ticonderogas* such as *Chosin*. *Churchill* gets a firm lock on the incoming missile, and sets up a [RIM-156 Standard SM-2](#) missile launch to intercept it. In the inner defensive ring around the carrier, *USS Lake Erie* (CG-70), picks up the missile and prepares a backup SM-2.

Churchill fires, but the target maneuvers. While *Churchill's* missile still might hit, *Lake Erie* has a better engagement geometry, and CEC agrees that the latter should fire a backup missile. *Churchill* illuminates the target with her [AN/SPG-62](#) directional illuminator radar, as has *Lake Erie* fire another SM-2. With another target course change, *Churchill* still has the best geometry to illuminate the target for the SM-2's final [semi-active radar homing](#), and keeps the SPG-62 on target. The *Lake Erie* missile picks up the *Churchill* illuminator, goes into final lock, and destroys the target

http://en.citizendium.org/wiki/Cooperative_Engagement_Capability

c. Navy Aviation Air Defense Weapons

Aircraft Type	Primary Role	Air Search Radar	Weapon Systems	ID Capabilities	Data Link Capabilities	Communication Capabilities	Combat Range
E-2C (Blk II) or E-2D	Air surveillance and aircraft control	APS-145	Detection range: over 300nm; over 2,000 tracks	IFF (M1-4) Limited ES capability, CID CAP	TADIL-A TADIL-J TADIL-C	HF, UHF UHF/VHF SATCOM Have Quick	4 hours on station
F-18C/D & E/F	Air intercept, strike	APG-65	AIM-7, AIM-9 AIM-120 AGM-84, 20 mm	NCTR (Electronic ID) IFF	TADIL-C	VHF UHF Have Quick	575 nm with in-flight refueling
EA-6B	SEAD/Jamming EW intercept	APS-130	AGM-84 ALQ-99, USQ-113 ALQ-218	Rotating IFF mounted on SPS-49	TADIL-C	HF UHF/VHF Have Quick	600 nm with in-flight refueling
F-18G	SEAD/Jamming EW intercept	APG-79 AESA	AGM-84, AIM-120 ALQ-99, JSOW ALQ-218	Rotating IFF mounted on SPS-49	TADIL-C	HF, INCANS* UHF/VHF Have Quick	575 mm with in-flight refueling
	Will replace the EA-6B; *Allows voice communication while jamming						
EP-3	EW Communications	APS-116	N/A	Rotating IFF NTDS	TADIL-A	HF, UHF, SATCOM UHF/VHF	2,300 nm (3 hrs on station)

Table 2-42: Navy Aviation Air Defense Weapons

2012. Army Air Defense

Characteristics	Patriot (MIM-104)	SLAMRAAM/AIM-120	Avenger/Stinger
Targets (air)	Airplanes, helicopters, UAV	Airplanes, helicopters, UAV	Airplanes, helicopters, UAV
Targets (missile)	TBM, TASM, Cruise missiles	Cruise missiles	Cruise missiles
Sensor Range (planning)	100 km AN/MPQ-53	75 km AN/MPQ-64 Sentinel radar; relies on a BMC4I battle management system for fire data; Avenger has onboard visual or FLIR systems	
Number of launchers per organization	4 batteries per Patriot or AMD bn; 6 launchers per battery	24 fire units per AMD or 36 per MAMD battalion (fire units may be Avenger or SLAMRAAM; SLAMRAAM to replace Avenger on a one for one basis)	
Number of missiles per launcher	16 per PAC-3 (MIM-104F)	6 AIM-120 (or AIM-9) per SLAMRAAM fire unit (HMMWV mounted)	8 Stinger per Avenger fire unit
Coverage angle of supporting radar	Track = 120 degrees Search = 90 degrees	360 degrees out to 75 km	
Engagement range (planning)	70 km (PAC-3)	40 km (AIM-120 AMRAAM) or 10 km (AIM-9 Sidewinder)	4 km (Stinger) 2 km (.50-cal)

Table 2-43: Army Air Defense Capabilities

2013. Joint Support Systems

The E-8C joint surveillance, target attack radar system (JSTARS) is an airborne multi-mode radar surveillance/target acquisition system. It detects and tracks moving or fixed targets for attack by standoff weapons and aircraft. Other reconnaissance, surveillance, and target acquisition systems can cue it. It provides surveillance and attack information in all light and near-all-weather conditions. It uses a Boeing 707 airframe equipped with a phased-array antenna in a conformal belly pod that can operate both as a synthetic aperture side-looking radar to detect fixed surface targets or as a Doppler radar to detect moving vehicles on a time sharing basis. The E-8C is equipped for secure communications using HAVE QUICK for anti-jam communications with Army units. The system includes Army AN/TSQ-132 truck-mounted ground station modules and data link connectivity for transmitting raw radar data to the Army ground stations. It can send targeting information to Air Force controllers on the ground via Joint Tactical Information Distribution System (JTIDS) and/or directly to JTIDS equipped tactical aircraft.

The E-3 *Sentry* airborne warning and control system (AWACS) is a modified Boeing 707/320 commercial airframe with a rotating radar dome. It is an integrated command and control battle management, or C2BM, surveillance, target detection, and tracking platform. It provides an accurate, real-time picture of the battlespace to the Joint Air Operations Center. It also provides situational awareness of friendly, neutral and hostile activity, command and control in an area of responsibility, battle management of theater forces, all-altitude and all-weather surveillance of the battle space, and early warning of enemy actions. The AWACS radar has a range of more than 250 miles (375.5 kilometers). The radar combined with an identification friend or foe, or IFF, subsystem can look down to detect, identify and track enemy and friendly low-flying aircraft by eliminating ground clutter returns that confuse other radar systems.

JTIDS is a joint Service program that provides high-capacity, anti jam protected data distribution and voice communications to tactical forces in air defense, defensive counter-air, and anti-air warfare areas. It provides a secure, jam-resistant, high capacity data link communications system for the rapid exchange of information in a tactical combat environment. JTIDS is the communications component of the tactical digital information link (TADIL) designated Link-16, and is synonymous with the TADIL J message standard. The JTIDS family of terminals (Class 2 and 2H for the Air Force, Navy and Marine Corps; and 2M for Army) employs time division multiple access, and spread spectrum techniques. Host platforms (i.e. E-2, E-3, E-8, F-15, RIVET JOINT, ABCCC, MAOC, and MCE) program and budget for JTIDS production

Equipment Capabilities

terminals. The JTIDS provides an information distribution system for selected US Air Force and Navy AWACS and tactical units. It features secure, jam resistant, low probability of exploitation tactical data and voice communications. It will provide precise tactical air navigation, relative navigation, and identification, and will have additional capabilities of common grid navigation. It will also use automatic relay capability inherent in the long range communications equipment. The system will be interoperable among the Services and NATO/Allied users equipped with JTIDS or the NATO multifunctional information distribution system. Anti-jam protection is achieved through frequency hopping, spread spectrum techniques. It allows sensor data exchange between platforms in real-time and provides integrated communications, relative navigation and identification, combat status and targeting information. It will be employed in air defense, defensive counter-air, and anti-air warfare mission areas. All terminals provide data communication in the LINK 16 data format.



EP-3E Aries II

2014. Intelligence, Surveillance and Reconnaissance (ISR) Assets

a. Ground Reconnaissance

All ground reconnaissance units collect HUMINT, MASINT and technical intelligence information. Their collection devices include 7x50 binoculars, 10x sniper scopes (M24/M40A5 rifles) and M49 20x spitting scopes. The maximum observation range with these devices is 4 km.

Asset	Size	Duration*	Notes
USMC Force Recon Team	6	4 to 6 days	Missions/Roles: Both Recon and Force Recon teams conduct amphibious ground or underwater reconnaissance, initial terminal guidance, sensor emplacement, battle damage assessment or direct action (DA) raids or ambushes. Force Recon teams (only) can also conduct deep (DR) and special reconnaissance (SR), unconventional warfare (UW), and foreign internal defense (FID). They are also parachute qualified and have greater DA capabilities. Though they belong to the division reconnaissance battalion they are tasked exclusively by the MAGTF commander. Reports: SPOT, SALUTE, NATO formatted, or others as Div/MEF may require.
USMC Recon Team	6		
USMC Scout Sniper Squad	4	1-2 days (?)	Missions/Roles: short range tactical recon/sniper (DA) in support of an infantry battalion Reports: SPOT, SALUTE, others as required
USMC SOC Team**	14	4 to 6 days	Missions/Roles: FID, COIN, DA, SR, counter terrorism (CT), or IO support for SOCOM or a GCC; a USA ODA differs in its greater emphasis on UW and geographic specialization; both are parachute/boat/SCUBA qualified. Reports: SPOT, SALUTE, NATO, others as required
USA SF ODA**	12		
USA Long Range Scout (LRS) Team	6		
USA Scout Team	6	1-2 days (?)	Missions/Roles: Recon/DA in support of an infantry battalion
USA Sniper Team	3		Missions/Roles: Sniper/DA in support of an infantry battalion
USN SEAL Platoon**	16	6(+) days	Missions/Roles: Similar to USA ODA but specialize in operations on or under water; less emphasis on IO.
CUWTF (ROK only)***	12?	4 to 6 days	Joint US-ROK w/US Rangers/SOF & ROK SF/SEALs; SOCKOR site: http://8tharmy.korea.army.mil/SOCKOR/

*Without re-supply; **May sub-divide into two elements ***Combined Unconventional Warfare Task Force (Joint US/ROK)

Table 2-44: Ground Reconnaissance Units

TYPE	MARINE	ARMY
Standard Sniper Units	Scout Sniper Platoon: Four scout sniper squads with two two-man teams each (one shooter, one spotter); eight 7.62-mm and four 0.50-cal sniper rifles	Sniper Squad: A leader plus two or three three-man teams (one 0.50-cal, two [one is semi-auto] 7.62-mm sniper rifles, and three M4 carbines per team)
Optics (various)	Examples of what is available include 10x rifle scopes, 20x spotter scopes, 7x50 binoculars, day/night vision	
7.62 x 51 mm rifles	M40A5: USMC rebuilt Remington 700 bolt action rifle M110 semi-automatic sniper system (SASS) based on the AR10; to replace M40 and M24 series rifles	M24; Army rebuild of the Remington 700 rifle
.300 Winchester Magnum	none	M2010: an M24 rebuilt to fire .300 Winchester Magnum; increases effective range from 800 to 1,200 meters
0.50-cal Rifle	M107 long range sniper rifle (LRSR) replacing M82A3; both are variants of the Barrett rifle	
Flash suppressor	10-inch suppressor eliminates 98% of muzzle flash, 60 % of recoil and reduces sound by 32 decibels.	

Table 2-45: Sniper Units and Equipment

b. Unmanned ISR Aircraft Systems (see section 2004)

c. Fixed-Wing ISR Aircraft

Asset	Operational Altitude/Range	Info Types Collected	Sensors	Comments (Missions, Roles, Type Reporting Produced, Sources)
AV-8B	Max Speed: 460 mph Ceiling: 33,100 ft Range: 685 miles Loiter time: 60 min.	Various	LITENING II targeting and recon pods	Missions/Roles: The LITENING II combines day/night targeting and navigation capabilities in a single, low-cost, high-performance pod. It enables the aircraft to detect and identify ground targets for extremely accurate delivery of both conventional and precision-guided weapons, and an intelligence, surveillance and reconnaissance (ISR) capability. Reports: IMINT Reporting including ROVER 3.
EA-6B	Max Speed: 754 mph Ceiling: 37,600 ft Range: 850 miles	ELINT	ALQ-99 On-board System (OBS)	Mission/Roles: Electronic Reconnaissance. The EA-6B's ALQ-99 OBS collects, records and updates tactical electronic order of battle (EOB) data that it can disseminate through the C2 system while airborne. Reports: Via TERPES.
EF-18G (various; USN only)	Max Speed: 1,127 mph Ceiling: 50,000 ft Range: 330 miles combat	Various	ATARS, LITENING Targeting & Recon Pods - FLIR, CCD TV, laser tracker, infrared laser marker & range-finder, KB-35 strike camera	Missions/Roles: The LITENING II combines day/night targeting and navigation capabilities in a single, low-cost, high-performance pod. It enables the aircraft to detect and identify ground targets for extremely accurate delivery of both conventional and precision-guided weapons, and an intelligence, surveillance and reconnaissance (ISR) capability. Reports: IMINT Reporting including ROVER 3.
P-3C Orion	Max Speed: 466 mph Ceiling: 28,300 ft Range: 5,600 miles	Various	Various	Missions/Roles: Land-based, long range ASW patrol aircraft that can provide Ku band packet MUX data links for video and other sensor data to surface forces, and Command, Control, Communications, Computers, and Intelligence, Surveillance, and Reconnaissance (C4ISR) capabilities. The P-8A is replacing the P-3C; Patrol Squadron (VP)-16 was the first to convert to the P-8A in NOV 2013. Reports: Unknown.
P-8A Poseidon	Max Speed: 560 mph Ceiling: 41,000 ft Range: 1,200 nm + four hours on station	Various	Various	
EP-3E Aries II	Max Speed: 530 mph Ceiling: 29,000 ft Range: 3,000 miles	Various	Classified	Missions/Roles: An electronic warfare and recon aircraft utilizing the P-3 Orion air frame and state-of-the-art electronic surveillance equipment for its primary mission. Reports: Unknown.
EC-130 Senior Hunter	Max Speed: 344 mph Ceiling: 33,000 ft Range: 2,050 miles	Various	Various	Missions/Roles: Delivers PSYOPS and civil affairs broadcasts in standard AM, FM, HF, TV and military communications bands. Missions are flown at maximum altitude to ensure optimum propagation patterns. Typical mission (day or night) consists of a single-ship orbit offset from the target audience. Secondary missions include command and control (C2) communications countermeasures (C3CM) and limited intelligence gathering. Reports: Unknown
RC-12D Guard Rail	Max Speed: 287 mph Ceiling: 30,000 ft Range: 1,200 miles	SIGINT	Classified	Missions/Roles: GR/CS provides near real-time SIGINT and targeting information to tactical commanders throughout the corps area with emphasis on deep battle and follow-on forces attack support. It collects selected low, mid, and high band radio signals, identifies/classifies them, determines source locations, and provides near real-time reporting to tactical commanders. GR/CS targeting accuracy is also provided by the ELINT system. Automated addressing to CTT field terminals provides automated message distribution to tactical commanders in near real time. Reports: SIGINT and ELINT.
C-12R Horned Owl	Cruise speed: 325mph Ceiling: 30,000+ ft Range: 3,640 km	Various	APY-8 Lynx grnd-looking radar & other electro-optical sensors for long range day/night viewing	Missions/Roles: A manned sensor 'platform' fitted with belly pods carrying camera turrets and synthetic aperture radar. An ARMS – the Aerial Reconnaissance Multi-Sensor platform. Recent missions include route reconnaissance in search of IEDs
RC-135V Rivet Joint	Max Speed: 500 mph Ceiling: 44,000 ft Range: 3,900 miles	SIGINT COMINT	Various	Missions/Roles: The Rivet Joint's on-board sensor suite allows the mission crew to detect, identify and geo-locate signals throughout the electromagnetic spectrum. The mission crew can then forward gathered information in a variety of formats to a wide range of consumers via Rivet Joint's extensive communications suite. (Bo-707 airframe) Reports: SIGINT and COMINT reporting.
E-8 JSTARS	Max Speed: 639 mph Ceiling: 42,000 ft Sensor Rng: 150 miles Endurance: 9 hrs.	Ground Surveillance MTI and SAR	WAS/MTI SAR/FTI	Missions/Roles: JSTARS is an airborne battle management and command and control platform (Bo-707 airframe) that conducts ground surveillance to develop an understanding of the enemy situation and to support attack operations and targeting that contributes to the delay, disruption, and destruction of enemy forces. These functions support the primary mission of Joint STARS which is to provide dedicated support of ground commander's requirements. Reports: N/A
E-3 Sentry (AWACS)	Max Speed: 530 mph Ceiling: 41,000 ft Range: 5,747 miles	N/A	Various	Missions/Roles: Surveillance of aircraft (Bo-707 air frame) in low, medium, and high altitude, C3 in all weather. Reports: N/A
King Air 350 ER	Cruise speed: 300mph Ceiling: 35,000 ft Range 1,764 nm	TBD	TBD	USMC ordered 6 on 10 July 2008 to replace the C12. VMR Det Belle Chasse, Louisiana received two (C12W) in AUG 2010 for evaluation. (ER = Extended Range)

Equipment Capabilities

Asset	Operational Altitude/Range	Info Types Collected	Sensors	Comments (Missions, Roles, Type Reporting Produced, Sources)
U-2	Max Speed: 528 mph Ceiling: 90,000 ft Range: 2,200 ~4,600 miles	SIGINT IMINT (wet-film or EO)	Classified	Missions/Roles: The U-2 provides continuous day or night, high altitude, all weather, stand-off surveillance of a battle area in direct support of U.S. and allied forces. Currently, the RQ-4 <i>Global Hawk</i> is programmed to replace it in FY-19. Reports: N/A
RC-7B Crazy Hawk	Max Speed: 270 mph Max Ceiling: 21,000 ft Range: 770 miles	SIGINT IMINT MTI-SAR	Various	Missions/Roles: Developed by Southern Command after requirement for a manned SIGINT/IMINT. Current version (RC-7B) designated the ARL-M, conducts IMINT, SIGINT, as well as provides MTI SAR data. Reports: TACREPs, KL, SPOT reports, VPN reporting.

Table 2-46: Fixed-Wing ISR Aircraft Assets

d. Ground Sensors

Asset	Range	Info Types Collected	Sensors & Max Range	Comments (Missions, Roles, Type Reporting Produced, Sources)
Intelligence Bn (MHG): Ground Sensor Platoon (GSP)	N/A	MASINT	Tactical Remote Sensor System (TRSS)	Mission/Roles: Continuous all-weather location determination and activity monitoring of within a given area of operation. Sub-Functions: Graphic depiction of objects through thermal graphic optics; target classification (i.e., tracked vehicle, rotary-winged aircraft etc.) and hand deployed ground sensors. Equipment: Each Sensor Mobile Monitor System (SMMS) has two stations each with an IBM laptop loaded with monitoring software. An improved version of this system is expected to reach IOC in the fourth quarter of FY15. Reports: SALUTE or SENREP (Sensor Reports); positive ID and classification of detected activity; strip charts and image displays.
Radio Bn (MHG) EW LAV variant (LAV-EW)	N/A	SIGINT	Classified	Mission/Roles: ES/EA in support of the MAGTF. Can be lifted via CH-53E under ideal conditions; however the weight is very close to NATOPS limits. System integrated in a specially configured LAV. Reports: TACREP, SALUTE, SPOT, KL, or others as required.
Radio Bn (MHG) Radio Recon Team (RRT)	N/A	SIGINT	Classified	Mission/Roles: ES/EA in support of the MAGTF. Can conduct ESM/EA in support of advance force or MSPF/R&S operations. Can insert via helicopter (parachute/ rappel/ fast rope), surface craft, or foot. Reports: TACREP, SALUTE, SPOT, KL, or others as required.
Radio Bn (MHG) SIGINT Supt Team (SST)	N/A	SIGINT	Classified	Mission/Roles: ES/EA in support of the MAGTF. Has capability to insert via helicopter (rappel/fast rope), surface craft, or foot. Reports: TACREP, SALUTE, SPOT, KL, or others as required.
HET Tm Intel Bn (MHG)	N/A	HUMINT	N/A	Missions/Roles: Counter Intelligence (CI) and HUMINT collection. CI/HUMINT teams collect intelligence from human sources in support of the MAGTF. HET (Human Exploitation) teams replace CI teams and interrogator-translater platoons. Equipment: CIHEP Media Exploitation System (TAMCN A0100) Reports: TACREP, SALUTE, SPOT, KL, or others as required.
CI/HUMINT Detachment (CHD) Intel Bn (MHG)				
TSCM Team Intel Bn (MHG)	N/A	SIGINT ELINT, ECM	N/A	Missions/Roles: Technical surveillance counter-measures; teams sweep for and neutralize hostile electronic monitoring devices. Reports: N/A

Table 2-47: Ground Sensors

e. MAGTF METOC (Meterologic and Oceanographic) Systems

Asset & TAMCN	Description
NITES IV AN/UMK-4 (V)4 w/Processor A0294 Sensor A0302 INMARSAT A0303	Man-portable tactical weather forecasting system consisting of a processing module (including three laptops with software), an enhanced Automated Weather Observation System (AWOS) and an INMARSAT for backup communication with the Fleet Numerical Meteorology and Oceanography Center (FNMOC) only. It includes a mini-rawisonde system (AN/UMK-12) for monitoring helium weather balloons.
AN/TMQ-56(V)1 (ATC) & (V)2 (IBV) METMF(R) NEXGEN A0402	Mobile tactical/strategic weather forecasting station consisting of processing and communication subsystems mounted in a shelter on a specially configured M1152A2 HMMWV with trailer. It also has upper air (rawisonde), meteorological radar and satellite capabilities, plus one local (LSS) and two remote (RSS) sensing subsystems (AWOS). NEXGEN has access to global weather models via the Sonalysts Forecaster toolkit and can predict weather anywhere in the world. It can also build a mesoscale nowcast model (MM5 & COAMPS) which can produce an atmospheric data cube within a user-defined area of up to 500 NM X 500 NM, to a height of 30,000 feet. It also forecasts oceanographic parameters.

Table 2-48: MAGTF METOC Systems

Currently, the NITES IV (with software upgrade 4) is the primary weather prediction in the MAGTF. A full MEF has 14 of them (seven in the production and analysis [P&A] company of the intelligence battalion plus one per MEF, Division, Wing and MLG headquarters and one per air traffic control [ATC] detachment). One METMF(R) NEXGEN is replacing the significantly less mobile METMF(R) (TAMCN A0399) in each ATC detachment. Also, each P&A company will receive the slightly modified Intelligence Battalion Version (IBV) of NEXGEN.



Figure 2-29: NITES IV EAWOS



Figure 2-30: METMF(R) NEXGEN in Travel Mode

The primary (ground) sensor for NITES IV and METMF(R) is called an Automated Weather Observation System (AWOS). NITES uses an Enhanced AWOS (EAWOS). This system is usually configured for constant data collection and transmission of data via cable. Its solar panel with battery pack powers all subsystems except the ceilometer (which requires external power). A ceilometer is a device that uses a laser or other light source to determine the height of a cloud base. The METMF(R) uses an Advanced AWOS (AAWOS), which is configured for intermittent data collection. It can transmit this data to the base station via an iridium modem from anywhere in the world. AAWOS also runs on solar power but does not normally use a ceilometer. The METMF(R) NEXGEN uses two AAWOS as remote sensing subsystems and one EAWOS as a local sensing subsystem. The EAWOS with its ceilometer can operate up to 150 feet from the NEXGEN base station.

f. Persistent Surveillance Systems

The Persistent Threat Detection System (PTDS) is a combination of cameras and surveillance equipment located on towers, masts, or aerostats. They can be equipped with a variety of sensor suites (electro optical/ infrared {EO/IR}, radar, acoustic detectors) to provide unprecedented elevated persistent surveillance (EPS). There is a 17 meter version which can carry a up to 200 lbs. to 1,000 feet. Larger 32 and 38 meter versions carrying heavier payloads are also available. PTDS is not a MAGTF asset.



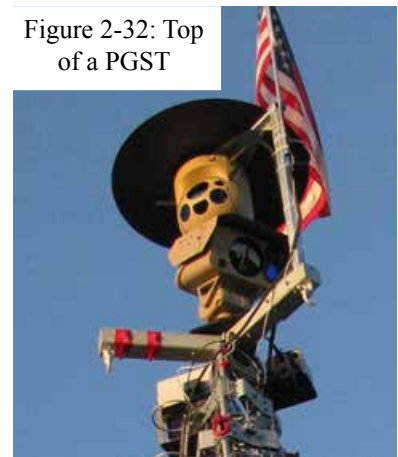
Figure 2-31: Persistent Threat Detection System Aerostat

Aerostats differ from blimps in that blimps are powered and aerostats are not. They are tethered by a cable that provides power and communications to the radar and day/night vidcams up there. The cameras can see out to 80 kilometers at that altitude, less than half that with a radar. In Iraq and Afghanistan, where they were deployed in 2003, locals liked to use them as targets. Rifle fire won't destroy them, but does increase their percentage of "down" time for repairs. Normally, they can stay up for 20 days with 95% availability. Gunfire damage can cause them to be brought down every few days.

Persistent Ground Surveillance Towers (PGST): These provide the equivalent of a permanent UAV presence. In Afghanistan they have proved useful for monitoring thinly populated areas and deterring attacks. A 30 foot tower can see out to eleven kilometers, a 60 foot tower to 16 kilometers and an 84 foot tower to 20 kilometers. They are much cheaper than Aerostats much less affected by gunfire damage. Iraq recently (June 2014) ordered seven Aerostats and 14 RAID towers from the United States. It is unclear exactly which sensors, and supporting software, Iraqis will be allowed to buy. The United States assumes that the Iranians will examine any military equipment sold to them.

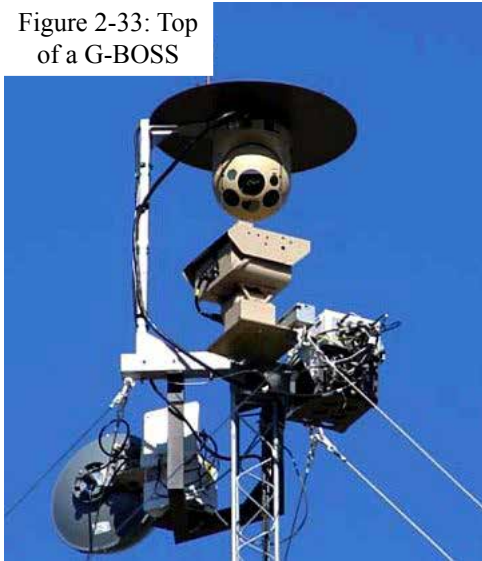
The US Marine Corps Forces Pacific (MARFORPAC) Experimentation Center (MEC) began demonstrating a maritime domain awareness system at Philippine Coast Guard headquarters on 27 January 2014. The system, known as the Maritime Persistent Surveillance Tower (MPST), is an experimental maritime adaptation of the PGST(s) currently used in Afghanistan. MARFORPAC has described this land-based mobile tower as a "multi-sensor payload platform that supports persistent 360° surveillance operations" that is able to detect and monitor surface vessels operating in the littoral waters of the Philippines. MARFORPAC has provided further details. <http://www.janes.com/article/33211/usmc-demonstrates-maritime-surveillance-tower-in-Philippines>.

Figure 2-32: Top of a PGST



Equipment Capabilities

Figure 2-33: Top of a G-BOSS



Ground Based Operational Surveillance System (G-BOSS): G-BOSS is a self-erecting, trailer-mounted 80-ft. tower carrying a multi-spectral Electro-Optic/Infrared sensor suite. This consists of a Star SAFIRE IIIIFP camera with a laser pointer and range finder. There is also a ThermoVision 3000 camera with a global Positioning System (GPS), a Man-portable Surveillance and Target Acquisition Radar (MSTAR) and a Ground Control Station (GCS) with optional Remote Ground Station (RGS). Other associated equipment includes capability for video capture, storage, transmission, and power generation. G-BOSS can integrate signals from Unmanned Aerial Vehicles (UAVs) using the Video Scout video management system and from the Tactical Remote Sensor Suite (TRSS) of unattended ground sensors (UGS). There are three G-BOSS variants: G-BOSS, G-BOSS Lite, and CERBERUS Lite. The system provides (24/7) display and tracking of items of interest. Its capabilities enhance situational awareness by enable the monitoring of activities along roads, borders, rivers, pipelines, and other choke points. Multiple systems may be networked into a single RGS. This allows an operator to observe his entire perimeter through an easily understood display. The alarm and assessment data are presented automatically on the display through data overlay and window pop-ups. This networking capability also

reduces the number of personnel needed for guard and watch duties. G-BOSS is used for Force Protection, check point security, route reconnaissance, patrol over watch, IED emplacement detection, intelligence collection, and personnel/vehicle identification.

GyroCam: This is another designation for the Vehicle Optical Sensor System (VOSS) used in route clearing platoons (RCP) to detect explosive hazards; see section 4019.

The Future of Persistent Surveillance: Previous editions of this pamphlet reported that the Defense Advanced Research Projects Agency (DARPA) was working in concert with Boeing on a program called VULTURE. Some of the goals of Vulture were to produce a craft that would remain airborne for five years with a 450 kg payload and the power to overcome conditions at 60,000 to 90,000 feet and ability to remain on station 99% of the time.

In July 2014, in response to an inquiry from MSTP the Boeing Phantom Works Communications. Managing Editor sent this note: “DARPA’s Vulture program was refocused in 2012 from a full-system flight demonstration technology program to a focused technology effort seeking advances in photovoltaics (solar collection) and energy storage systems (ESS), or solid fuel cells. This was not a decision to end the program; however, the decision was made to not pursue a demonstrator for flight in the 2014 timeframe. A demonstrator may be built in the future, but at this time Boeing and DARPA are focused on advancing the photovoltaic technology”

Operational Considerations

3001. Types of Offensive Operations

a. Movement to Contact

Movement to contact is an offensive operation conducted to develop the situation and to establish or regain contact with the enemy. A properly executed movement to contact allows the commander to make initial contact with minimum forces and to expedite the employment and concentration of the force. The commander must foresee his actions upon contact. He organizes his force to provide flexible and rapid exploitation of the contact gained. The force utilizes battle drills that focus on overcoming initial contact quickly. These procedures must be practiced and thoroughly rehearsed to permit the entire force to act without detailed guidance. Failure to prepare accordingly results in delay and confusion and grants the enemy time to seize the initiative and to dictate the conditions under which the engagement is fought.

The GCE commander's intent dictates the extent to which his forces will be engaged. The desired contact may be by observation, physical contact between security forces, or physical contact with main forces. In each instance, the task organization, scheme of maneuver, and support required may differ significantly. In addition, the GCE commander must consider and arrange for additional support required from the MAGTF. Every reconnaissance and security means is employed so that the main force will be committed under the most favorable conditions.

To maintain his freedom of action once he makes contact, the commander deploys an advance force capable of locating and fixing the enemy. The main body is positioned so as to remain uncommitted, capable of maneuvering without effective enemy interference at the time of the commander's choosing. The advance force must ensure the uninterrupted progress of the main body. The advance force must contain sufficient combat power to overcome security and delaying forces and provide time for the commander to deploy the main body at the critical location. This allows the commander to choose the best possible time and location to exploit the meeting engagement, to maintain pressure on the enemy, and to shift to another type of offensive operation. Premature deployment of the main body is costly in terms of time, resources, and disclosure of the main effort. A movement to contact ends when ground enemy resistance requires the deployment of the main body.

b. Attack

The purpose of the attack is to defeat, destroy, or neutralize the enemy. An attack emphasizes maximum application of combat power, coupled with bold maneuver, shock effect in the assault, and prompt exploitation of success. There are four principal tasks in an attack:

- Prevent effective enemy maneuver or counteraction.
- Maneuver to gain an advantage.
- Deliver an overwhelming assault to destroy him.

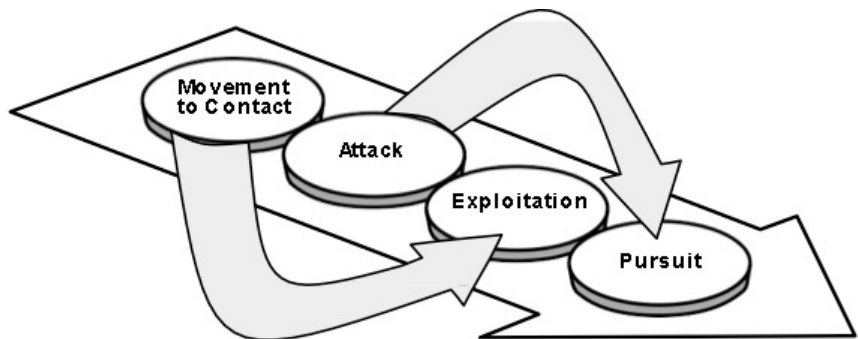


Figure 3-1: Types of Offensive Operations

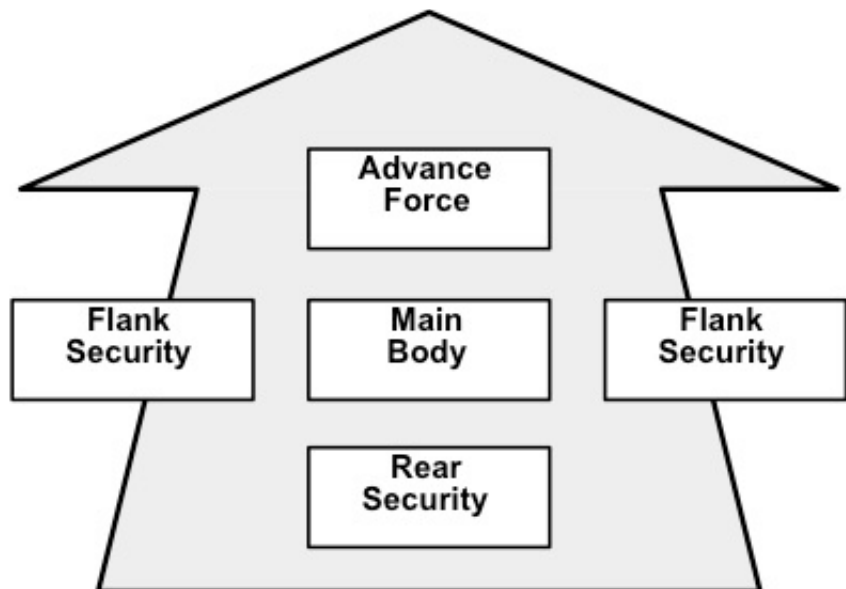


Figure 3-2: Movement to Contact

Battlespace and Time

- Exploit advantages gained.

Commanders must expect to make adjustments during an attack. Skillful commanders provide for the means and methods to work these adjustments rapidly in order to maintain the momentum of the attack. Flexibility in the scheme of maneuver, organization for combat, and universal understanding of the commander's intent provide means to adapt to these changes on the battlefield.

The commander presses the attack although his troops may be exhausted and his supplies depleted against a weakened or shaken enemy. However, the commander must strive to accomplish his objectives prior to the force reaching its culminating point, that point in time or location that the attacker's combat power no longer exceeds that of the defender. Once reaching his culminating point, the GCE commander risks overextension and counterattack by the defender who recognizes these vulnerabilities.

There are no concrete criteria for determining when an organization involved in an engagement, battle, or campaign has reached its culminating point. Rather, it must be an intuitive understanding borne of experience to which the commander must be ever sensitive. If the force is incapable of accomplishing its mission before reaching its culminating point, the commander must plan to phase his operation accordingly. The differences between the types of attacks lie in the degrees of preparation, planning, coordination, and the effect desired on the enemy.

Hasty Attack: A hasty attack is an attack in which preparation time is traded for speed to exploit opportunity. To maintain momentum or retain initiative, minimum time is devoted to preparation. Those forces readily available are committed immediately to the attack. A hasty attack seeks to take advantage of the enemy's lack of readiness and involves boldness, surprise, and speed to achieve success before the enemy has had time to improve his defensive posture. By necessity, hasty attacks are simple and require a minimum of coordination with higher and adjacent commanders. Hasty attacks are most likely the result of movements to contact, meeting engagements, penetrations, or fleeting opportunities created by disorder, enemy mistakes, or the result of our own actions.

Deliberate Attack: A deliberate attack is a type of offensive action characterized by preplanned coordinated employment of firepower and maneuver to close with and destroy the enemy. The deliberate attack is a fully coordinated operation that is usually reserved for those situations where the enemy defense cannot be overcome by a hasty attack or where the deployment of the enemy shows no identifiable exposed flank or physical weakness. Deliberate attacks usually include a high volume of planned fire, deception plans, extensive use of C2W, and all-source intelligence gathering. Time taken by the commander to prepare a deliberate attack is also time in which the enemy can continue defensive improvements, can disengage, or can launch a spoiling attack.

Spoiling Attack: Commanders normally mount spoiling attacks from a defensive posture to disrupt an expected enemy attack. A spoiling attack attempts to strike the enemy while he is most vulnerable—during his preparations for attack in assembly areas and attack positions or while he is on the move prior to crossing the line of departure. Spoiling attacks are conducted similarly to any other type of attack. Frequently, the circumstances in which commanders conduct spoiling attacks preclude full exploitation. However, when the situation permits, a spoiling attack should be exploited, and commanders must be prepared to take advantage of the success like that achieved in any other attack.

Counterattack: Commanders conduct counterattacks either with a reserve or otherwise uncommitted or lightly engaged forces. The counterattack is conducted after the enemy has commenced his attack and a resolute defense or enemy tactical error exposes him to effective counteraction. The commander must identify the enemy's main effort and determine the appropriate course of action to prevent it from succeeding.

Feint: A feint is a supporting effort designed to divert or distract the enemy's attention away from the main effort and involves physical contact with the enemy. A feint must be sufficiently strong to confuse the enemy as to the location of the main effort. Ideally, a feint causes the enemy to shift forces to the diversion and away from the main effort. Feints are usually shallow, limited-objective attacks conducted before or during the attack of the main effort. A unit conducting a feint usually attacks on a wider front than normal, with a consequent reduction in mass and depth. A unit conducting a feint normally keeps only a minimal reserve to deal with unexpected developments.

Demonstrations are related operations, also designed to divert enemy attention to allow decisive action elsewhere. A demonstration is a show of force that threatens an attack at another location but does not make contact with the enemy. The commander executes a demonstration by an actual or simulated massing of combat power, troops movements, or some other activity designed to indicate the preparations for or beginning of an attack at a point other than the main effort.

Reconnaissance in Force: The reconnaissance in force is always a deliberate attack by major forces to obtain information and to locate and test enemy dispositions, strengths, and reactions. While the primary purpose of a reconnaissance in force is to gain information, the commander must be prepared to exploit opportunity. A reconnaissance in force usually develops

information more rapidly and in more detail than other reconnaissance methods. If the commander must develop the enemy situation along a broad front, the reconnaissance in force may consist of strong probing actions to determine the enemy situation at selected points.

Raid: A raid is an offensive operation, usually small-scale, involving a penetration of hostile territory for a specific purpose other than seizing and holding terrain. It ends with a planned withdrawal upon completion of the assigned mission. The organization and the composition of the raid force are tailored to the mission. Raids are characterized by surprise and swift, precise, and bold action.

c. Exploitation

The enemy may still be capable of fielding cohesive units after being attacked. In the exploitation, the attacker extends the destruction of the defending force by maintaining constant offensive pressure. The objective of the exploitation is the disintegration of enemy forces to the point where he has no alternative but surrender or flight. When an attack succeeds, the enemy may attempt to disengage, withdraw, and establish or reconstitute an effective defense. Rapid exploitation of successful attacks inhibits the enemy's ability to do so. Attacks that achieve annihilation of the defending force are rare.

The commander must be prepared to exploit every attack without delay. While exploitation following an attack is fundamental, it is especially important in a deliberate attack where the concentration necessary for success requires accepting risk elsewhere. Failure to exploit aggressively the success of the main effort may provide the enemy sufficient time to detect and exploit those risks. As a result, the enemy regains both the initiative and the advantage.

The GCE commander's principal tool for the conduct of an exploitation is his reserve. He may also designate other exploiting forces through the issuance of a fragmentary order. Commanders of exploitation forces must be given as much freedom of action as possible, and efforts must be characterized by boldness, aggressiveness, and speed. However, the commander needs sufficient centralized control to concentrate his forces and to prevent his units from becoming overextended.

Essential to the exploitation is the knowledge of the enemy's condition and identification of enemy critical vulnerabilities. The GCE commander's knowledge of the situation must be so complete that he will not commit his exploitation force prematurely or lose an opportunity by acting too late. Events, such as increased enemy prisoners of war (EPWs), lack of organized defense, loss of enemy unit cohesion upon contact, and capture of enemy leaders indicate an opportunity to shift to an exploitation. Once begun, an exploitation is executed relentlessly to deny the enemy any respite from pressure.

Typical missions for the exploitation force include cutting lines of communication, isolating and destroying enemy units, and disrupting enemy C2.

d. Pursuit

When it becomes clear that organized enemy resistance has completely broken down, the commander shifts to the pursuit. The difference between an exploitation and a pursuit is the condition of the enemy. The object of a pursuit is annihilation of the enemy force. Like exploitation, pursuit requires broad decentralized control and rapid movement.

The GCE commander must ensure that all assets, to include allocated MAGTF assets, are used to maximum effectiveness during the pursuit. The commander task organizes the force into a direct pressure force and an encircling force.

The direct pressure force must have sufficient combat power to maintain pressure on the enemy. The encircling force must have continuous fire support and greater mobility than the enemy. The capabilities of the ACE make it particularly

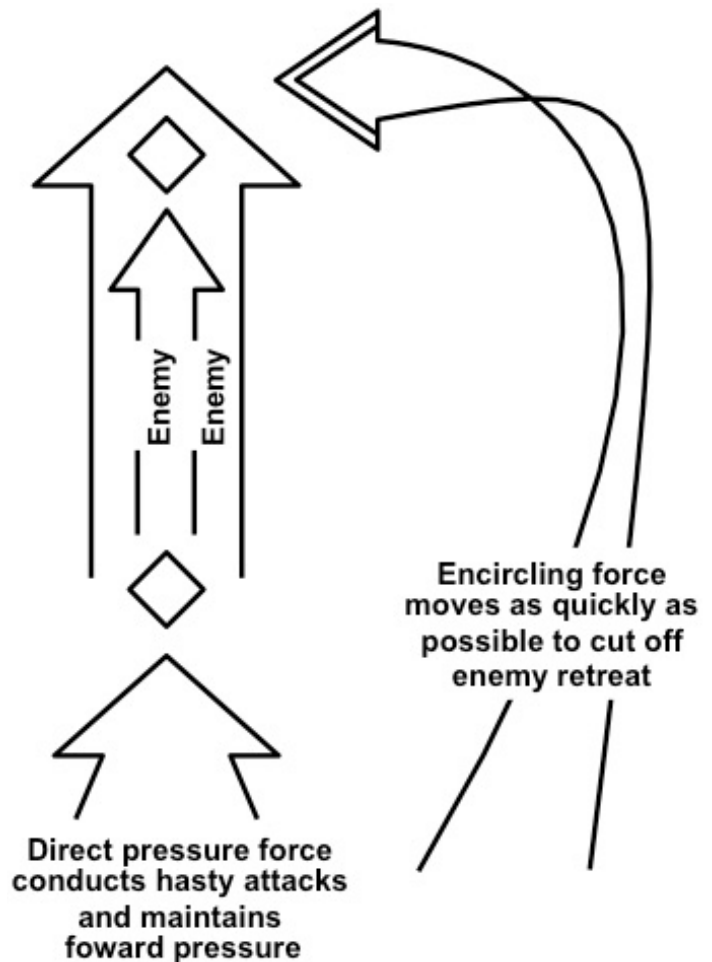


Figure 3-3: Pursuit

Battlespace and Time

valuable as an encircling force by destroying and denying the enemy routes of escape. To maintain tempo and pressure, the MAGTF commander may shift the main effort to the ACE during a pursuit. A pursuit is pushed to the utmost limits of endurance of troops, equipment, and especially supplies. If the force must stop for rest, maintenance, or reorganization, the enemy may be able to pull together scattered units, emplace obstacles, or break contact altogether.

Sources: MCDP 1-0, *Marine Corps Operations* (2011) and MCWP 3-10 (ex-MCWP 3-1) *Ground Combat Operations* (1995)

3002. Types of Defense

a. Mobile Defense

A mobile defense is the defense of an area or position in which maneuver is used together with fire and terrain to seize the initiative from the enemy. The mobile defense destroys the attacking enemy through offensive action. The commander allocates the bulk of his combat power to mobile forces that strike the enemy where he is most vulnerable and when he least expects attack. Minimum force is placed forward to canalize, delay, disrupt, and deceive the enemy as to the actual location of our defenses. Retaining his mobile forces until the critical time and place are identified, the commander then focuses combat power in a single or series of violent and rapid counterattacks throughout the depth of the battlespace.

A mobile defense focuses on the destruction of the enemy by permitting him to advance into position that exposes him to counterattack by a strong, mobile reserve. It is characterized by minimal combat power forward and the bulk of combat power held in reserve for the decisive counterattack. A mobile defense requires mobility greater than that of the attacker. Marines generate the mobility advantage necessary in the mobile defense with organic mechanized and armor forces, helicopter-borne forces, and Marine aviation. The commander must have sufficient depth within his area of operations to allow the enemy to move into his mobile defense. Terrain and space are traded to draw the enemy ever deeper into our defensive area, causing him to over-extend his force and expose his flanks and lines of communication to attack. The success of the mobile defense often presents the opportunity to resume the offense and must be planned. Depth is required in a mobile defense in order to draw the enemy in and expose an exploitable weakness to counterattack. The following circumstances favor the conduct of a mobile defense—

- The defender possesses equal or greater mobility than the enemy.
- The frontage assigned exceeds the defender's capability to establish an effective position defense.
- The available battlespace allows the enemy to be drawn into an unfavorable position and exposed to attack.
- Time for preparing defensive positions is limited.
- Sufficient mechanized and aviation forces are available to allow rapid concentration of combat power.
- The enemy may employ weapons of mass destruction.
- The mission does not require denying the enemy specific terrain.

b. Position Defense

The position defense is a type of defense in which the bulk of the defending force is disposed in selected tactical positions where the decisive battle is to be fought. It denies the enemy critical terrain or facilities. A position defense focuses on the retention of terrain by absorbing the enemy into a series of interlocked positions from which he can be destroyed, largely by fires, together with friendly maneuver. Principal reliance is placed on the ability of the forces in the defended positions to maintain their positions and to control the terrain between them. The position defense is sometimes referred to as an area defense. This defense uses battle positions, strongpoints, obstacles, and barriers to slow, canalize, and defeat the enemy attack. The assignment of forces within these areas and positions allow for depth and mutual support of the force.

Battle Position. A battle position is a defensive location oriented on the most likely enemy avenue of approach from which a unit may defend or attack. It can be used to deny or delay the enemy the use of certain terrain or an avenue of approach. The size of a battle position can vary with the size of the unit assigned. For ground combat units, battle positions are usually hastily occupied but should be continuously improved.

Strongpoint. A strongpoint is a fortified defensive position designed to deny the enemy certain terrain as well as the use of an avenue of approach. It differs from a battle position in that it is designed to be occupied for an extended period of time. It is established on critical terrain and must be held for the defense to succeed. A strongpoint is organized for all-around defense and should have sufficient supplies and ammunition to continue to fight even if surrounded or cut off from resupply. The commander positions the bulk of his combat power in static defensive positions and small mobile reserves. He depends on his static forces to defend their positions. His reserves are used to blunt and contain penetrations, to counterattack, and to exploit opportunities presented by the enemy. The commander also employs security forces in the position defense. The commander conducts a position defense when—

- The force must defend specific terrain that is militarily and politically essential.
- The defender possesses less mobility than the enemy.
- Maneuver space is limited or the terrain restricts the movement of the defending force.
- The terrain enables mutual support to the defending force.
- The depth of the battlespace is limited.
- The terrain restricts the movement of the defender.
- There is sufficient time to prepare positions.
- The employment of weapons of mass destruction by the enemy is unlikely.

3003. Notional Defensive Operations Schematic

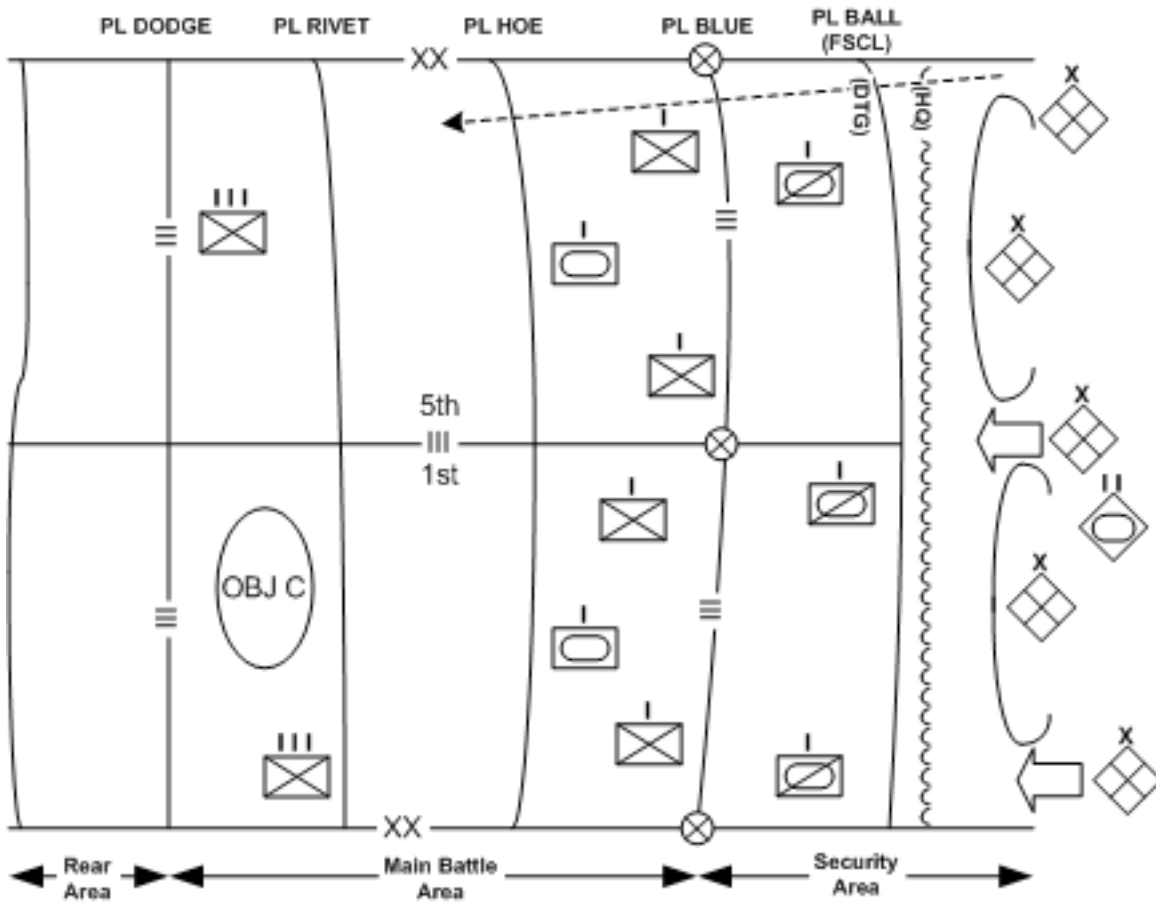


Figure 3-4. Notional Defensive Operations Schematic

3004. Historical Planning Ratios for Array of Friendly Units

Friendly Mission	Ratio – Friendly to Enemy	Notes
Delay	1 to 16	
Defend	1 to 3	Prepared or Fortified
Defend	1 to 2.5	Hasty
Attack	3 to 1	Prepared or Fortified
Attack	2.5 to 1	Hasty Position
Counterattack	1 to 16	Flank

Table 3-1. Planning Ratios for Array of Friendly Units

Battlespace and Time

3005. Opposed Rates of Advance Tables

Degree of Resistance Attacker-Defender Ratio	Prepared Defense (Note 5)						Hasty Defense (Note 6)					
	Go terrain		Slow-Go Terrain		No-Go Terrain		Go terrain		Slow-Go Terrain		No-Go Terrain	
	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf
Intense 1:1	2	2	1	1	0.6	0.6	4	4	2	2	1.21	1.2
Very Heavy 2:1 (-)	5 to 6	4	2 to 3	2	1.5 to 1.8	1.2	10 to 12	8	5 to 6	4	3 to 3.6	2.4
Heavy 3:1	7 to 8	5	3 to 4	2.5	2.1 to 2.3	1.5	13 to 17	10	8	5	3.9 to 4.8	3
Medium 4:1	8 to 10	6	4 to 5	3	2.4 to 3	1.8	16 to 20	12	10	6	4.8 to 6	3.6
Light 5:1	16 to 20	10	8 to 10	5	4.8 to 6	3	30 to 40	18	20	9	9 to 12	5.4
Negligible 6:1	24 to 30	12	12 to 15	6	7.2 to 9	3.6	48 to 60	24	30	12	14.4 to 18	7.2

Table 3-2. Division Opposed Rates of Advance (km/day)

Degree of Resistance Attacker-Defender Ratio	Prepared Defense (Note 5)						Hasty Defense (Note 6)					
	Go terrain		Slow-Go Terrain		No-Go Terrain		Go terrain		Slow-Go Terrain		No-Go Terrain	
	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf	Arm/Mech	Inf
Intense 1:1	0.6	0.5	0.5	0.3	0.15	0.1	1	0.8	0.8	0.5	0.4	0.2
Very Heavy 2:1 (-)	0.9	0.6	0.6	0.4	0.3	0.2	1.5	1	1	0.7	0.6	0.3
Heavy 3:1	1.2	0.7	0.75	0.5	0.5	0.3	2	1.2	1.3	0.9	0.8	0.5
Medium 4:1	1.4	0.8	1	0.6	0.5	0.5	2.4	1.4	1.75	1.1	0.9	0.8
Light 5:1	1.5	0.9	1.1	0.7	0.6	0.5	2.6	1.6	2	1.2	1	0.9
Negligible 6:1	1.7+	1+	1.3+	0.8	0.6	0.6+	3+	1.7+	2.3+	1.3+	1.1+	1

Table 3-3. Brigade and Below Opposed Rates of Advance (km/day)

Notes (both tables):

1. Brigade and below level units cannot sustain these rates for 24 hours.
2. The relative combat power ratio must be computed for the unit(s) under consideration.
3. When there is surprise, multiply these figures by a surprise factor as follows:
 - Complete Surprise x 5 (e.g. Germans at The Ardennes in 1944, Arabs in 1973).
 - Substantial Surprise x 3 (e.g. German Invasion of Russia in 1941, Israelis' Invasion of Sinai in 1967).
 - Minor Surprise x 1.3 (e.g. Allied Normandy landing in 1944, Pakistanis' attack on India in 1971).
4. The effects of surprise last for 3 days, being reduced by one-third on day 2 and two-thirds on day 3.
5. Prepared defense is based on defender in prepared positions (24 hours or more).
6. Hasty defense is based on 2 to 12 hours preparation time.
7. The ratios used here are to determine the degree of resistance. There is no direct relationship between advance rates and force ratios. However, sustained advances probably are not possible with a 3 to 1 ratio. Advance is possible against superior forces but cannot be sustained.

Rates greater than 6 to 1 will result in advances between these and the unopposed rates.

3006. Rear Area Operations

Marine Corps doctrine for rear area operations is still under review in the light of recent experience gained in Afghanistan and Iraq. The dominant feature of these campaigns has been the enemy's near exclusive use of irregular warfare. Distinctions between forward and rear areas have largely disappeared and this situation is likely to prevail in future conflicts. Joint doctrine, as expressed in JP 3-10 Joint Security Operations in Theater (Nov. 2014), has replaced specific forward and rear area concepts with a holistic approach that focuses on security operations throughout a given theater. Among other things, JP 3-10 has changed the joint rear area to the joint security area.

JP 3-10 publication is available on line at http://www.dtic.mil/doctrine/new_pubs/jointpub_operations.htm

However, notwithstanding the doctrine promulgated in JP 3-10, the Marine Corps continues to use the security area in the traditional sense, using the term "rear area" to mean "the area to the rear of the main battle area where logistics and administrative functions are the dominant activity" [MCDP 1-0 Marine Corps Operations August 2011]. Its doctrine will remain that promulgated in MCTP 3-30C (formerly MCWP 3-41.1) Rear Area Operations published July 2000, until it is replaced.

MCRP 1-10.2 (formerly MCRP 5-12C), published in August 2013, defines the rear area as the area extending forward from a command's rear boundary to the rear of the areas assigned to the command's subordinate units. This area is provided primarily for the performance of combat service support functions. MCRP 1-10.2 defines "rear operations" as those "... Military actions conducted to support and permit force sustainment and to provide security for such actions."

The rear area fits within a battle-space framework that consists of deep, close and rear areas. For friendly forces the deep area is the rear area of its adversaries. In the same way, the friendly rear area is the adversary deep area. The close area is where friendly and enemy (usually ground) forces are in direct contact. Traditionally, the battle-space framework has been linear. In other words, friendly and enemy forces face each other in a central “close area” while the friendly force “rear area” is behind it while its “deep area” is just behind the enemy. For an example see Figure 3-4.



Figure 3-4: Sample Linear Battle-space

However, recent operations in such places as Somalia, Afghanistan, and Iraq challenge traditional notions of deep, close, and rear areas. Irregular warfare can involve areas of operations where deep, close, and rear all share the same space, which compresses the time between tactical actions and strategic effects. In counterinsurgency or other types of irregular warfare, deep operations may be more a function of time or activity than space. All of this can produce a non-linear battle-space, examples of which are shown in Figure 3-5.

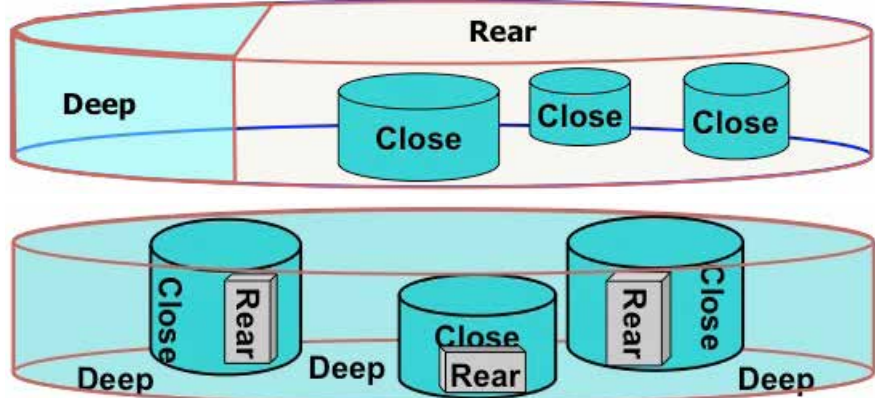


Figure 3-5: Sample Non-Linear Battle-spaces

Rear area operations themselves perform functions such as communication, intelligence, sustainment, security, movement, area management, infrastructure development and host nation support. All of these activities follow the single battle concept. They do not occur in isolation from other MAGTF operations but are part of a single whole. However, Marine Corps forces do not have dedicated rear area resources. Apart from the allocation of existing resources these can also come from USMCR or Army augmentation. In addition, rear area functions are not restricted to any specific echelon of command. The rear area may expand or contract as the current operation proceeds.

For security the rear area must have a sufficient force to counter existing threats. As part of the IPB the G-2 section classifies the rear area threat level according to the criteria shown in Table 3-4. The countering of Level I and Level II threats require relatively few resources. The various operating bases, base clusters and units within the rear area organize base defense forces from their own assets and may organize small reaction forces as well.

Threat Level	Example	Response
Level I	Agents, sympathizers, terrorists, saboteurs	Unit, base, and base cluster self-defense
Level II	Small tactical units, unconventional force, guerrillas	Self-defense measures with response force(s) and supporting arms
Level III	Large tactical units (air / heliborne, amphibious)	Tactical Combat Force

Table 3-4: Rear Area Threat Levels

A Level III threat, on the other hand, requires a Tactical Combat Force (TCF). This is a task force, which may be of any size but is normally built around an infantry battalion and augmented with appropriate combat support and combat service support elements. It must be strong enough to defeat the threat. Only a rear area commander can commit this force (a rear coordinator cannot). When he commits it he assigns it an AO. It will normally have OPCON over any base defense forces within that AO. To the greatest extent possible, TCF employment should be well planned and rehearsed.

For command and control the MAGTF commander may choose to keep all rear area command functions within the MAGTF command element (CE). He may also appoint a rear area coordinator to assist the CE or he may appoint a separate rear area commander to assume rear area command responsibilities in lieu of the CE.

Not surprisingly, a rear area coordinator only has coordinating authority. This gives him the power to compel the various entities within the rear area to confer and consult with each other but he cannot compel them to reach any agreement. He does not own his own battle-space and, of course, he is not a commander.

Command authority, on the other hand, vests the holder with the full authority and responsibility for the accomplishment of his assigned mission. This includes making the best use of all available resources as well as the planning for, employment of, organization, direction, coordination, and control of military forces for the accomplishment of assigned missions. A rear area commander usually has an assigned battle-space and, of course, the full authority of a commander.

Sources: MCDP 1-0; MCTP 3-30C (formerly MCWP 3-41.1); MCRP 1-10.2 (formerly MCRP 5-12C); JP 3-10.

Battlespace and Time

3007. Weather Conditions - Sea States

The Beaufort Scale has replaced the old sea state scale as an indicator of oceanic weather conditions. For a chart showing the Beaufort Scale see Section 4035, page IV-62.

3008. Mine Countermeasures Terminology and Responsibilities

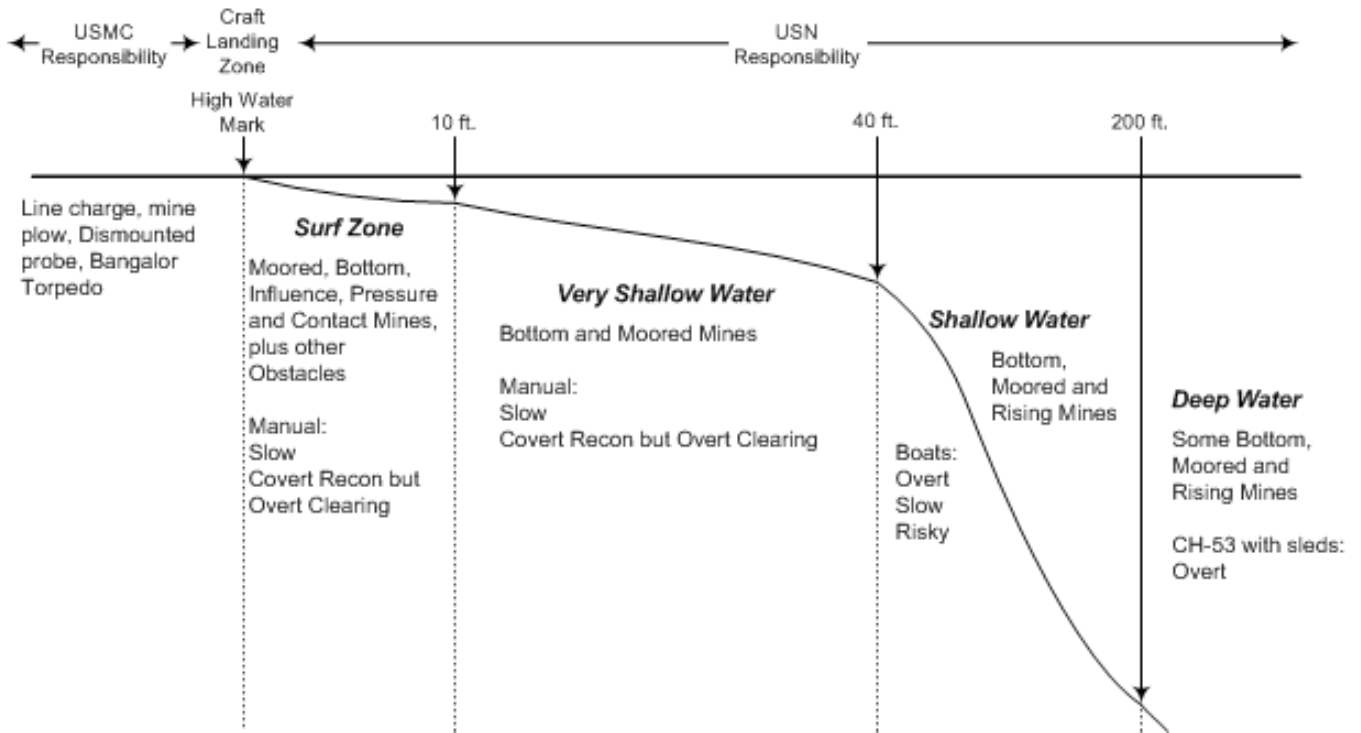


Figure 3-6: Mine Countermeasures Responsibilities

Staff Planning Factors and Considerations

4001. Casualty Rate Estimation

Casualty estimates are the responsibility of the MAGTF G-1. A primary tool for making such estimates in the “Joint Medical Planning Toolkit.” JMPT is a DoD medical planning and programming tool and authorized for use in medical systems analysis, logistics analysis, operational risk assessments, and theater medical course of action assessments. It includes a casualty rate estimation module that allows the user to pick, from a list of previous engagements (e.g. Fallujah) as the basis for the predicted casualty rate. On December 19, 2012, the Force Health Protection Integration Council (FHPIC) voted to accredit JMPT.

- JMPT is a desktop discrete-event simulation designed for Navy and Marine Corps medical planners that was developed under contract with the Naval Health Research Center (NHRC).
- JMPT simulates the stochastic flow of patients from the point of injury (POI) through more definitive care.
- JMPT provides an easily configurable and expandable open architecture to aid a variety of medical planners and analysts.
- JMPT provides logistics estimates for medical facility, personnel, supply, and transportation requirements.
- JMPT permits risk assessment, overall medical systems analysis, and operations research studies for a variety of emergency medicine scenarios.

The MAGTF G-1, Medical Plans and G3 officers should also consider unit SOP(s), commander’s guidance, intelligence estimates and their own experience and intuition when producing casualty estimates.

4002. Planning for Enemy Prisoners of War, Actual or Suspected Insurgents and/ or Civilian Detainees

The DOD Directive 2310.1, DOD Program for Enemy Prisoners of War (EPW) and Other Detainees, designates the Secretary of the Army as the executive agent for the administration of the DOD EPW/ Detainee Program. When operating jointly, the U.S. Army receives detainees captured by the U.S. Marine Corps, Navy, and/or Air Force. The U.S. Army receives prisoners as soon as possible after capturing forces complete initial classification and administrative processing. (MCTP 10-10F [ex-MCWP 3-34.1], *Military Police Operations* 09-2010) Planning considerations for EPW/CI can include the following:

Collection Points - To handle expected Enemy Prisoners of War (EPW), Civilian Internees (CI) or other detainees the MAGTF establishes a system of EPW/CI collection points. A collection point is an area where EPW/CI are held temporarily while awaiting evacuation to transfer points or holding areas further to the rear or to the custody of the US Army. At the collection point EPW/CI may be interrogated for intelligence information and, if they are sick or seriously injured, can receive medical treatment. Collection points may be classified as follows:

- **Company-level Collection Point** - *Tactical troops guard EPW.*
- **Battalion-level Collection Point** -
 - Collection points are usually established at the battalion level.
 - Established at a central location designated by the GCE commander.
 - Usually operated by Military Police (see Paragraph 1015).

Holding Areas - Holding areas can accommodate more captives for longer periods of time than can collection points. Like collection points, holding points are temporary and must be able to move with little or no notice. They are usually located in or near a base. An MP platoon (able to guard up to 500 captives) or company (able to guard up to 2,000) usually operates a MAGTF holding area.

COIN Considerations - The nature of COIN operations sometimes makes it difficult to separate potential detainees from innocent bystanders, since insurgents lack distinctive uniforms and deliberately mingle with the local populace. Interrogators are often under extreme pressure to get information that can lead to follow-on operations or save the lives of noncombatants, Soldiers, or Marines. While enemy prisoners in conventional war are considered moral and legal equals, the moral and legal status of insurgents is ambiguous and often contested. What is not ambiguous is the legal obligation of Soldiers and Marines to treat all prisoners and detainees humanely, and in accordance with the Detainee Treatment Act of 2005 and DODD 2310.01E. No person in the custody or under the control of DOD, shall be subject to torture or cruel, inhuman, or degrading treatment or punishment, as defined in, U.S. law (FM 3-24).

4003. MAGTF Health Service Support

a. Basic Concepts

Under joint doctrine (JP-4.02, July 2012) the mission of health service support (HSS) is “... to maintain the individual and group health needed to accomplish a military mission.” According to Marine Corps doctrine (MCTP 3-40A [ex-MCWP 4-11.1], *Health Service Support Operations*, 12-2012) it is “... to minimize the effects that wounds, injuries, and disease have on units’ effectiveness, readiness, and morale.” Navy doctrine (NWP 4-02, January 2008) states that Naval Expeditionary Health Service Support (NEHSS) exists “... to promote physical and mental health readiness and to care for the sick and injured in military operations.”

Staff Planning Factors and Considerations

Major Jonathan Letterman, USAMC was the founding father of modern US military medicine. As medical director of the Army of the Potomac during the Civil War, Letterman sought to get wounded soldiers off the battlefield and into the hands of trained medical orderlies as soon as possible. He introduced the principles of triage to focus treatment on patients who could most benefit from it. He also devised a series of levels that a wounded man would pass through, beginning with battlefield first aid and ending at a base hospital. The lower levels would focus on minimal measures needed to save life or limb. Expanded treatments would be available higher up. A casualty would proceed up this ladder only as far as was necessary to return him to duty. Only the most seriously injured would go all the way to the top.

Today, our armed Services recognize five levels of medical care, collectively known as the “taxonomy of care.” Two sets of definitions of the various care levels of this taxonomy exist. The Army and Air Force uses one and the Navy, the other. The Navy definitions have since become the official “joint” definitions but the Army-Air Force definitions are still in wide use. If the two definition sets are in use simultaneously there are enough differences between them to create misunderstanding. Planners should be aware of the main distinctions (see Table 4-1).

Navy-Joint Care Level	Army-Air Force (AAF) Care Level	SERVICES PROVIDED	SERVICE PROVIDERS (2)
First Responder (FR) (also called Level/Role 1)	Level I or Role 1	Casualty location/collection; Triage; First Aid / Emergency Medical Treatment (EMT) at POI (1); Treatment of minor injury/illness (“sick call”); Routine disease/stress prevention; Casualty evacuation from POI to Level I or II MTF (AAF); Advanced Trauma Mgmt (ATM - AAF)	<i>Self/buddy aid – Combat Life Saver (Army-USMC) Hospital Corpsman (USN) & Combat Medic (Army) Squadron Medical Element (SME – USAF) Bn/Sqdrn Aid Station/Medical Platoon (USN-USMC) Battalion or Brigade Medical Platoon (Army) Air/ground ambulance (AAF)</i>
Forward Resuscitative Care (FRC) (also called Level/Role 2)	Level II or Role 2	ER-level resuscitative treatment; local anesthesia Limited patient holding (72 hours maximum); Radiology; Laboratory; Limited dental; Combat Operational Stress Control (COSC); Limited optometry; Advanced preventive medicine; (+ Level I services, as required - AAF only)	<i>Medical Battalion (including Surgical Company, STP(3), Cmbt Stress Tm; holding ward) (USN/MC) Dental Det./Co./Bn./Sqdrn (Army-USAF-USN/MC) BCT/Area Support Medical Company (Army) COSC Det. (Army); EMEDS Basic (USAF) NBC/Preventive Medicine Teams (various) (USAF)</i>
	Level II+ or Role 2+	Level II plus general anesthesia; OR-level surgery; advanced resuscitative treatment	<i>FRSS (4) (USN/MC); Fleet Surgical Team (USN); Mobile Field Surgical Team (MFST)(USAF); Forward Surgical Team (FST) (Army)</i>
Theater Hospitalization (TH) (also called Level/Role 3)	Level III or Role 3	In-theater hospital; medical, surgical, dental & psychiatric care for all patient categories; Patients stabilized for evacuation to COMMZ or out of theater (AAF); severe trauma patients should reach a Level III MTF within 12 hours; (+ Level I & II services as required - AAF only)	<i>EMEDS (+25 or above)/AF Theater Hospital (USAF) Expeditionary Medical Facility, Hospital ship (USN) Fleet Hospital (USN); Area Medical Lab (Army) Combat Support Hospital (CSH) (Army) Hospital Augmentation Tms. (various types) (Army) Minimum Care Detachment (Army)</i>
Definitive Care (DC) (also called Level/Role 4)	Level IV or Role 4	Additional and specialized medical, surgical and patient holding capabilities to prepare patients for evacuation to CONUS	<i>OCONUS MTF (usually permanent or semi-permanent); Augmented AFTH (USAF) Augmented CSH (Army)</i>
	Level V or Role 5	Full range of acute, convalescent, restorative & rehabilitative care (CONUS only)	<i>CONUS MTF; VA or NDMS(5) hospital</i>
En Route Care	Included in all five Roles/Levels	Essential care during patient movement	<i>ERCS(6) (USN), Stretcher team; ground ambulance Aero-Medical Evacuation, CCATT(7) (USAF)</i>

NOTES: (1) POI = point of injury/illness; (2) The list of service providers is not exhaustive; those found within the MAGTF are in italics; (3) Shock-Trauma Platoon – this is really a FRC (Level 2) unit but it provides some FR (Level 1) services; (4) Forward Resuscitative Surgical System; (5) NDMS = National Disaster Medical System; (6) ERCS = En Route Care System; (7) CCATT = Critical Care Air Transport Team; AAF = Army-Air Force term/function

Table 4-1. Taxonomy of Care (Army/Air Force Care Levels vs. Navy/Joint Care Levels)

Planners should note that while Army-Air Force medical units are staffed and equipped to furnish care not only at their designated levels but at all lower levels, Navy/Marine Corps medical units normally furnish care at their designated levels only. They have little or no capacity to provide lower levels of care.

b. HSS Within the MAGTF

MAGTF medical assets only provide medical care at the First Responder (FR or Level/Role 1) and Forward Resuscitative Care (FRC or Level/Role 2) levels. Theater hospitalization (TH or Level/Role 3) and higher care must come from theater level Navy or other Service assets. Table 4-2 (below) describes the medical capabilities of MAGTF components.

Battalion/squadron medical platoons/units are the primary FR (Level/Role 1) care providers. They range in size from an officer and two to four enlisted Hospital Corpsmen (in an aircraft squadron) to two officers and 65 enlisted in an infantry or LAR battalion. In garrison, their mission to keep all members of the parent unit medically fit for deployment. In combat they minimize the effects of wounds, injuries and diseases. Larger units operate an aid station and attach Hospital Corpsmen to their forward operating elements.

These attached Corpsman locate and collect (or direct the collection of) casualties and provide essential first aid at the point of injury or illness (POI). In combat, casualties go first to a company collection point (CCP) under the direction of the first sergeant and senior Corpsman. Ambulatory casualties are directed to the CCP while stretcher teams or ambulances carry the non-ambulatory. At the CCP they may receive further treatment and if this renders them fit for duty they can return to their units. If not, they go to the BAS by ambulance or stretcher or on foot.

An infantry battalion BAS typically operates as a forward echelon under the senior medical officer (the battalion surgeon) and a rear echelon under the junior medical officer (a physician’s assistant). When the battalion displaces the forward BAS echelon moves with it, leaving its patients with the rear echelon. The rear echelon rejoins the forward echelon when it has evacuated all its patients to higher level medical treatment facilities (MTF) such as an STP or FRSS (see Figure 4-1, Table 4-4 and 4003c) from a supporting surgical platoon or transferred them to other medical units at the same care level. Battalion aid stations in other than those in infantry or LAR battalions have only one echelon.

CARE LEVEL	UNIT TYPE	CAPABILITIES
First Responder (FR) or Role/Level 1	Battalion/Squadron Medical	Collects casualties, administers first aid; provides aid station services (sick call, sanitation, triage, trauma stabilization, etc.); evacuates serious casualties to an FRC or Role/Level 2 facility
	Regiment/Group Medical	Provides aid station services to the regiment/group headquarters company, battery or squadron and a special staff officer to the battalion/squadron staff. May also provide specialists (such as psychiatrists) to reinforce subordinate battalion or squadron aid stations.
Forward Resuscitative Care (FRC) or Role/Level 2	Shock-Trauma Platoon (STP)	Emergency resuscitation; not oriented to casualty collection but can triage for an FRSS or act as a BAS; very limited patient holding; evacuates patients to theater hospitals (Role/Level 3)
	Forward Resuscitative Surgical System (FRSS) (Role/Level 2+)	Performs operating room surgery beyond STP capabilities (can enter a major body cavity); patient holding capability even more limited than STP; evacuates stabilized patients to an STP or (preferably) directly to a Role/Level 3 facility (theater hospital)
	Medical Battalion (Role/Level 2+)	Provides STP, FRSS, ERCS, patient holding wards, combat stress control, lab, pharmacy and radiology support; evacuates patients to a Level 3 facility (theater hospital)
	Dental Battalion	Provides detachments for routine and emergency dental care, which augment medical battalion assets and battalion/squadron and regiment/group aid stations
Theater Hospitalization (TH) or Role/Level 3	None within a MAGTF	Navy Expeditionary Medical Facilities (formerly fleet hospitals) or hospital ships, shipboard hospital facilities; Army combat support hospitals; and Air Force theater hospitals.
En Route Care	Ambulance Team	Provides short distance ground evacuation; consists of one Marine driver and one Navy Hospital Corpsmen; provides first aid en route as required. The standard ambulance is the light armored M997A2. The unarmored M1035A2 is used in more benign environments.
	Stretcher Team	While not part of the battalion medical section, litter bearers operate under the supervision of the battalion surgeon. Litter bearers are Marines designated and trained in advance in casualty handling procedures. The number of required litter bearers varies with the situation; 24 is considered minimal for an infantry battalion. For longer carries over tougher terrain, four bearers may be required per litter. Indigenous civilians may act as litter bearers if properly supervised.
	En Route Care System (ERCS)	Supports up to two stabilized patients that require ventilators during a flight (fixed or rotary wing) of up to two hours. Longer flights are possible if relief or resupply is available.

Table 4-2: Capabilities of MAGTF HSS elements

The responsibilities of a BAS in the field include the following:

- Provide routine sick call for battalion personnel
- Conduct triage
- Treat casualties to minimize mortality, prevent further injury, and stabilize for further evacuation
- Provide temporary shelter in conjunction with treatment
- Record all casualties received and treated, and report them to the appropriate unit section for preparation of casualty reports
- Conduct routine disease and injury surveillance as an outcome measure of command preventive programs
- Return patients to duty whenever possible
- Initiate treatment of combat stress casualties
- Transfer evacuees from the BAS to ambulance, helicopter, or other evacuation transportation
- Maintain deployment health records (DHR) of battalion personnel
- Provide personnel replacement and medical re-supply of company level hospital Corpsmen
- Implement PVNTMED petty officer program and ensure that program objectives are accomplished

A BAS typically operates out of a GP tent but it can also assume a “mobile” configuration using (in the case of each echelon of an infantry battalion BAS) one MTRV 7-ton truck (if available) and one M1035 (unarmored two-stretcher HMMWV) ambulance. After it arrives at its operating site a BAS can set up and become operational in about an hour. It then functions as a crude emergency room, operating as far forward as the situation permits. It can hold patients for up to six hours. When operating it organizes its personnel for five basic functions:

- Security: personnel assigned to BAS security have two main tasks: (1) removing weapons and ammunition from patients before they enter the triage or treatment areas; and (2) keeping people out of the BAS who do not belong there.
- Triage: consists of separating patients into three groups: (1) those likely to survive without major impairment (loss of limb(s), eyesight, etc.) even if they receive no immediate treatment; (2) those likely to die or suffer major impairment whether they receive immediate treatment or not; and (3) those that can survive and/or avoid major impairment only if they receive immediate treatment.
- Treatment Area: usually located in a GP tent, MTRV or any secured area with or without shelter. Here, the battalion surgeon (and/or his assistant, if he has one) performs (or supervises) essential life/limb saving procedures. The surgeon will focus primarily on Triage group (3) casualties, described above. Group (1) casualties and group (2) casualties expected to survive will be here also.
- Evacuation Area: a staging area for patients awaiting evacuation and/or those requiring monitoring and continued care. BAS personnel stationed here will issue casualty reports and CASEVAC or MEDEVAC requests.

Staff Planning Factors and Considerations

- Expectant Area: the chaplain normally supervises this staging area. It is for Triage group (2) casualties who are not expected to survive. Most will be on pain medications.

The BAS evacuates all casualties requiring surgery beyond its capabilities, all psychological casualties, and all other casualties not fit to return to their parent units to the nearest surgical company.

For its medical logistics needs, a BAS requires AMAL 635 (two units per infantry/LAR bn), AMAL 636 (two units per AMAL-635 or four per infantry/LAR battalion) and AMAL 699 (four per infantry/LAR bn). All significant AMAL(s) are described on Table 4-3, below.

TAM CN	AMAL	Title	Description	Dimensions L x W x H (ft)	Cube (ft)	*Wt. (lbs)	**P
C8600	AMAL-618	Lab Equipment	Provides ancillary testing for field Medical Treatment Facilities (MTF); one AMAL619 supports 100 patients; two stocked per AMAL618; partial refrigeration required	5.58 x 3.5 x 4.83	94.45	1,125	2/1
C8604	AMAL-619	Lab Consumables		4.17 x 3.33 x 3.5	48.61	480	1/1
C8614	AMAL-627	X-Ray Equipment	One digital X-Ray unit supporting up to 60 cases for 24 hours; no separate AMAL for consumables	5.58 x 2.33 x 2.41	31.48	440	1/1
C8624	AMAL-631	STP Equipment	AMAL631 equips one STP; AMAL632 supports initial resuscitation for up to 50 non-surgical patients & 10 post trauma care patients up to 48 hours; two AMAL632 issued per AMAL631; AMAL 631/32 may require MHE	8 x 4.58 x 5	183.33	2,746	2/1
C8628	AMAL-632	STP Consumables		9 x 7.33 x 5.5	363.00	2,545	3/1
C8630	AMAL-633	Acute Care Ward (ACW)	AMAL 633 equips six cots & four critical care beds; AMAL 634 supports up to 50 bed days; two AMAL 634 issued per AMAL-633; supports FRSS post op patients	6.5 x 6.5 x 6.25	264.06	2,313	4/1
C8634	AMAL-634	ACW Consumables		11.67 x 4.5 x 4.25	223.13	2,015	2/1
C8638	AMAL-635	BAS Equipment	Equips a surgeon & a PA; consumables for initial resuscitation of up to 50 patients with major wounds; two AMAL636 issued per AMAL635; used with AMAL699	6.67 x 5.67 x 2.25	85.00	720	2/1
C8640	AMAL-636	BAS Consumables		6 x 5.5 x 5.17	170.50	1,600	2/1
C8644	AMAL-637	Preventive Med Maneuvr	Up to 30 days eqpt/supplies for preventive medical incl. advice, food inspection; waste, potable water, vector/disease surveillance/control, heat/cold injury prevention	2.75 x 1.75 x 1	4.81	53	1/1
C8648	AMAL-638	Preventive Med Tech		4.58 x 3.83 x 5.5	96.63	810	1/1
C8650	AMAL-639	Operating Room (OR) Equipment	AMAL-639 transportable in a HMMWV w/trailer; equips one OR for major procedures, sterilization & general anesthesia; AMAL-640 supports up to 25 surgical cases; AMAL-639/640 used for non-FRSS field OR(s)	5.67 x 4.58 x 5.75	149.34	4,984	6/2
C8654	AMAL-640	OR Consumables		11.5 x 7.83 x 4.5	405.38	2,696	4/1
C8745	AMAL-645	FRSS Equipment	AMAL-645 equips one FRSS; AMAL-646 supports up to 18 emergency surgeries over 48 hrs.	38.08 x 4.25 x 4	647.42	8,510	7/3
C8656	AMAL-646	FRSS Consumables		27.75 x 4.17 x 4	462.50	2,910	5/1
C8700	AMAL-647	En Route Care System	Eqpt & supply for ERCS tm to support two critically ill but stable casualties for MEDEVAC flight up to 2 hrs	4.58 x 4 x 4.92	90.14	731	1/1
C8004	AMAL-648	Short Range CasEvac	Supports MEDEVAC fm POI to Surgical Co (2 hr flight) for 8 patients (6 litter [incl. 1 critical] and 2 sitting)	2.83 x 1.75 x 4.17	20.25	244	1/1
C8006	AMAL-650	Preventive Med OEHS	30 days' supplies/equipment for industrial hygiene & environmental health (AMAL-650) & entomology (651)	4.42 x 3.25 x 4	57.42	341	1/1
C8007	AMAL-651	Preventive Med ENTO		8.42 x 6.125 x 5.5	283.54	2,072	7/2
C8005	AMAL-652	Chem-Bio Incident Response Force (CBIRF)	Supports CBIRF CBRN response in CONUS & OCONUS; sustains up to 50 critical or 100 moderate trauma patients 24-48 hrs; CBRN antidotes for up to 500 patients & protection for up to 200 CBIRF personnel	29.75 x 5 x 4.67	694.17	4,255	8/3
C5332	AMAL-653	Corpsman Assault Pack	One per combat corpsman; not a true AMAL; contents vary by mission; it is filled/replenished from AMAL-636	2 x 1.5 x 1	3.00	40	n/a
C8009	AMAL-660	MarSOC Corpsman Pk	Equips one special operations corpsman/IDC	TBD by MarSOC	TBD	TBD	n/a
C8715	ADAL-662	Field Dental Operatory	Equips one dental officer & two techs; supports emergency & stabilizing care for 200 patients (incl 5 surgical packs) for evacuation to a higher care level	7.42 x 5.58 x 2.42	100.07	755	2/1
C8685	AMAL-685	Cold Weather	Eqpt & supplies for cold weather injuries; augments AMAL-635/36 & 699 for a population-at-risk (PAR) of 1,000 for 30 days; scalable to fit mission/PAR size	3.42 x 2.92 x 5	49.83	110	1/1
C8686	AMAL-686	Hot Weather	Eqpt & supplies for hot weather injuries; augments AMAL-635/36 & 699 for a ***PAR of 1,000 for 30 days	3.83 x 3.08 x 5.67	66.98	130	1/1
C8687	AMAL-687	NBC Medications	CBRN treatment for self-aid by one individual	6.67 x 3.67 x 6.67	162.96	1,600	2/1
C8688	AMAL-688	NBC	CBRN treatments for a PAR of 1,000 for 30 days	7.08 x 7 x 7.17	355.35	3,129	2/1
C8694	AMAL-691	BioMed Test & Repair	Tools & test eqpt to repair/calibrate/maintain medical equipment in other AMAL/ADAL(s); scalable	5.92 x 2.75 x 6.92	112.54	979	1/1
C8698	AMAL-692	BioMed T&R supplies		4.75 x 4 x 4.75	90.25	680	1/1
C8740	AMAL-699	Sick Call	Equipment & supplies to treat 300 disease & non-battle injury (DNBI) patients over a 30-day period; augments AMAL-635/36 (BAS)	3.92 x 3.75 x 5.5	81.00	878	1/1

*Wt = shipping weight; **P = Number of standard wood pallets / Air Force 463L pallets required for shipping; ***PAR = Population at risk

Table 4-3: Authorized Medical (or Dental) Allowance Lists (AMAL/ADAL)

c. Logistical and Operational Considerations for MAGTF Level Medical Units

In garrison and during routine deployments, MAGTF level Navy medical units are not staffed with the full wartime complement of HSS personnel. When increased medical and dental manning levels are required, the Health Services Augmentation Program (HSAP) allows HSS manning levels to comply with wartime requirements. (See Bureau of Medicine and Surgery Instruction [BUMEDINST] 6440.5C Series, Health Services Augmentation Program [HSAP], for detailed information on the HSAP process.)

Medical Battalion:

- It is subordinate to the MLG and consists of an H&S company and two or three surgical companies.
- The H&S company provides the battalion with limited command and control, combat stress and preventive medical teams, a blood bank, utilities personnel, an ambulance reserve and two or three additional surgical platoons.
- The H&S company has recently reorganized. Under current doctrine, it is no longer a part of the evacuation chain, except for combat stress casualties (unless it attaches its combat stress teams to the surgical companies). The H&S company's surgical platoons may reinforce, or accept overflow casualties from, the surgical companies.
- Current medical doctrine emphasizes rapid patient stabilization and evacuation in lieu of patient holding. See MCTP 3-40A (ex-MCWP 4-11.1), *Health Service Support Operations*, 12-2012 and MCRP 3-40A.5 (ex-MCRP 4-11.1E), *HSS Field Reference Guide* 10-2015.
- The medical battalion is dependent on:
 - The Engineer Support Battalion and CLB-DS engineers for general engineering (site preparation, etc.) and additional utilities (water, electric power, laundry) support. The Medical battalion already has its own bath and refrigeration units.
 - The MLG Food Service Company for rations for organic personnel and patient feeding
 - The MLG CLR-GS for all classes of supply and all medical/non-medical equipment maintenance
 - The Dental Battalion, MLG, for dental detachments.
 - MLG and Air Wing transportation assets for displacements (by ground or air) and patient movement (by air).

Surgical Company:

- One surgical company supports one regimental combat team (RCT) or, when reinforced, a Marine Expeditionary Brigade (MEB). In the field it is usually ADCON to the medical battalion but OPCON to a direct support combat logistics battalion (CLB-DS).
- Under current doctrine a surgical company in direct support of an RCT or MEB typically forward deploys one surgical platoon with the battalion aid station (BAS) of a maneuver battalion (normally infantry). This BAS should be within 30 minutes' evacuation time of the BAS(s) belonging to the other maneuver battalions in the RCT. The remainder of the surgical company co-locates with the CLB-DS in the CSSA or within approximately one hour evacuation time from its forward surgical platoon.
- Each BAS sends those casualties most urgently requiring surgery to the forward surgical platoon. It sends all other surgical casualties requiring evacuation to the surgical company main body.
- A surgical platoon evacuates its stabilized cases directly to a theater hospital, approximately two hours' flying time distant. Its ERCS (En Route Care System) team accompanies any patient (or patients) needing a ventilator during the flight.
- In addition to its other equipment, each surgical company has one set of operating room (OR) equipment (AMAL-639) and two sets of OR consumables (AMAL-640) not included in the surgical platoons. It is not FRSS (Forward Recussative Surgical System) equipment. Its purpose is to augment surgical capabilities during sustained (static) operations where multiple surgical platoons are co-located. FRSS sets replaced this equipment because it did not meet Operational Maneuver From the Sea (OMFTS) mobility standards.
- The surgical company is dependent on:
 - The medical battalion H&S company for administrative, utilities, pharmacy, blood bank, and chaplain services, combat stress and preventive medical teams and reinforcing ambulance and surgical assets.
 - Other MLG elements providing the same services (dental, engineering, utilities, food service, supply and maintenance) for the surgical company as those that support the medical battalion (above). A surgical company in the field normally has one or more dental platoons or a dental company attached to, or supporting it.

Surgical Platoon Elements:***FRSS (Forward Resuscitative Surgical System):***

- This unit performs operating room (OR) surgery rather than ordinary emergency room or ER surgery. OR surgeons have special skills that enable them to enter a patient's major body cavities (head, chest, abdomen or leg) when the need to do so is urgent.
- About 10% of severe trauma patients require OR surgery within 30-60 minutes after injury. The FRSS is the only MAGTF element that can provide it. Planners should use it sparingly. OR surgery is also available in any Role/Level 3 or higher facility.
- Qualification as an OR surgeon requires five years of intensive study and practice beyond ordinary surgical training. Graduates of such training have highly perishable skills. They should participate in at least 15 major surgeries per month to maintain their profi-

Staff Planning Factors and Considerations

ciency. This will involve detaching FRSS surgeons from their parent medical battalion during “slow” periods to make them available to operate on patients at busy Role 3 or higher level theater hospitals.

- An FRSS has no organic vehicles but to displace it requires two HMMWV(s) (or one troop/cargo HMMWV and one M1035 ambulance) with trailers. If carrying multiple AMAL-646 (see Table 4-3) it also needs an MTRV (or equivalent airlift). It fits into two Base-X tents and requires an hour’s setup time after arrival at its work site. Its required “footprint” is no larger than that of a BAS.
- An FRSS can only operate on one patient at a time but has cots for two pre-op and two post-op patients. It is not resourced to hold patients longer than four hours.
- An FRSS with one AMAL 646 (FRSS consumables - see Table 4-3) can treat an average of 18 patients over a 48-hour period. After this the FRSS requires another AMAL-646. Personnel rest/rotation and/or equipment maintenance/repair may also be necessary.
- Whenever possible, an FRSS should operate with a shock, trauma platoon (STP). The FRSS does the OR surgery, while the STP does initial resuscitation and serves as a triage and evacuation station. If no STP is available a BAS may substitute.

TYPE	Surgeons (A)	Anesthesia (A)	OR Nurses	MSC (B)	ENL	OR Tables	Pre/Post-Op Beds/Cots (C)	Continuous Ops (D)	Surgeries (E)	Equipment Wt (lbs) (F)
FST (USA)	4	2 (nurses)	3	1	10	2	8	72 hours	30	12,644#
FRST (USA)	6	2 (nurses)	4	1	7	2	8	72 hours	30	13,000?
MFST (USAF)	3	1 (doctor)	1	0	0	1	2	36 hours	10	600#
FRSS (USMC)	2	1 (doctor)	1	0	4	1	4	48 hours	18	8,500#

- Notes
- A FST/MFST/FRSS each include one orthopedic surgeon, an FRST has two and two ER physicians ; others are trauma surgeons;
 - B MSC = Medical Service Corps (medical administrative/logistics officer)
 - C Figures indicate the maximum number of patients that the unit can simultaneously accommodate in pre-op and post-op care. In an FRSS two beds/cots are designated for pre-op patients and two for post-op. The other teams use their cots/beds as required.
 - D Maximum time period during which the unit can operate without resupply, relief, reconstitution or augmentation
 - E Maximum number of major trauma surgeries the unit can perform over one operations period without relief, reconstitution or re-supply. Planners should count a non-operative resuscitation as one half of a major trauma surgery.
 - F Equipment weight excludes vehicles and only includes tentage for FRSS. To displace in one lift an FRST requires two LMTV and four HMMWV(s); an FST six HMMWV(s); an FRSS two; and an MFST one (all vehicles have trailers except in an MFST).

The Army introduced the FRST in 2014 as a modular upgrade of the FST. It consists of an administrative, two surgical and resuscitative elements and may conduct split operations. When conducting split operations FRST elements can only sustain themselves for 24 hours.

Table 4-4. Capability Comparison between the Army Forward Surgical Team (FST), Forward Resuscitative and Surgical Team (FRST), Air Force Mobile Field Surgical Team (MFST) and Navy/Marine Corps Forward Resuscitative Surgical System (FRSS)

STP (Shock Trauma Platoon):

- An STP consists of a stabilization section (two ER surgeons, a physician’s assistant, and seven enlisted corpsmen) and an evacuation section (one ER nurse and seven corpsmen). It has no organic vehicles but requires two MTRV(s) (with one trailer) and three HMMWV (two may be ambulances) or equivalent airlift to displace. It fits into three tents and can set up in an hour.
- An STP performs ER surgery; this covers surgeries of all types except those involving entry into a major body cavity (MBC). ER surgery can stabilize 90% of all trauma cases well enough to enable them to survive evacuation to a theater hospital.
- An STP with one AMAL-632 (STP consumables) can treat an average of 50 patients before it requires resupply (see Table 4-3).
- An STP has 10 holding cots (up to four for critical care patients). It can hold patients up to 72 hours but because patient holding significantly drains mission essential resources, it will avoid holding any patient beyond 12 hours.
- A forward deployed STP can reinforce or replace a BAS. It can also augment an FRSS.

ERCS (En Route Care System):

- An ERCS team (one critical care nurse and one hospital corpsman) provides essential care during movement (usually by tactical aircraft) for patients requiring a ventilator (oxygen).
- One ERCS team can support up to two critically ill/injured patients for up to two hours (flight time) before requiring re-supply (one AMAL-647 ERCS equipment and consumables - see Table 4-3).
- During patient movement one or more hospital corpsmen per air or surface vehicle can monitor less serious casualties that do not require ventilators. The AMAL-648 supports medical evacuations of this type (see Table 4-3). Its most common use is for the aerial movement of patients from the POI (Point of injury/illness) to the surgical company. Each MWSS holds three AMAL-648.
- Aircraft able to conduct tactical casualty/medical evacuation missions are described in Table 4-5.

Acute Care (Holding) Ward (ACW):

- An ACW (one family physician, one critical care nurse one registered nurse and eight hospital corpsman) employs one AMAL 633 with six cots & four critical care beds for pre-and post-op FRSS and STP patients. It is normally issued two AMAL-634 (ACW consumables - see Table 4-3). Each AMAL-634 supports 50 patient bed-days. Note that cots are intended for short term (typically, three hours or less) holding of patients awaiting surgery or evacuation. Beds are for longer term holding (up to 72 hours).

Surgical Co Motor Transport:
 2 MK-593 trailers
 1 M1123 troop/cargo HMMWV
 6 M1102 HMMWV trailers
 8 M997A2 ambulances
 1 M1035A2 ambulance

Element	Equipment	Consumables
FRSS	1 AMAL-645	5 AMAL-646
STP	1 AMAL-631	2 AMAL-632
ACW	1 AMAL-633	2 AMAL-634
ERCS	4 AMAL-647	
Lab Tm	1 AMAL-618	2 AMAL-619
X-Ray Tm	1 AMAL-627	2 AMAL-631

Equipment for one Surgical Platoon

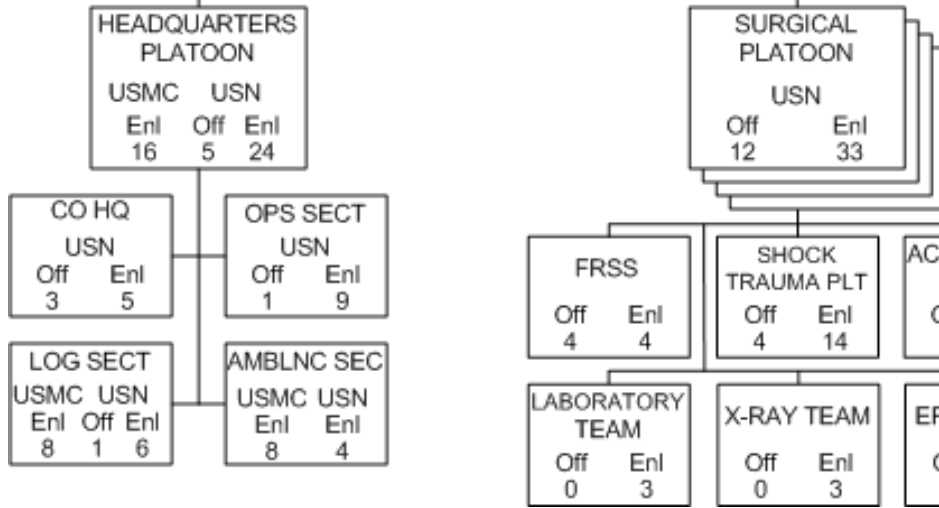
Notes: (1) The 1st and 2nd Medical Battalions have three surgical companies each. The 3rd and 4th have only two.

(2) A 3rd Medical Battalion surgical company has only three surgical platoons.

(3) FRSS: see Table 4-4

(4) A Shock Trauma Platoon (STP) has 10 holding cots: up to four can hold critical care patients.

(5) An Acute Care Ward (ACW) has 10 holding beds: up to four can hold critical care patients.



Medical Bn H&S Co Motor Transport:
 7 MK/AMK-23 MTRV Trucks
 5 MK-593 trailers
 14 M1123 troop/cargo HMMWV
 6 M1102 HMMWV trailers
 18 M997A2 armored ambulances (4 litter)
 3 M1035A2 unarmored ambulances (2 litter)

The headquarters and service companies of 3rd and 4th Medical Battalions have only two surgical platoons each. The 4th Medical Battalion H&S company has 38 additional Marines (total of 6 officers and 95 enlisted) but its combat stress platoon has only six officers and six enlisted (two teams).

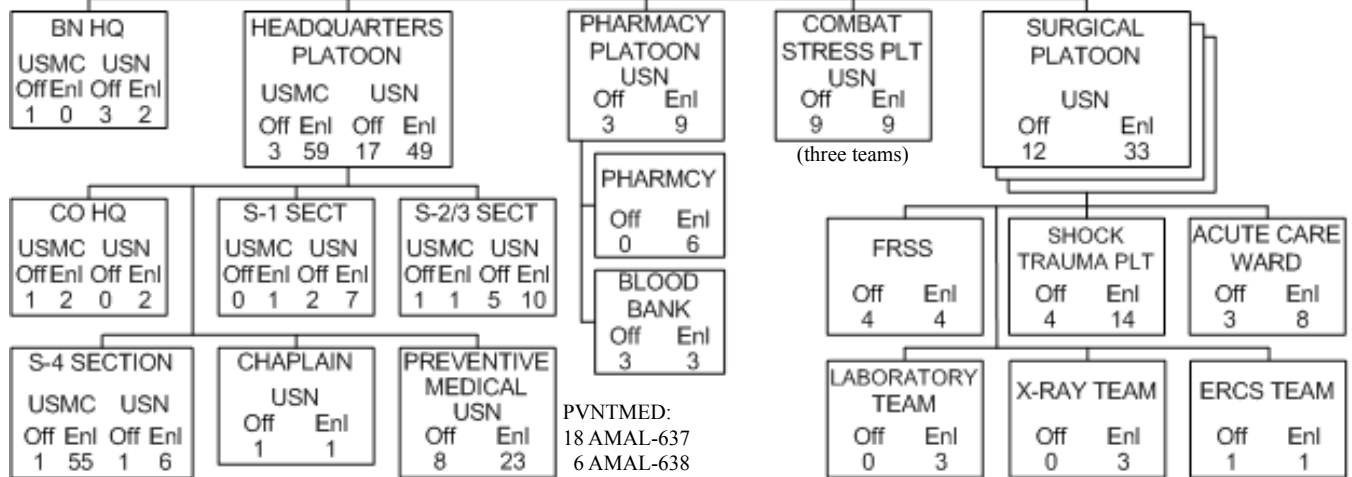


Figure 4-1: Medical Battalion Organization FY17

- An ACW extends FRSS/STP capabilities by enabling the holding of more patients (up to 72 hours) pending evacuation or (in the case of the less seriously injured) recovery.

Medical Logistics:

- See Table 4-3 for planning data for the standard authorized medical allowance lists (AMAL).

d. Patient Movement (PM) Concept

PM is a casualty management system that coordinates the movement of casualties from point of injury through successive levels of care to a facility providing the appropriate level of treatment. Prompt evacuation of casualties to treatment facilities is essential to minimize morbidity and mortality. (MCTP 3-40A, ex-MCWP 4-11.1 *HSS Ops*). The objective of PM is to collect, treat, stabilize and move combat casualties to an appropriate treatment facility within 10 to 60 minutes of the onset of severe combat trauma or acute illness. The (still unvalidated) "Golden Hour" concept holds that if a severely injured patient can receive lifesaving resuscitative surgery within that time his chances of survival and avoiding or minimizing post-traumatic shock are maximized. Current OIF/OEF trauma data show improved medical training and equipment has kept patient survival rates above 95% even well after the "Golden Hour" has passed.

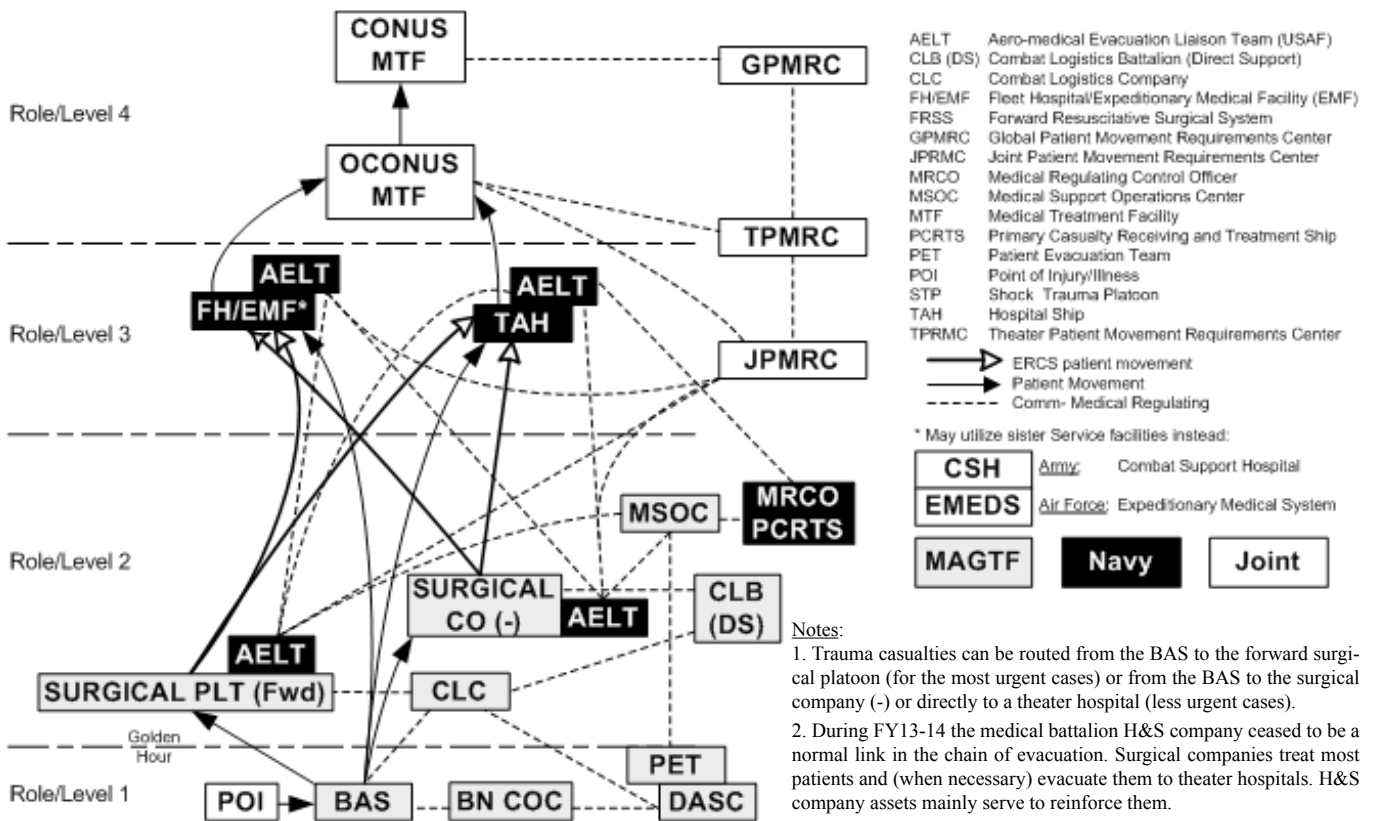


Figure 4-3: Mature Medical Regulating Concept

transportation movement requirements (best mode of transportation available), mission requirements determination (matching the right crew members and equipment), coordination, and overall activities supporting JTF PM requirements. The JPMRC performs integrated PM tasks for the MAGTF within a JTF or the task force's JOA. It may coordinate through the TPMRC to request and schedule strategic AE support (inter-theater), or work directly with the GPMRC as required. Since PM requires both intra-and inter-theater lift, it is critical that the JPMRC communicate requirements to the JTFS J-4 LNO to ensure expeditious medical regulating for casualties or patients to CONUS MTF(s).

To ensure supportability of the HSS mission, it is imperative to generate accurate casualty estimates (both battle and non-battle) and to fully utilize all organic, joint, coalition and host nation HSS assets available. The goal of HSS planning is to develop and execute a PM system that mitigates requirement shortfalls and provides for all levels of care. Effective and efficient PM planning takes full advantage of the "Golden Hour" thus maximizing patient prospects for survival, full recovery and return to duty.

f. The U.S. Army's Health Service Support (HSS) System

Army doctrine makes health service support part of the sustainment mission, but Army medical units operate under their own chain of command. Like its Air Force and Navy counterparts, the Army HSS system offers multiple levels of care as shown in Tables 4-1, 4-4 and 4-6.

The Army holds most of DoD's dedicated rotary wing medical evacuation assets. Its 26 combat support hospitals (CSH) provide theater hospitalization and limited definitive care. The US Army is also DoD's sole provider of veterinary care. This is focused on meat inspection and the care of military working dogs (MWD) from all Services. However, it can care for other military animals (such as pack mules) and for farm and other animals indigenous to a given Theater (to support civil-military operations).

Army battalion (and support brigade) medical platoons and teams/sections provide FR (Role/Level 1) medical care. They tend to be smaller than their Navy-Marine Corps counterparts relative to population at risk (PAR). For example, an Army infantry battalion has 15 company/platoon level "medics" as its "first responders" but a Marine battalion (with only 25% more men) has 44. For this reason the Army relies heavily on "buddy aid" and non-medical soldiers trained as "combat life savers" (CLS). Ideally, medics provide first aid and direct the movement of casualties from point of injury (POI) to a company-level casualty collection point (CCP), run by the company first sergeant and senior medic.

At the CCP, the senior medic triages all casualties, stabilizes the more serious ones, treats the less serious and, together with the first sergeant, arranges the evacuation of all casualties requiring further treatment. This will usually be to the battalion aid station (BAS). An Army BAS is similar to (though smaller than) its Navy-Marine Corps counterpart. When required it can split to form a forward aid station (FAS) as well as a BAS operating further to the rear. An evacuation section consisting (in a light infantry battalion) of eight ambulances with a driver and a medic in each supports the FAS/BAS. It can evacuate casualties from POI to CCP and from CCP to BAS. Helicopter evacuation is preferred when available. (See ATP 4-02.2 *Medical Evacuation* 08-2014 and ATP 4-02.3 *HSS for Maneuver Forces* 06-2014)

Within an Army brigade combat team (BCT), the brigade support medical company (BSMC – part of the brigade support battalion or BSB) provides FRC (Level/Role 2) care. Sustainment brigades directly supporting troops in combat can include FR/FRC (Level/Role 1 & 2) medi-

Staff Planning Factors and Considerations

UNIT TOE NO. / DESCRIPTION	NUMBER		PERSONNEL			REMARKS	
	AC*	RC*	OFF	WO	ENL		
MEDICAL COMMAND, BRIGADE & GROUP HEADQUARTERS & HEADQUARTERS COMPANIES (HHC)							
08640G	HHC, Medical Command	1	2	79	8	101	Controls two or more Medical Brigades for a theater army
08420G	HHC, Medical Brigade	5	10	35	5	65	May control 1-2 MMB and 1-2 hospitals etc. supports a corps
BATTALIONS & BATTALION EQUIVALENTS							
08485G	Multifunctional Medical Bn (MMB) (Level/Role 2)	5	16	16	2	60	Strength is for HQ and HQ Det (HHD) only. Usually controls 3 to 6 companies or 6-12 detachments.
08945R	Combat Support Hospital (CSH) (248 bed) (Corps) (Level/Role 3)	7	11	156	2	333	48 critical & 200 intermediate care beds; 6 OR tables (generates up to 96 OR table hours per day) (Note 1)
08976R	HHD, Hospital Center	3	4	10	0	17	Command Element for a Field Hospital/CSH (modular)
08988R	Field Hospital or CSH (modular)	3	8	49	3	113	1 ICU & 1 ICW (32 beds); 2 OR tables (36 hours/day) (Note 5)
COMPANIES, DETACHMENTS, & TEAMS (not an exhaustive list)							
08300R	Veterinary Services Detachment	8	12	10	1	49	Role 2 care for up to 50 MWD; inspects meat for 60,000 troops
08429A	Preventive Medical Detachment	12	24	2	0	11	Supports up to 17,000 troops (Role 2) (assigned to an MMB)
08430R	Med Det, Blood Support (MDBS)	5	2	2	0	19	One assigned per active MMB
08453R	Ground Ambulance Co (24 M997)	4	17	4	0	61	Can support a division in combat under an MMB/CSSB
08457A	Area Support Medical Co (ASMC)	14	43	13	0	65	Assigned/attached to MMB/CSSB; ER surgery only (Note 2)
08460R	Cmbt Op Stress Cntrl (COSC) Det	6	13	15	0	29	Assigned to an MMB; one det can support two divisions
08473R	Dental Co. (Area Support)	4	6	30	0	58	One per 43,000 troops; assigned to MedBde or MedCom
08488R	Medical Logistics Co.	7	10	2	1	68	Supports up to 22,000 troops (Note 3)
08497A	Medical Logistics Support Co	0	6	3	1	113	Supports up to 53,000 troops (Note 3)
08518L	Forward Surgical Team (FST)	11	16	10	0	10	Triage/surgery; up to 30 patients per 72 hrs. (Note 4)
08527A	Hospital Augmentation team	3	6	9	0	9	For head and neck injuries (Note 4)
08528	Fwd Resuscitative & Surgical Tm	6	6	13	0	7	(FRST) Modularized FST; can do split ops (Note 4)
08537L	Medical Teams (other types)	1	4	2-4	0	1-6	1 Pathology, 1 renal & 3 infectious disease tms (Note 4)
08567G	Optometry Team	10	4	2	0	4	One per 15,000 troops; usually assigned to an MMB
08948A	Hospital Company "B"	0	2	84	0	171	CSH element; 24 critical & 140 intermediate care beds
08949A	Medical Det. Minimum Care	0	10	7	0	32	CSH augment: adds 120 minimum care beds (Note 4)
08977R	Hospital Augmentation Det. (ICU)	3	4	33	0	33	2 ICU (24 beds), 2 OR tables (36 table hours/day) (Note 5)
08978R	Hospital Augmentation Det. (32 bed)	3	4	19	0	27	1 ICU & 1 ICW plus operational dental care (Note 5)
08979R	Hospital Augmentation Det. (ICW)	2	8	10	0	23	3 ICW (60 beds); augments admin & nutrition care (Note 5)

Notes: *AC = Active Component *RC = Reserve Component (i.e. Army Reserve/National Guard)

1. Consists of a command element and Hospital Companies "A" (84 beds) and "B" (164 beds); two active hospitals have no Company "B"
2. Supports up to 15,000 troops not assigned to BCT(s); ER surgery, ATM, triage, limited dental & COSC only; can hold up to 40 patients up to 72 hours (a Role/Level 2 MTF).
3. Assigned to an MMB or senior medical HQ in AO. Receives/issues 11.1 ST (MedLog) or 24 ST (MedLogSpt) Class VII / day; stores 51 ST (MedLog) or 415 ST (MedLogSpt)
4. Usually assigned to a MEDCOM or MEDBDE but attached to a FH/CSH. An FST/FRST can deploy to a ASMC/BSMC or BAS to provide OR capabilities (Role/Level 2+ or 3)
5. Base unit and augmentation modules for a modular Field Hospital/CSH; ICU = intensive care unit (12 beds); ICW = intermediate care ward (20 beds); carry 72 hours of supply

Table 4-6: Army Medical Units

cal units (see Figure 1-56). However, most Army medical units operate under their own functional brigades (commanding two to seven battalion equivalents each) and theater medical commands (MEDCOM).

An Army medical brigade will have at least one multifunctional medical battalion (MMB). An MMB controls three to six medical companies or six to 12 detachments (two detachments equate to one company). All of these will be Role I or II care, or medical logistics units. A typical MMB may have one or more area support medical companies (ASMC) a dental company, a medical logistics company and probably several detachments. (Each active component MMB also has a blood support detachment.) An ASMC provides BSMC services for all units within an assigned AO not organic to a BCT. An ASMC/BSMC differs from a Navy-Marine Corps surgical company in that it provides FR (Role or Level I) as well as FRC (Role/Level 2+) services (mainly STP and holding ward capabilities) but no FRSS capabilities. An ASMC can provide "operating room" (Level II+) surgery only if its parent medical brigade or MEDCOM reinforces it with a forward surgical team (FST).

An Army combat support hospital (CSH) is a theater hospital offering Role/Level 1, 2, 3 and, when augmented, Role/Level 4 care. It is a modular unit able to operate either as a single element or two separate elements (one with 84 beds and the other with 164). A minimum care detachment increases CSH bed capacity by 120. A typical medical brigade will have one to three CSH(s) and one or two MMB(s).

An Army Veterinary services detachment can inspect meat for up to 60,000 personnel (or for a USMC MEF). It also provides FR/FRC (Role/Levels 1 and 2) medical care for up to 50 military working dogs or other animals.

g. The U.S. Air Force HSS System

As stated in Annex 4-2 (to Air Force Doctrine) *Medical Operations* (September 2015) the Air Force Medical Service (AFMS) defines its core competencies as fixed-wing aero-medical evacuation, expeditious medical care in military operations, interface with "World Health

Care” (working with international medical officials), and (civil) population health. Relative to those of the Army and Navy-Marine Corps, the AFMS places less emphasis on battle casualties (though it can deal with them) and more on preventive medicine, disease and non-battle injury, NBC defense and serving the civil population. The AFMS is the main provider of fixed-wing aeromedical evacuation services within DoD (see AFTTP 3-42.5, *Aeromedical Evacuation* [11-2003] and AFTTP 3-42.51, *Critical Care Air Transport Team (CCATT)* [04-2015]).

Upon the opening of a theater of operations, the AFMS establishes a medical contingency ground support system (or MCGSS, see AFTTP 42.7, *Aerospace Medical Contingency Ground Support System* [08-2001, last update 10-2013]). The AFMS introduced MCGSS in 1998 to support the Air Force's Expeditionary Air Force (EAF) concept. Upon entering a new theater MCGSS begins by inserting advance elements with very small “footprints” and providing Level I medical services. The most common of these are as follows:

Squadron Medical Element (SME): provides FR (Role/Level 1) medical support to an aviation squadron. A typical SME has one officer (flight surgeon) and two enlisted medical technicians, one of whom may be an IDMT (see below).

Independent Duty Medical Technician (IDMT): similar to the Navy's independent duty Corpsman, an IDMT is a senior medic qualified as a licensed practical nurse (LPN). An IDMT can offer certain (Role/Level 1) medical services in lieu of a physician. These include “sick call,” immunizations, basic dental, and force health protection as well as emergency first aid. If operating without facilities an IDMT will need a vehicle and a shelter. One IDMT supports a population at risk (PAR) of 100-250. The AFMS has less than 500 IDMT(s).

Air Transportable Clinic (ATC): this is a 463L pallet of medical equipment and supplies that enables an SME and/or IDMT(s) to support a PAR of 300-500. A 10,000-lb capacity forklift can move it from the airfield (APOE) to its designated setup site.

To establish Role/Level 2 and higher medical services AFMS deploys expeditionary medical support (EMEDS) and Air Force Theater Hospitals (AFTH). The AFMS introduced EMEDS in 1999 as a replacement for the then existing (but much heavier and less flexible) air transportable hospital. The primary mission of EMEDS is to provide forward stabilization, resuscitative care, primary care, dental services, and force health protection. The modular and scalable design allows the AFMS to deploy capabilities ranging from providing small elements able to care for a limited number of casualties to a large medical system providing care to a population at risk (PAR) of 6,500 or more (a PAR includes all US civil/military/contract personnel but not local nationals). EMEDS assets are grouped into distinct medical support packages that provide an incremental buildup of capability: EMEDS HRT, EMEDS+10, and EMEDS+25. EMEDS is equipped and staffed on the assumption that (1) it will set up in a forward operating base (FOB) that already offers basic services and transportation; and (2) there is civil engineer support for site preparation and setup and to connect EMEDS with FOB utilities (water, power, etc.). For more on EMEDS see AFTTP 3-42.71, *Expeditionary Medical Support (EMEDS) and Air Force Theater Hospital (AFTH)*, (08-2014).

EMEDS HRT (Health Response Team): replaces the old EMEDS Basic and offers additional capabilities. It deploys within 24 hours of notification and reaches full operational capability (FOC) within 12 hours of arrival. It stabilizes patients and prepares them for movement to the next level of care. Patient evacuation within 24 hours is critical to mission success. EMEDS HRT is a Role/Level 2+ facility that supports the early phases of military operations and requires reinforcement for operations longer than 10 days. Like the old EMEDS Basic the EMEDS HRT's patient holding capability is limited to four beds (up to three for critical care) and eight cots.

In combat operations an EMEDS HRT supports a PAR of up to 3,000 and deploys with surgical, critical care, flight medicine, dental, and bioenvironmental engineering (BE) assets. Its equipment and supplies (for up to 10 days of operations) require ten 463L cargo pallets. The EMEDS HRT also requires five tents and requires 17,000 square feet of space.

In humanitarian assistance/disaster relief (HA/DR) operations, an EMEDS HRT focuses on estimated throughput not linked to a PAR. It can triage and treat 350 patients per day with a surge capacity of 500. The preexisting health status of the affected population and the scope and severity of the humanitarian/disaster event will impact patient throughput and supply duration. Due to anticipated high patient volumes, the estimate for initial supply duration is five days.

Core elements of an EMEDS HRT (totaling 16 officers and 14 enlisted) include a mobile field surgical team (MFST see Table 4-4), critical and primary care teams, a dental team (one dentist and one assistant) and a preventive medicine team. Optional elements include a specialist augmentation team (four officers and three enlisted providing pediatrics and OB/GYN care) and an international health specialist (officer) for HA/DR/stability operations plus additional preventive medicine personnel (two enlisted) for combat operations. The MFST and preventive medicine teams can initially deploy with man-pack equipment only. They can provide limited care within 15 minutes of arrival but will not have their full capabilities until their heavier equipment arrives.

EMEDS+10: this module upgrades EMEDS HRT to support to a PAR of 3,000 to 5,000 (at Role/Level 2+) for up to 10 days (without resupply). It reaches FOC within 36 hours. It increases the “footprint” of an EMEDS HRT from five tents/shelters to eight and from 17,000 square feet to 36,000. Its equipment requires 11 additional 463L cargo pallets and includes a deployable oxygen generation system (DOGS). It adds six holding beds to the four already in EMEDS HRT plus additional medical, administrative and logistical personnel (totaling eight officers and 16 enlisted) and another preventive medicine team (three enlisted). Other capabilities include advanced cardiac life support (ACLS), advanced trauma life support (ATLS) and a laboratory.

EMEDS+25: this module upgrades an EMEDS+10 hospital to a Role/Level 3 facility able to support a PAR of 5,000 to 6,500. It reaches FOC within 60 hours of arrival. It expands the EMEDS hospital's “footprint” from eight tents/shelters to 11 and from 26,000 square feet to 40,000. Its equipment requires eight additional 463L pallets (total of 28). The 25-bed Augmentation Team adds 15 holding beds to the ten already included in EMEDS+10 and provides additional physician, nursing, ancillary services (including physical therapy), medical logistics and administrative personnel (nine officers and 14 enlisted). EMEDS+25 also includes a second dental team, and a surgical augmentation team. The surgical augmentation team (surgeon, nurse anesthetist, OR nurse and two enlisted) cannot function on its own but instead increases the capacity of an existing MFST to two operating tables.

Staff Planning Factors and Considerations

Air Force Theater Hospital (AFTH): an EMEDS+25 upgraded with additional modules; it provides dedicated in-theater and en-route support to a PAR of more than 6,500. It is usually located at an air hub to facilitate patient movement to definitive care facilities in the continental United States (CONUS) and outside the continental United States (OCONUS). It is the largest type of Air Force deployed medical facility. It will have at least 58 beds (12 critical care and 46 medical/surgical), six operating room tables, and 260 personnel. The exact size and capabilities of an AFTHS are tailored meet the demands of the theater. It normally includes medical/surgical specialties, ancillary services and medical logistics functions not found in EMEDS.

In a mature theater, special capabilities may be centralized at one or more AFTH locations to provide a broader range of essential and subspecialty care with referral capability. The AFTH expansion packages are modular and can be added in multiple sets. An AFTH is a Role/Level 3 facility. A minimum sized 58-bed AFTH has a staff of 115 officers and 145 enlisted. Its supplies and equipment require 104 463L pallets and it occupies 29 tents/shelters and 62,000 square feet of space.

4004. Return to Duty Estimate Considerations



Chart shows breakdown of results of hits by enemy fire. Roughly 10% of the wounded can be returned to duty from Role I or II facilities. When figuring in DNBI the returned to duty (RTD) rate increases significantly. It will normally average around 40% from Role I or II facilities. A longer evacuation policy will increase the number RTD but will require greater logistic support. A shorter evacuation policy will reduce RTD and require less logistics but place greater demands on evacuation assets.

Figure 4-4: Return to Duty Estimate Considerations

4005. Human Waste and Solid Waste Planning Factors

Port-a-John Planning Factors	Six port-a-johns per 150 people plus one more for every 40 additional people
Planning factors for expedient "portable holes", "honey buckets", dug latrines, etc	One such latrine per 20 people (USAID and II MEF)
Solid waste Production (trash) Planning Factor	On average, one person will produce 5.3 lbs of solid waste per day.

See MCIP 3-40G.2i (ex-MCIP 4-11.0) or Army TM 3-34.56 *Waste Management for Deployed Forces* (07-2013)

Table 4-7: Human and Solid Waste Planning Factors

4006. Aviation Forward Operating Base Considerations

a. Forward Operating Bases

In preferred order—

- Occupy host nation airfield
- Use abandoned or captured airfields
- Use roads, highways, or parking lots
- Construct EAF (takes 2-3 weeks)

b. Forward Operating Base Classifications

- **Main Air Base.** A secure airfield capable of supporting sustained operations ashore; can handle all aircraft up to and including C-5s and C-17s; includes IMA support.
- **Air Facility.** A secure airbase able to support squadron-sized units and provide OMA. Can be an airfield, road segment, EAF or clear level ground. Can sustain combat sortie rate operations and support forward sites like FARP(s).
- **Air Site.** A secure location where aircraft preposition to reduce response time. Operations are limited to receiving and launching previously loaded aircraft awaiting pre-planned or immediate missions.
- **Air Point.** FARP(s) and lager points designed to support specific tactical missions. FARP(s) permit aircraft to rapidly rearm and refuel close to the battle to reduce response time. Lager points are where aircraft marshal between missions.



V-22 at a FOB in Afghanistan

c. Refueling Systems

Tactical Airfield Fuel Dispensing System (TAFDS)	Helicopter Expedient Refueling System (HERS)	MK-970 5,000-gallon Refueler Semi-Trailer	SIXCON Tank Modules
<ul style="list-style-type: none"> 320,000 gallons in six 20k and four 50k gal collapsible bladders Three systems per MWSS 600 gpm pumping capacity Up to 12 dispensing points. Can be established in 48 hours 	<ul style="list-style-type: none"> Stores up to 18,000 gallons in 18 500 & 3 3,000-gal bladders Three systems per MWSS. Helicopter transportable 125 gpm pumping capacity Up to 4 dispensing points Can be established in 4 hours. Not for extended operations. 	<ul style="list-style-type: none"> Each MWSS has 10 MK-970 (to increase to 12) but only three MK-31 tractors available per MWSS. Poor cross-country mobility. Capacity limited to 3,800-gal when moving cross-country. Only one dispensing point. 300 gpm pumping capacity 	<ul style="list-style-type: none"> 5 x 900-gal + 1 pump modules make up an ISO 20x8x8' package. Moved by MTRV, LVS or helicopter One dispensing point 100 gpm pump capacity

Table 4-8. Refueling System Capabilities (TM 11275-15/3D; TM 11240-154C)

d. Maritime Prepositioning Force Support (for Aviation only)

T-AVB	MPS
<ul style="list-style-type: none"> T-AVB 3 USNS Wright (East) and T-AVB 4 USNS Curtiss (West) Both ship are in Reduced Operating Status (ROS-5) and would deploy 120 hours after notification Will arrive in AO 15-20 days after notification of movement Provides sea lift of intermediate logistics support; marries up with aircraft, personnel and support pre-positioned by FIE and MPS. 	<ul style="list-style-type: none"> Usually in theater before T-AVB When combined with FIE and FISP allowances it provides the ACE 30 days of combat operations sustainment until arrival of T-AVB

Table 4-9. Maritime Prepositioning Force Support

e. MALSP Support Packages

Fly-in Support Package (FISP)	Contingency Support Package (CSP)	Follow-on Support Packages (FOSP)
<ul style="list-style-type: none"> Enabling packages (part of FIE) Provide O-level spare part support (remove & replace) When married with support from MPS and FIE, provides 30 days combat flying. 	<ul style="list-style-type: none"> Augment FISP Provides O & I level support (mobile facilities, equipment, spares, personnel) to sustain 90 days combat flying. 	<ul style="list-style-type: none"> Provides garrison support Final building block of MALSP

Table 4-10. MALSP Support Packages

4007. Aircraft Sortie Rates



Squadron (Type A/C)	Aircraft Per Squadron	Sustain Rate	Surge Rate	Surge Period		
				≤ 24 Hrs Post Surge Penalty	48 Hrs Post Surge Penalty	72 Hrs Post Surge Penalty
VMFA (F/A-18A/C)	12	2.5	4.0	N/A	2.0	1.5
VMFA (AW) (F/A-18D)	12	2.5	4.0	N/A	2.0	1.5
VMFA (F-35B)	16	Data not yet available (may be similar to AV-8B)				
VMA (AV-8B)	16	2.5	4.0	N/A	2.0	1.5
VMAQ (EA-6B)	5	1.2	2.0	N/A	1.0	.75
VMGR (KC-130)	12	1.2	2.0	N/A	1.0	.75
VMM (MV-22) (Note 5)	12	2.5	4.0	N/A	2.0	1.5
HMH (CH-53E)	16	2.0	3.0	N/A	1.5	1.0
HMLA (AH-1)	18	2.5	4.0	N/A	2.0	
HMLA (UH-1)	9	2.5	4.0	N/A	2.0	1.5
US Army Assault Avn Bn (UH-60)	30	2.5	4.0	N/A	2.0	1.5

Notes:

- Sortie rates will fluctuate based on the types and duration of missions flown, aircrew availability, and maintenance sustainment capability.
- For each day of surge, next day's surge and sustained sortie rates are reduced by 0.5.
- For each day of surge, plan on an equal number of post surge recovery days (i.e. 2 days of surge requires 2 days of recovery).
- For carrier-based aviation assume 10 strike sorties every deck-cycle with 8 deck-cycles in a 12-hour period. Eight deck-cycles times 10 strike sorties per deck-cycle equals 80 sorties in a 12-hour period.
- MV-22 Sortie rates are estimates using same data as F/A-18A/C/D.
- Helicopter sortie requirements based on legs less than 90 nm.
- Helicopter lift Requirements: UH-60 (Army only): 10-11 Marines; MV-22: up to 24 Marines; CH-53D/E: 24 Marines
- Vehicles not included. If vehicles are to be lifted by helicopter, assume any CH-53E lifting a vehicle is unavailable for troop lift.

Table 4-11: Aircraft Sortie Rates

Staff Planning Factors and Considerations

4008. Marine Air Command and Control System

a. Forms of Control

	TACC	TADC	TAOC	EW/C	DASC	MATCD	MMT	FAC	FAC(A)	ASC(A)	TAC(A)
Command	X										
Air Control	X	X	X	X	X	X	X	X	X	X	X
Positive Control			X	X		X	X				
Procedural Control			X	X	X	X	X	X	X	X	X
Radar Control			X	X		X	X				
Terminal Control			X	X		X	X	X	X		
Air Direction	X	X	X	X						X	X

Table 4-12: Forms of Control Exercised by Marine Air Command Control System Agencies

b. Marine Air Command and Control Organization

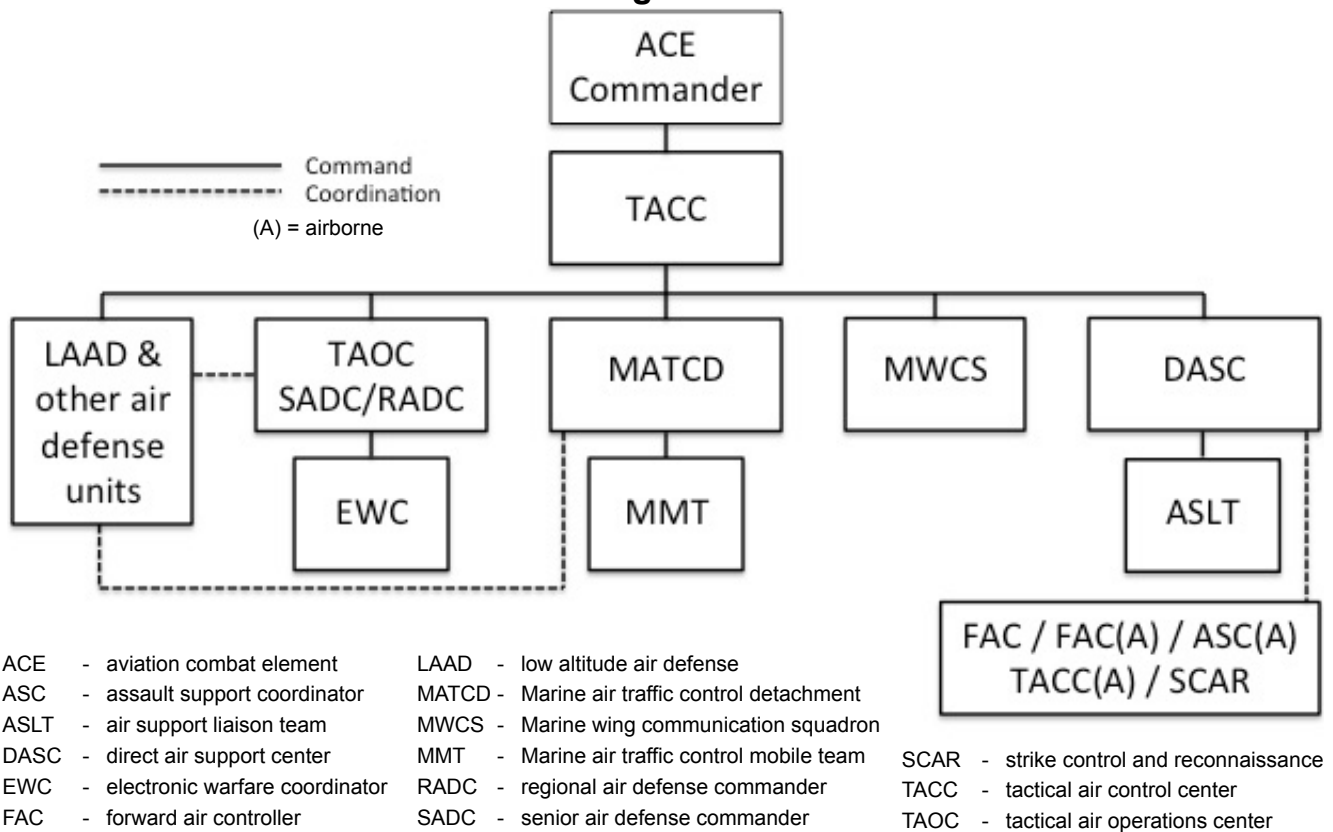


Figure 4-5: Marine Air Command and Control System (MACCS) Organization

c. Movement and Set-up

	TACC	TAOC	EW/C	DASC	ASE	MATCD	MMT
Time to set up (hours)*	24	24	4	2	1	18	2
Number of C-5 Equivalent sorties	17	21	7	2	0.5	3	0.5
Number of C-17 Equivalent sorties	32	37	12	3	1	5	1
Number of C-130 Equivalent sorties	95	109	34	9	2	14	2

*Indicated times may be optimistic but updated information is not available.

Table 4-13: Marine Air Command Control System Agency Planning Factors

Standard MACCS packages are configured as follows:*

TACC = TBMC, CDLS, power, a/c, shelters, tents, etc.
 TAOC = 4 TAOM, 2 AN/TPS-59, 2 AN/TPS-63, 2 ADCP and SADF
 EW/C = 2 TAOM, 1 AN/TPS-59 and 1 ADCP
 DASC = 3 AN/TSQ-207 CASC, 2 AN/MRC-148, 1 AN/MRC-145

ASE = 1 AN/TSQ-207 CASC, 1 AN/MRC-148, 1 M1123 HMMWV
 MATCD = 1 AN/TPS-73, AN/TPN-22, AN/TSQ-120, AN/TSQ-131 and AN/TRN-44
 MMT = 1 AN/TPN-30, AN/TRN-46, AN/TSQ-216 w/trailer and 1 M1123 HMMWV
 * Packages represent an 80% solution. Specific mission planning may require changes.

d. Theater Air Ground System (TAGS)

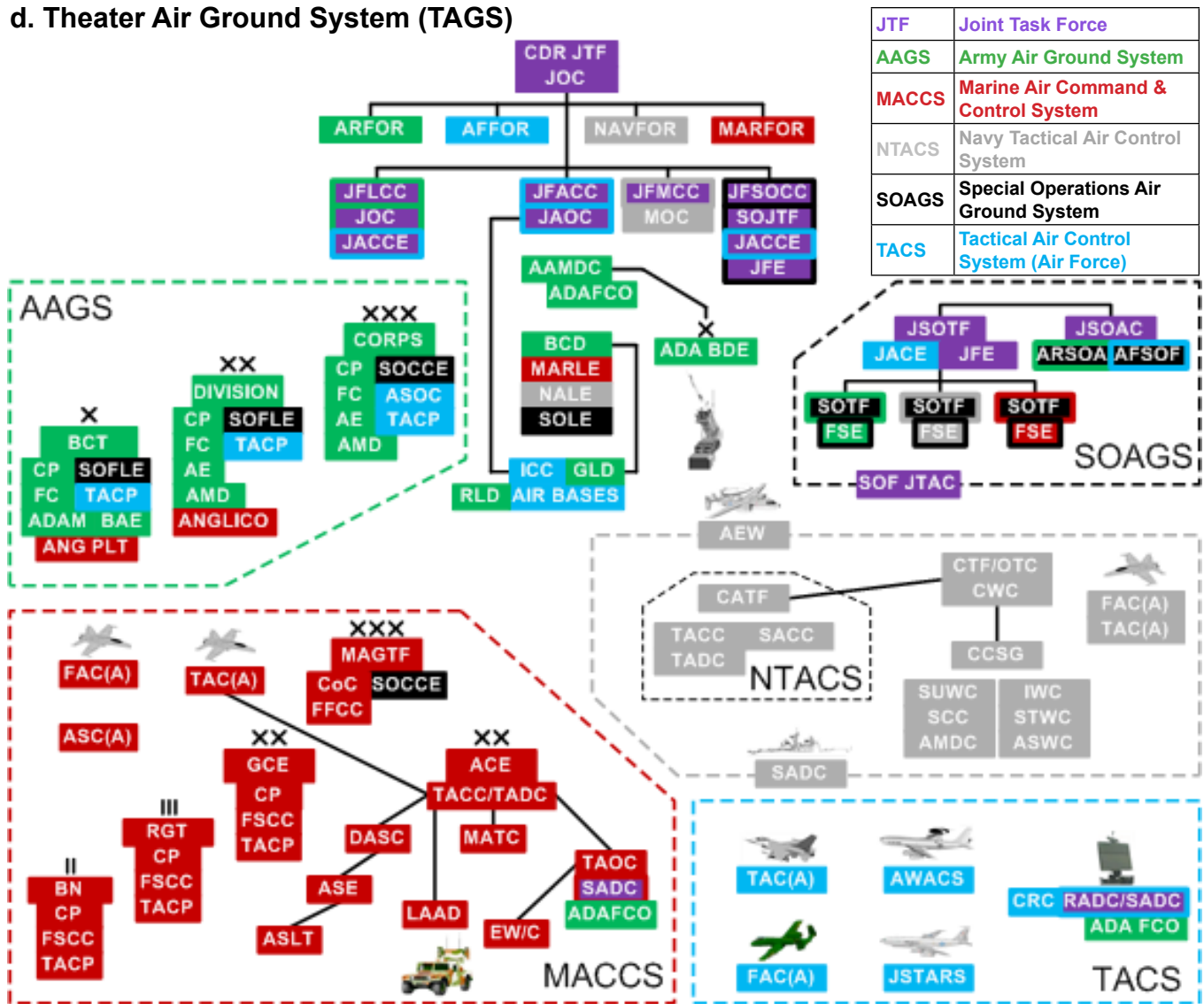


Figure 4-6: Theater Air-Ground System; from MCRP 3-20.1 (ex-MCRP 3-25F) June 2014

TAGS Glossary					
AADC	area air defense commander	CWC	composite warfare commander	JTAC	joint terminal attack controller
AAMDC	army air & missile defense command	DASC	direct air support center	LAAD	low altitude air defense
ACE	aviation combat element	EW/C	early warning/control	MARFOR	Marine Corps forces
ADAFCO	air defense artillery fire control officer	FAC(A)	forward air controller (airborne)	MARLE	Marine liaison element
ADAM	air defense and airspace management	FC	fires cell	MATC	Marine air traffic control
AEW	airborne early warning	FFCC	force fires coordination center	MOC	maritime operations center
AFFOR	Air Force forces	FSCC	fire support coordination center	NALE	naval and amphibious liaison element
AMD	air & missile defense	FSE	fire support element	NAVFOR	Navy forces
AMDC	air & missile defense commander	GCE	ground combat element	RADC	regional air defense commander
ANGLICO	air naval gunfire liaison company	GLD	ground liaison detachment	RLD	reconnaissance liaison detachment
ARFOR	Army forces	ICC	installation control center	SADC	sector air defense commander
ARSOA	Army special operations aviation	IWC	information operations warfare cdr	SCC	sea combat commander
ASC(A)	air support coordinator (Airborne)	JACCE	joint air component coordination element	SOCCE	special operations command & control element
ASE	air support element	JACE	joint air coordination element	SOJTF	special operations joint task force
ASLT	air support liaison team	JAOC	joint air operations center	SOLE	special operations liaison element
ASOC	air support operations center	JFACC	joint force air component cdr	SOTF	special operations task force
ASWC	antisubmarine warfare commander	JFE	joint fires element	STWC	strike warfare commander
AWACS	airborne warning and control system	JFLCC	joint force land component cdr	SUWC	surface warfare commander
BAE	brigade aviation element	JFMCC	joint force maritime component cdr	TAC(A)	tactical air coordinator (airborne)
BCD	battlefield coordination detachment	JFSOCC	joint force special opns component cdr	TACC	tactical air command center
CATF	commander amphibious task force	JOC	joint operations center	TACP	tactical air control party
CCSG	commander, carrier strike group	JSOAC	joint special operations air component	TACS	theater air control system
CRC	control and reporting center	JSOTF	joint special operations task force	TADC	tactical air direction center
CTF/OTC	cmndr task force/officer in tactical command	JSTARS	joint surveillance target attack radar system	TAOC	tactical air operations center

Staff Planning Factors and Considerations

NOTES: (Figure 4-6)

- The TAGS example in Figure 4-6 presents a typical joint forces command structure. JFACC and JFLCC are Air Force and Army officers, respectively.
- An Army corps is the senior Army air-ground system (AAGS) tactical echelon. Therefore, the air support operations group (ASOG) provides it with an air support operations center (ASOC).
- The commander, Marine Forces or COMMARFOR command a Marine expeditionary force (MEF) Marine air-ground task force (MAGTF). The COMMARFOR is neither the land or air component commander. Based on its size, the JFSOCC provides the MEF with a SOCC.
- Depending on the mission, the AADC assigns RADC or SADC duties with or without an ADAFCO to the AWACS or SADC duties to the AEW.
- The color scheme provides a visual reference of each element's Service component source. This shows the cross component integration between functional commands. Joint elements are purple with a heavy color coded outline indicating the Service providing the joint element (e.g., the joint air operations center is outlined in blue indicating the COMAFFOR's air operations center is performing this joint function for the joint task force commander.)
- The colored dashed lines represent each component's individual command and control (C2) and airspace management system. The joint C2 structure not enclosed in a box provides the framework integrating the component systems.

e. Service Function Comparisons

MARINE	NAVY	AIR FORCE	ARMY
TACC	TACC	AOC	DOCC
TAOC	FAWC	CRC	ADA TOC
EW/C	SAWC	CRE	ADA TAC
FSCC	SACC		FSE
DASC	ASCS	ASOC	G-3 AIR
TACP		TACP	FIST
TAC(A)		TAC(A)	FO
	E-2C or D HAWKEYE	AWACS	

Table 4-14: Service Function Comparison

4009. Artillery Planning Factors and Considerations

a. Artillery Organization for Combat

- Place units in a tactical organization to establish command relationships.
- Give units a tactical mission.

b. Fundamentals of Organizing for Combat

The fundamentals of organizing for combat include—

- Adequate support for committed maneuver units*
- Weight the main attack in the offense or the most vulnerable area in the defense*
- Facilitate future operations*
- Ensure immediately available artillery support for the commander to influence the action.
- Maximum feasible centralized control.

*Achievable by mission, ammunition and positioning

c. Establishing Command Relationships

- Strategic tailoring.
- Tactical tailoring.
- Command relationships (organic, assigned, attached or OPCON).

d. Tactical Missions (Inherent Responsibilities)

Artillery Unit Mission	Answers calls for fire in priority from	Establish Liaison with	Establish Comm. with	Has as its Zone of Fire	Furnishes Forward Observers	is Positioned by	Has Fires Planned by
Direct Support	1. Supported unit 2. Own observers 3. Higher artillery HQ	Supported unit (down to Bn level)	Supported unit	Zone of action of supported unit	To each maneuver company of supported unit	Unit commander as needed or ordered by higher artillery HQ	Develop own fire plan in coordination with supported unit
Reinforcing	1. Reinforced unit 2. Own observers 3. Higher artillery HQ	Reinforced unit	Reinforced unit	Zone of action of supported unit	Upon request of reinforced units	Reinforced unit or as ordered by higher artillery HQ	Reinforced unit
General Support	1. Higher artillery HQ 2. Own Observers	No inherent requirement	No inherent requirement	Zone of action of supported unit	No inherent requirement	Higher Artillery HQ	Higher Artillery HQ
General Support Reinforcing	1. Higher artillery HQ 2. Reinforced unit 3. Own observers	Reinforced unit	Reinforced unit	Zone of action of supported unit to include that of reinforced unit	Request of reinforced unit subject to the approval of higher artillery HQ	Higher artillery HQ or reinforced unit (with higher artillery HQ)	Higher Artillery HQ

Table 4-15. Artillery Tactical Missions (Inherent Responsibilities)

e. Essential Fire Support Tasks

INFORMATION	EXAMPLE
Task: Describes the targeting objective fires must achieve against a specific enemy formation's function or capability. Formations are HPTs or contain one or more HPTs.	Delay the movement of insurgents from AO Alpha until 5 th Marines can block their main escape routes.
Purpose: Describes maneuver or operational purpose for the task. Identify as specifically as possible the maneuver formation that will leverage the targeting objective; describe in space and time what the objective accomplishes.	Allow 5 th Marines to encircle and destroy the large group of insurgents currently operating in AO Alpha.
Method: Describes how the task and purpose will be achieved. It ties the detect function or "lookers" (executor/observer/TA sensor) with the deliver function or "shooters" (lethal and nonlethal assets) in time and space and describes how to achieve the task.	STA TM 1 calls for FASCAM after it detects a large insurgent group approaching the mountain pass through TAI 1. 2/11 emplaces a medium density FASCAM minefield to block this escape route.
Effects: Effects provide a measure of when we are done with the task. It also provides the basis for the assess function and the decision to reattack or not.	Insurgent movement through TAI 1 is delayed, allowing time for 5 th Marines to complete its encirclement and destroy the insurgent force.
End State: This defines what constitutes success for a given task. Successful accomplishment may require meeting a quantitative goal (example: 90% of designated targets assessed as destroyed). End state criteria will also influence a decision to re-attack or not.	

Table 4-16. Artillery Essential Fire Support Tasks

f. Artillery Cannon and Rocket Characteristics

Asset	Max. Range (meters)	Max. Rate of Fire	Sustained Rate of Fire	Ammunition Available
Self propelled 155mm howitzer M109A6 (Army only)	24,000 (Excalibur), 30,000 (RAP) 22,000 (w/o RAP), 28,1000 (BBDPICM) 17,900 (DPICM)	4 rpm for 3 minutes	1 round per minute (rpm)	Projectiles: HE, RAP, ICM, ILLUM, DPICM, ADAM, WP, RAAMS, CLGP/CPHD, SMK, Excalibur
Towed 155mm light-weight howitzer M777 (TAMCN E0671)	24,000 (Excalibur), 30,000 (RAP) 24,700 (w/o RAP), 28,1000 (BBDPICM) 18,000 (DPICM)	5 rpm for 2 minutes (est)	2 rpm	HE effective casualty radius (ECR) is 50 meters Fuzes: PD, VT, MT, MTSQ, Delay
Towed 105mm howitzer M119 (Army only)	19,5000 (RAP), 14,5000 (w/o RAP)	6 rpm for 2 minutes	3 rpm for 30 minutes	HE, WP, ILLUM, APICM, SMK
Self propelled 227mm MLRS M270A1 (Army only)	32,000 (DPICM), 65,000 (ER DPICM) 70,000 (GMLRS), ATACMS 165,000 (basic) or 300,000 (Block 1A)	1 round per 1.5 seconds	1 round per 4.5 seconds	DPICM, APAM, AT2, carries two pods with six rockets or one ATACMS in each
227mm HIMARS M142 mounted on an MTV truck (E1500)	32,000 (DPICM), 65,000 (ER DPICM) Fires the same munitions as MLRS but USMC has not acquired ATACMS	1 round per 1.5 seconds	1 round per 4.5 seconds	DPICM, Unitary, cargo; carries only one rocket pod (six rockets)
Notes:	(1) An M777 weights 10,000 lbs and needs 2.5 minutes to emplace and 2.25 minutes to displace (2) The M119 howitzer weighs 4,500 lbs and uses a heavy HMMWV as its prime mover (US Army only) (3) Guided MLRS uses a DPICM warhead (M30) or a unitary warhead (M31) Minimum range is 15,000 m (4) M982A1 <i>Excalibur</i> , is a 50 lb GPS guided projectile (anti-armor or anti-personnel). Minimum range is 8,000 meters			

Abbreviations:

ADAM	Area Denial Anti-personnel Mine (FASCAM)	ER	Extended Range	MTSQ	Mechanical Time Super Quick (fuze)
APAM	Anti Personnel, Anti Material	ET	Electronic Time (fuze - MLRS /HIMARS only)	PD	Point Detonating (fuze)
APICM	Antipersonnel Improved Conventional Munitions	GMLRS	Guided MLRS (inertial guidance plus GPS)	RAAMS	Remote Anti Armor Munition System
BBDPICM	Base Bleed Dual Purpose Improved Conventional Munitions	ILLUM	Illumination	RAP	Rocket Assisted Projectile
CLGP/CPHD	Copperhead laser guide projectile	MLRS	Multiple Launch Rocket System	SMK	Smoke (HC)
DPICM	Dual Purpose Improved Conventional Munitions	MT	Mechanical Time (fuze)	WP	White Phosphorus

Table 4-17. Artillery Cannon and Rocket Characteristics



Figure 4-7: Multiple Rocket Launcher Systems

Staff Planning Factors and Considerations

g. Artillery Ammunition Basic Load and Daily Allowance

DODIC	NOMENCLATURE	MODEL	BASIC ALLOWANCE	DAILY ALLOWANCE (battalion)	
				ASSAULT	SUSTAINMENT
CA45	CTRG 120mm Mortar HE	M1101	150	47.33	10.29
CA46	CTRG 120mm Mortar ILLUM	M1105	12	4.52	0.95
CA49	CTRG 120mm Mortar SMK WP	M1103	12	4.02	0.84
CA57	CTRG 120mm Mortar HEMP		54	2.96	0.22
D003*	Charge, projectile spotting	M509	75	24.00	4.00
D501/D502	PROJ 155mm HE ADAM	M692/M731	0	91.78	0.00
D503	PROJ 155mm RAAM-L	M718	0	34.43	0.00
D505	PROJ 155mm Illumination	M485	90	9.00	1.00
D509	PROJ 155mm HE RAAM-S	M741	0	15.93	0.00
D528	PROJ 155mm SMK WP	M825	120	9.00	1.00
D550	PROJ 155mm SMK WP	M110A1	72	8.00	1.00
D563*	PROJ 155mm HE APER DPICM	M483A1	576	189.00	21.00
D579	PROJ 155mm HE RAP (TNT)	M549A1	48	15.00	3.00
D864**	PROJ 155mm HE w/Supp Chg	M864	1,224	212.00	35.00
DA12	CHG, PROP MACS	M231	2,232	517.00	63.00
DA13	CHG, PROP MACS	M232	4,758	1,108.00	138.00
DA49	PROJ 155mm Infrared Illum	M1066	30	3.00	0.00
DA58	PROJ 155mm PG Excalibur	M982A1	0	5.00	0.05
DWGU	Tail Charge Assembly for CA49	M1100	12	4.02	0.84
N340	Fuze, Point Detonating	M739A1	648	142.00	14.00
N523	Primer, Percussion	M82	2,160	502.00	62.00
N659	Fuze, Point Detonating	MK-399 Mod 1	36	8.00	1.00
NA09	Fuze, Multi-Option	M782	333	74.00	7.00
NA15	Fuze, Electric Time	M767A1	171	35.00	4.00
NA17	Fuze, Electric Time	M762A1	816	206.00	33.00
NA29	Fuze, Precision Guidance Kit	XM1156	159	32.00	3.00

*DPICM (requires spotting charge M509); **DODIC(s) D529 and/or D544 may be used in lieu of D864 (see Table 4-17)

Table 4-18. Cannon Ammunition Allowances (155-mm battalion with 18 guns & 6 mortars)

Notes:

- All quantities are based upon an 18-gun (three firing battery) 155mm howitzer battalion. The 120mm mortars (Expeditionary Fire Support System) are held by the battalion H&S battery for issue to a firing battery in lieu of howitzers for certain air assault operations. Note that ammunition for each mortar is carried in an M1164 trailer, which has 30 ammunition cells. 120mm HE and ILLUM rounds each fit in one cell but a WP (CA49) round requires a tail assembly charge. Two tail assembly charges require one ammunition cell. Therefore, two WP rounds require three cells.
- The basic allowance refers to the ammunition quantities carried by the battalion and its subordinate batteries in their organic vehicles. The basic allowance must be maintained at all times and replenished as soon as possible after it is depleted. Prior to the start of an operation the senior artillery commander may request that the composition of his basic allowance be altered to conform to theater-specific conditions.
- The daily assault allowance reflects expected usage under full combat conditions. The daily sustainment reflects expected usage during an occupation or truce period following major combat operations. The reason for the fractions is that the data reflects a battalion total based on an average expected usage level per weapon. Planners should be aware that these figures are generic and may vary according to theater specific conditions.
- The basic allowance for a HIMARS battalion is nine rocket pods (54 rockets) per launcher. The assault allowance for a three-battery (18 launcher) battalion is 16.41 rockets per day. The sustainment allowance is 0.31 rockets per day
- Data on basic and daily assault and sustainment allowances for all Class V items (not just artillery-related) are available using the Class V Requirements Generator at <http://www.mccdc.marines.mil/Resources/Ammunition-Requirements/>.

OFFENSE			DEFENSE			FIRE MISSION TYPES
Infantry Hvy Threat	Armor Hvy Threat	Composite Threat	Infantry Hvy Threat	Armor Hvy Threat	Composite Threat	
32	32	32	11	13	13	Battalion Mass Killing Missions (Bn 3 rounds)
26	10	10	12	5	5	Minutes of illumination
10	2	2	10	2	2	500m Smoke Screens (10 min duration)
2	2	2	1	1	1	Point Targets Destroyed
3	0	0	3	0	0	200 x 200 Low Density Minefield (1SD, 2LD Low Angle)
1	1	1	1	1	1	200 x 200 Medium Density Minefield (1LD Low Angle)

Table 4-19. Artillery Battalion Mission Equivalents

h. Artillery Ammunition Transportation

DODIC	Nomenclature	Model	Hazard Class	Number per Skid/Pallet/Box	Dimensions (in) Skid/Pallet/Can	Weight per Skid/Pallet/Can
CA45	CTRG 120mm Mortar HE	M1101	1.2.1E	36 per pallet	44.48 x 42.59 x 45.8	2,382-lbs
CA46	CTRG 120mm Mtr ILLUM	M1105	1.3G	36 per pallet	44.48 x 42.59 x 45.8	2,418-lbs
CA49	CTRG 120mm M SMK WP	M1103	1.2.1H	36 per pallet	44.48 x 42.59 x 45.8	2,274-lbs
CA57*	CTRG 120mm Mrtr HEMP		1.1E	18 per pallet	41.09 x 39.17 x 51.26	2,195.8-lbs
D003**	CHG, projectile spotting	M509	1.1D	24 per ammo can	12.03 x 6.09 x 7.5	16-lbs
D501/D502	PROJ 155mm HE ADAM	M692/M731	1.2D	8 per skid	27.12 x 13.62 x 38.75	886-lbs
D503	PROJ 155mm RAAM-L	M718	1.1D	8 per skid	27.12 x 13.62 x 38.75	882-lbs
D505	PROJ 155mm Illumination	M485	1.3G	8 per skid	27.12 x 13.62 x 38.75	782-lbs
D509	PROJ 155mm HE RAAM-S	M741	1.1D	8 per skid	27.12 x 13.62 x 38.75	882-lbs
D528	PROJ 155mm SMK WP	M825	1.3H	8 per skid	27.12 x 13.62 x 38.75	830-lbs
D529	PROJ 155mm HE (TNT)	M795	1.1D	8 per skid	29.12 x 14.62 x 37.44	855-lbs
D544	PROJ 155mm HE	M107	1.1D	8 per skid	27.13 x 13.63 x 31.69	797-lbs
D550	PROJ 155mm SMK WP	M110A1	1.2.2H	8 per skid	27.13 x 13.63 x 31.69	797-lbs
D563**	PROJ 155mm HE APER	M483/M509	1.1D	8 per skid	27.12 x 13.62 x 38.75	874-lbs
D579	PROJ 155mm HE RAP (TNT)	M549A1	1.1D	8 per skid	29.12 x 14.62 x 39.44	830-lbs
D864	PROJ 155mm HE w/Supp Ch	M864	1.1D	8 per skid	27.12 x 13.62 x 38.75	896-lbs
DA12	CHG, PROP MACS	M231	1.3C	4 per tube, 30 tubes per pallet	46.5 x 38.0 x 43.25	1,297-lbs
DA13	CHG, PROP MACS	M232	1.3C	5 per tube, 30 tubes per pallet	46.5 x 38.0 x 43.25	1,835-lbs
DA45	PROJ 155mm HE ER PG	M982	1.1D	9 per pallet	44.5 x 36 x 36.63	1,650-lbs
DA49	PROJ 155mm Infrared Illum	XM1066	1.2G	8 per skid	29.13 x 14.63 x 31.13	767-lbs
DA58	PROJ 155mm PG Excalibur	M982A1	1.1D	9 per pallet	44.5 x 33.56 x 36.62	1,649-lbs
DWGU	Tail Charge Assy for CA49	M1100	1.2.2C	2 per tube; 16 tubes per pallet	44.48 x 42.59 x 45.8	1,465-lbs
H104	MLRS Rocket Pod 298mm	M26	1.1E	6 rockets per pod	166.0 x 41.5 x 33.0	5,095-lbs
HA22	GMLRS Rkt Pod 298mm	M30	1.1E	6 rockets per pod	166.0 x 41.5 x 33.0	5,020-lbs
HA51	GMLRS Rkt Pod 298mm	M31A1	1.1E	6 rockets per pod	166.0 x 41.5 x 33.0	5,903-lbs
N340	Fuze, Point Detonating	M739A1	1.1D	8 fuzes per ammo can	12.03 x 6.09 x 7.5	25.4-lbs
N523	Primer, Percussion	M82	1.4S	100 primers per ammo can	12.03 x 6.09 x 7.5	14.08-lbs
N659	Fuze, Point Detonating	MK-399 M1	1.2.2D	8 fuzes per ammo can	12.03 x 6.09 x 7.5	22.0-lbs
NA09	Fuze, Multi-Option	M782	1.2D	8 fuzes per ammo can	12.03 x 6.09 x 7.5	16.15-lbs
NA15	Fuze, Electric Time	M767A1	1.2.2D	8 fuzes per ammo can	12.03 x 6.09 x 7.5	16.15-lbs
NA17	Fuze, Electric Time	M762A1	1.4S	8 fuzes per ammo can	12.03 x 6.09 x 7.5	15.8-lbs
NA29	Fuze, Precision Guidance	XM1156	1.1D	3 fuzes per ammo can	14.24 x 5.7 x 13.88	28.3-lbs

*New type; has anti-armor capability; **DPICM (requires spotting charge M509).

Table 4-20. Ordnance Classification and Packaging Data (field artillery weapons)

Notes:

- The Class V Requirements Generator at <http://www.mccdc.marines.mil/Resources/Ammunition-Requirements/> is the primary tool for estimating combat ammunition loads. All explosives described in this publication are Class 1.
- Without a forklift, one Marine, on average, can offload one HE projectile from an MTRV or trailer per minute. For example, three Marines can offload 96 HE projectiles in an average of 32 minutes.

Explosive Division	Hazard Description (for Class 1 explosives only)	Compatibility Group	Description
1.1	Mass explosion hazard; (a mass explosion is one that affects a whole load simultaneously)	B	Detonators & other initiating devices lacking two or more independent safety features
1.2	Projection hazard (explosion produces fragments) but no mass explosion hazard*	C	Propellants and similar substances
	<i>*1.2.1 if bursting charge exceeds 1.6-lbs; 1.2.2 if 1.6-lbs or less.</i>	D	Secondary detonating explosive (incl. black powder); but no propellant or means of initiation
1.3	Fire hazard but no more than small blast and/or projection hazards; no mass explosion hazard	E	Secondary detonating explosive with propellant but no means of initiation
1.4	Minor explosion hazard (affects little more than the packaging); no mass explosion hazard	F	Secondary detonating explosive with propellant & means of initiation
1.5	Very insensitive explosives (very low detonation probability) but carries a mass explosion hazard	G	Pyrotechnics or explosives with smoke, incendiary or illumination substances
1.6	Extremely insensitive explosives; no mass explosion hazard	H	Explosives with white phosphorus
		S	No significant explosive hazard

Table 4-21: Hazard Class Description (only includes hazard classes found in Table 4-20)

Note: Compatibility Groups C, D & E may be stored or shipped together in the same hold or cargo bed; B, F, G & H must be stored or shipped separately except that Group S munitions may be stored or shipped with munitions from any other compatibility group.

Staff Planning Factors and Considerations

i. Artillery Employment Considerations in Built-Up Areas

Organization for Combat	Movement & Positioning	Delivery of Fire	Security	Command & Control
Centralized control is required during initial phases; decentralized control is required during later phases to support semi-independent actions of small units	<p>Movement should occur during night or periods of reduced visibility when possible.</p> <p>There are few displacements; when they occur they are often by platoon or section.</p> <p>Positions should be selected that minimize masking, provide several routes of escape, and afford as much cover and concealment as possible. Use of existing structures (garages, office buildings, highway overpasses) is recommended.</p> <p>Special techniques for emplacing howitzers, such as spades against a curb when the ground is not suitable for emplacement, may be required. Explosives may be required to soften emplacement of howitzers.</p> <p>Reconnaissance, selection, and occupation of position (RSOP) elements should be well armed because they may have to clear areas to be occupied. Extensive route reconnaissance is required.</p> <p>Target acquisition devices are somewhat degraded. Radars should be emplaced to cover likely areas of enemy indirect-fire weapon employment. Radars should not be placed in the midst of an urban area because of masking.</p>	<p>Both direct and indirect fires are delivered for supported units.</p> <p>Destruction of fortifications may require assault fire techniques.</p> <p>High-angle fires may be required.</p> <p>Need for accurate meteorological (MET) and survey data increases because most targets are point targets.</p> <p>Improved conventional munitions and variable time (fuze) effects are reduced by structures, although they are effective against personnel on rooftops. HE delay is used for penetration effects. Illumination, chemical incendiary ammunition, and smoke are effective.</p> <p>Ammunition expenditures will be heavy. Lasers and PGM permit destruction of targets with minimal rubbing of adjacent buildings. Tall buildings may hamper laser use. Batteries must be prepared for hasty survey techniques.</p> <p>Magnetic instruments are impaired</p>	Positions must be fortified	<p>Radio communications are impaired by buildings.</p> <p>Wire can usually be run overhead.</p> <p>Make use of civilian communications.</p> <p>A greater use of messengers and prearranged audio and visual signals may be required.</p>

Table 4-22: Artillery Employment Considerations in Built-Up Areas

4010. Scatterable mines (SCATMINE) and Other Type Mine Information

SCATMINE(s) are designed to be delivered or dispensed remotely by aircraft, artillery, missile, or a ground dispenser. All US SCATMINE(s) have a limited active life after which they self-destruct. The duration of the active life varies with the type of mine and the delivery system. SCATMINE(s) must be laid on the surface as it is not possible to bury them.

SCATMINE systems enable a tactical commander to emplace minefields rapidly in enemy-held territories, contaminated territories, and in any areas where it is impossible or too dangerous for engineers to emplace conventional minefields. Some systems allow for rapid emplacement of minefields in friendly areas. As with all minefields and obstacles, scatterable minefields are an engineer responsibility.

Based on the tactical plan, the maneuver commander's staff engineer determines the minefield location, size, density, and emplacement and SD (self-destruct) times. With this information and a thorough understanding of the available systems, he can then recommend the type of minefield (conventional or scatterable) to be emplaced. If a scatterable minefield is selected, he recommends the delivery system and coordinates the minefield with appropriate staff officers.

a. Types of SCATMINE and Self-Destruct (SD) Times

SYSTEM		NUMBER/TYPE OF MINES	ARM	SHORT	LONG
FASCAM	ADAM	36 antipersonnel (AP) mines per projectile (155)	45 sec or 2 min	4 hours (M731 projectiles)	48 hours (M692 projectiles)
	RAAM	9 antitank (AT) mines per projectile (155)		4 hours (M741 projectiles)	48 hours (M718 projectiles)
Volcano		5 AT, 1 AP mines per M87 canister 6 AT, 0 AP mines per M87A1 canister	4 min	4 hours (set by operator)	48 hours or 15 days (set by operator)
MOPMS	M77 (AP) M76 (AT)	17 AT and 4 AP mines per M131 dispenser	2 min	4 hours (set by operator)	Recycle to 15 days up to 4 cycles
Gator	BLU-92B (AP) BLU-91B (AT)	USAF: CBU-89B (72 AT, 22 AP each) USN: CBU-78B (45 AT, 15 AP each)	2 min	4 hours (set by operator)	48 hours or 15 days (set by operator)

Table 4-23: Types of SCATMINE and SD Times

- NOTES:
- Mines begin to self-destruct at 80% of laid life (i.e., a 4-hour field begins to self-destruct after 3 hours and 12 minutes; a 15-day field begins to self-destruct after 12 days).
 - All scatterable mines are laid on the surface but are colored to be less visible.
 - ADAM and RAAM are dispersed by 155mm howitzer projectiles (FASCAM); *Gator* is dispersed from fixed-wing aircraft; *Volcano* is dispersed from aircraft or surface vehicles; MOPMS is dispersed from a man-portable "suitcase" dispenser.
 - Abbreviations: AT = antitank; AP = anti-personnel; ADAM = Area Denial Artillery Munition; RAAM = Remote Anti-Armor Munition; MOPMS = Modular Pack Mine System; BLU = Bomb Live Unit
 - Antitank mines achieve "K-kills" against armored vehicle targets with a fuse that senses changes that occur in the magnetic field around mine as a target vehicle passes over it. The mine then fires a self-forging fragment (SFF) into the lightly protected belly

of the target vehicle. RAAM, *Volcano*, MOPMS and *Gator* mines are all the same size (1.7 kg each) and use the same bursting charge (585g). About 20% of RAAM mines have anti-handling devices. The other types may still detonate if moved.

- An antipersonnel mine deploys up to eight tripwires (each up to 12 meters long) to sense its targets. ADAM is a "bounding" mine, which propels a small bursting charge (21g) into the air before exploding it. It is much smaller than a *Volcano*, MOPMS or *Gator* mine (ADAM weighs 540g; the others weigh 1.44 kg each). *Volcano*, MOPMS and *Gator* mines each explode a 540g bursting charge at ground level. All *Gator* AP and 20% of ADAM have anti-handling devices. *Volcano* and MOPMS AP mines do not.

b. Situational SCATMINE Employment Planning Time

Identify enemy actions	5 min
Make executive decision	2 min
Pass to execute	2 min
Change mission	5 min
Execute obstacle	7 to 60 min
Arming	2 min
Total	23 - 76 min

Table 4-24: Situational SCATMINE Employment Planning Times

Notes: The time required to lay a given SCATMINE field depends on minefield size, density, size firing unit, unit/MF angle, range, and number of rounds. Example: 4 guns, .003 density, 550 x 200 m, low angle, 15,500 m, BMA > 800 mils, 78 rounds = 20 min to fire.

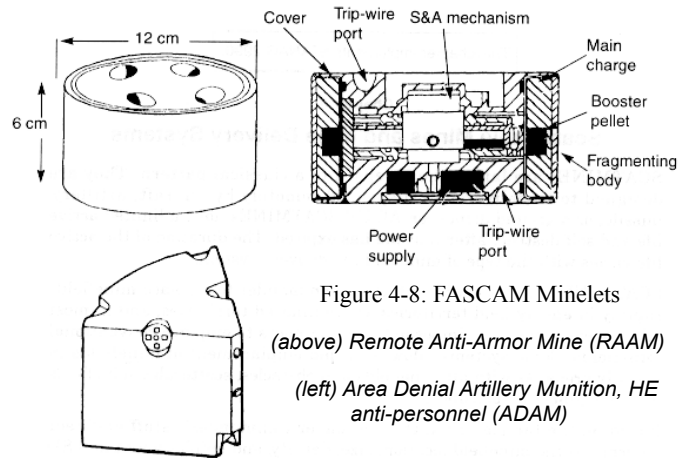


Figure 4-8: FASCAM Minelets

(above) Remote Anti-Armor Mine (RAAM)

(left) Area Denial Artillery Munition, HE anti-personnel (ADAM)

c. Field Artillery SCATMINE (FASCAM) Fire Planning

Obstacle effect	Overall Density		RAAM		ADAM		Standard Area (m)	Probability of Encounter
	Rating	Total linear ²	Area ²	Linear ²	Area ²	Linear ²		
Disrupt	Low	0.3/m	0.001	0.2	0.0005	0.1	200 x 200	25-35 percent
Fix	Medium	0.5/m	0.002	0.4	0.0005	0.1	200 x 200	45-55 percent
Turn	High	1.2/m	0.002	0.8	0.0010	0.4	400 x 400	85+ percent
Block	High	1.4/m	0.004	0.6	0.0020	0.8	400 x 400	85+ percent

Table 4-25: FASCAM/SCATMINE minefield density and size

- NOTES:
- Obstacle effects: (a) Disrupt = slow/disorganize an enemy's advance; (b) Fix = slow an enemy within a specific area (making him vulnerable to other assets); (c) Turn = manipulate an enemy's maneuver in a desired direction; (d) Block = stop an enemy along a specific route.
 - Mine densities: (a) Linear = number of mines per meter; (b) Area = number of mines per square meter; a linear density of less than 0.5 per meter is low; a density of 0.5 to 0.9 is medium and 0.9 or more is high. Mine densities may be reduced if minefields are covered by fire.
 - The standard size of a FASCAM minefield is 400 x 400 meters for high-angle, and 200 x 200 meters for low-angle.

d. SCATMINE Characteristics

Delivery System	Minefield dimensions (m)		Self-Arm Time	Self-Destruct (SD) Time	Rounds or Canisters	Basic Load
	Length	Depth				
Artillery FASCAM 155MM (AP/AT) ADAM/RAAM M731/741 projectiles ADAM/RAAM M692/M718 projectiles	400	400	1 minute after ground impact	4 hours (M731/M741) 48 hours (M692/M718)	Disrupt: 24R + 6A Fix: 48R + 12A Turn: 48R + 12A Block: 96R + 12A	155mm Battalion • 180R (4 hr) • 90A (4 hr) • 162R (48 hr) • 36A (48 hr)
GATOR A-10, F-16, or F/A-18	650	200	2 minutes	4 hr, 48 hrs or 15 days	Fix: 2 CBU-89B or (FA18) CBU-78B dispensers	Fix: 2 dispensers per sorties
MOPMS (Box Perimeter security)	70	35	2 minutes	4 - 16 hrs	1 M131 suitcase (162-lbs weight)	2 M131 per engineer squad
VOLCANO (Helicopter dispensed)	Disrupt: 1,100 Fix: 1,100 Turn: 550 Block: 550	120 120 320 320	2 minutes	48 hrs, 5 days or 15 days	160 canisters (960 mines) (one full load)	2 loads of 160 canisters per VOLCANO

Table 4-26: SCATMINE characteristics

e. SCATMINE Life Cycle

The following data is taken from ATP 3-90.80/MCTP 3-34B (ex-MCWP 3-17.5), *Combined Arms Countermobility Operations* 09-2014.

All SCATMINE systems have a similar life cycle, although specific times vary based on the SD time and the dispensing system.

Staff Planning Factors and Considerations

For safety reasons, SCATMINE must receive two arming signals at launch. One signal is usually physical (spin, acceleration, or un-stacking), and the other is electronic. This same electronic signal activates the mine's SD time.

Mines start their safe-separation countdown (arming time) when they receive arming signals. This allows the mines to come to rest after dispensing and allows the mine dispenser to exit the area safely.

Mines are armed after the arming time expires. The first step in arming is a self-test to ensure proper circuitry. Approximately 0.5 percent of the mines launched will fail the self-test and self-destruct immediately.

After the self-test, mines remain active until their self-destruct (SD) time expires or until they are encountered. Mines actually self-destruct at 80 to 100 percent of their SD time. The time period from when the mines begin to self-destruct and when they finish is called the SD window. No mines should remain active after the SD time has been reached. Two to five percent of US SCATMINE(s) fail to SD as intended. Any mines found after the SD time must be treated as unexploded ordnance (UXO). For example, mines with a 4-hour SD time will actually start self-destructing at 3 hours and 12 minutes. When the 4-hour SD time is reached, no unexploded mines should exist.

f. SCATMINE Limitations

Between 5 and 15 percent of SCATMINE(s) will come to rest on their edges; mines with spring fingers will be in the lower percentile. If there is mud or snow more than 10 centimeters deep, the number will be in the higher percentile. When employing ADAM or RAAM in more than 10 centimeters (four inches) of snow or mud, high-angle fire should be used and the number of mines increased. AP mines may be less effective in snow, because the deployment of trip wires is hindered. Melting of the snow may also cause the mines to change positions and detonate themselves.

Due to their small size, the reduced explosive, and the possibility of landing with an improper orientation (on their side or at an angle), AT SCATMINE(s) have less chance of destroying a vehicle than a conventional full-width AT mine. An armored vehicle will not always be destroyed after an encounter with an AT SCATMINE. Further, the effectiveness of SCATMINE(s) in water obstacles is reduced even more, because five centimeters (two inches) of water prevents the formation of the M-S slug (SFF). Although the blast wave is accentuated by underwater placement (attacking hatches and covers), mining of banks and approaches is recommended instead.

4011. Counterfire Radars

a. AN/TPS-80 Ground/Air Task Oriented Radar (G/ATOR) (TAMCN A1405)

Developed as the Multi-Role Radar System (MRRS) this 3D short to medium range multipurpose radar is still in development. As an air surveillance system it detects, identifies, and tracks low level cruise missiles, manned aircraft, and unmanned aerial vehicles. In its Ground Weapons Locating Radar (GWLRL) role it locates rockets, mortars, and artillery fire. It will replace all current ground radars in the MEF except the LWCM (see below) and the AN/TPS-59 long range surveillance radar (two per MACS). The G/ATOR system has three elements. The radar equipment group (REG) is carried on a trailer and towed by an MK-23/25 MTVR. The MTVR also carries the power equipment group (PEG), consisting of a 60 KW generator (the REG needs the whole 60 KW). An accompanying HMMWV carries the communication equipment group (CEG). The radar antenna folds for travel. A G/ATOR system can be air lifted by three CH-53E or three MV-22 or one C-130. Full technical data on G/ATOR has not yet been released and may still be subject to change. However, in its GWLRL role G/ATOR should be able to locate weapons out to 70 km and with better accuracy than existing systems. Setup time is about 30 minutes. The Marine Corps wants to build three new units in FY16 but the HASC, reacting to program delays and DOT&E concerns was only willing to fund two. The current system IOC (FY16 for air defense/surveillance; FY17 for GWLRL; and for air traffic control FY19) will probably be pushed back.



Figure 4-9: AN/TPQ-80 G/ATOR

b. AN/TPQ-46 and AN/TPQ-37 Counterfire Radar Characteristics (AN/TPQ-46 is TAMCN A1440)

		AN/TPQ-46 GWLRL (Ground Weapons Locating Radar)	AN/TPQ-37 GWLRL
Range	Minimum	750 m	3,000 m
	Maximum	24,000 m	50,000 m
Search Sector	Minimum	230 mils and 1,600 mils	300 mils and 1,600 mils
	Maximum	Extended azimuth search function up to 6,400 mils	1st round fire-for-effect
Accuracy		1st round fire-for-effect	1st round fire-for-effect
Setup/break down Time		20 minutes* / 10 minutes*	not available
Transportation		Air external CH-53E (without vehicle) / Internal KC-130	Air external CH-53E / Internal KC-130
Screening Crest		15 -30 miles	5 -15 mils
Positioning		METT-T dependent	METT-T dependent

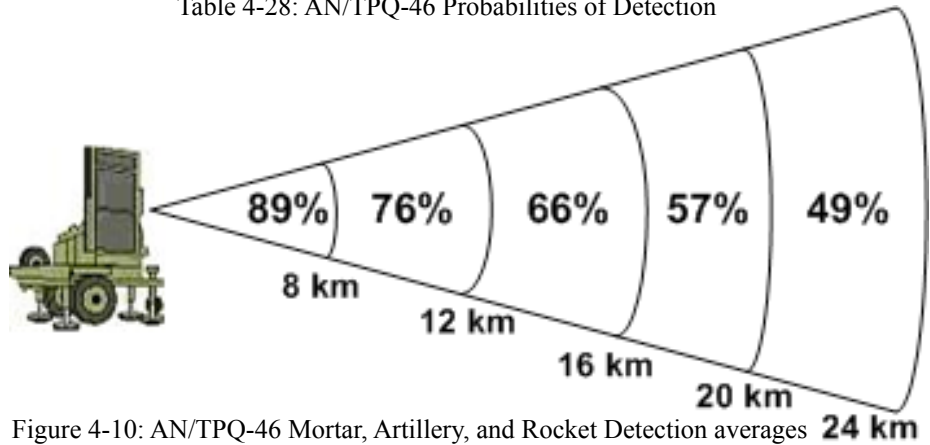
Emplacement and march order times are a function of crew proficiency and may be shorter. *Setup/breakdown times shown are the ARTEP Standards.

Table 4-27: AN/TPQ-46 and AN/TPQ-37 Counterfire Radar Characteristics.

c. AN/TPQ-46 Probabilities of Detection

	Range Bands (km)									
	0-8	8,1-12	12.1-16	16.1-20	20.1-24	24.1-28	28.1-34	34.1-40	40.1-46	46.1-50
Lt/Med Mortars (81mm)	0.9	0.78	0.67	0.56	0.46	0.35	0	0	0	0
Heavy Mortars (120mm)	0.94	0.84	0.78	0.73	0.7	0.65	0	0	0	0
Lt/Med Arty (122/155mm)	0.84	0.67	0.57	0.47	0.37	0.37	0	0	0	0
Heavy Arty (8 inch)	0.88	0.74	0.64	0.53	0.45	0.32	0	0	0	0
Rockets / SSM	0.88	0.74	0.64	0.53	0.45	0.32	0	0	0	0
Mortar / Arty average	0.89	0.76	0.66	0.57	0.49	0.4	0	0	0	0

Table 4-28: AN/TPQ-46 Probabilities of Detection



Note: The AN/TPQ-46B (current version) is the Marine Corps version of the Army's AN/TPQ-36(v)10. It has a crew of seven and its TAMCN includes four HMMWV(s). One is a C2/recon vehicle, another carries the operation control shelter and tows the radar. A third carries the generator and tows the antenna-transceiver trailer. The fourth carries other equipment/supplies.

Figure 4-10: AN/TPQ-46 Mortar, Artillery, and Rocket Detection averages

d. AN/TPQ-37 Probabilities of Detection

	PROBABILITY OF LOCATION	50% CIRCULAR ERROR PROBABLE	90% CIRCULAR ERROR PROBABLE
81 mm Mortars	No specific data exists. Data indicates AN/TPQ can be expected to track visibility and velocity requirements are met		
105mm Artillery Muzzle velocity: 207-684 m/s Quadrant elevation: 200-1100 mils	85%; 4-20 km 1600 mil coverage	35 m or 0.35% range, whichever is greater	90 m or 0.9% range, whichever is greater
155mm Artillery Muzzle velocity: 207-684 m/s Quadrant elevation: 200-1100 mils	85%; 4-25 km Center 1067 mils	35 m or 0.35% range, whichever is greater	90 m or 0.9% range, whichever is greater

Table 4-29: AN/TPQ-37 Probabilities of Detection

The AN/TPQ-37 Firefinder radar is the Army's heavier, longer-ranged GWLR. This system has a relatively large "footprint." It requires a crew of 12 and for displacements it needs two 2.5-ton (MTV) trucks (one for the radar and the other for the generators) and two HMMWV (one for the control van and the other as a recon vehicle).

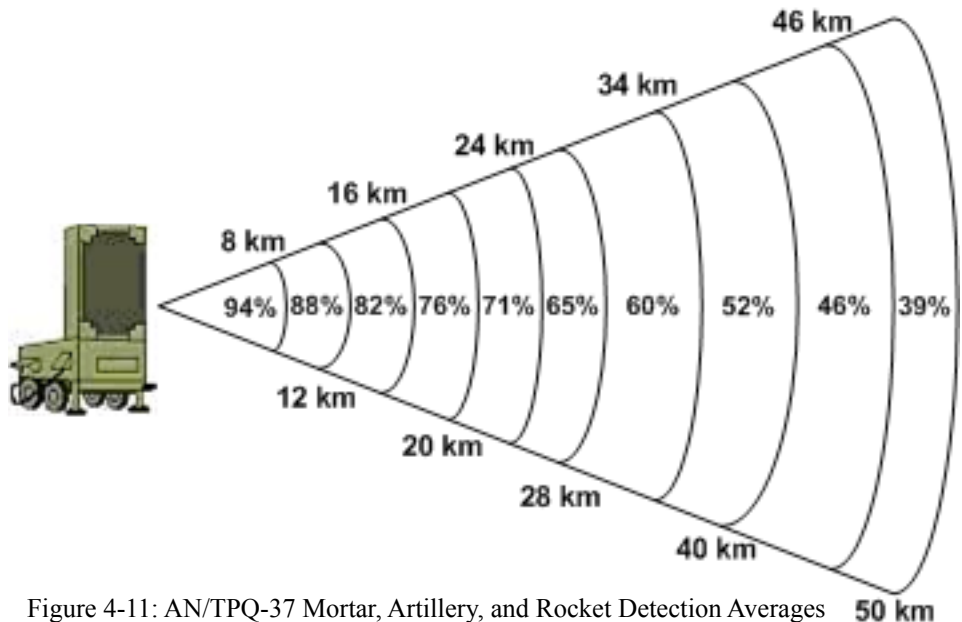


Figure 4-11: AN/TPQ-37 Mortar, Artillery, and Rocket Detection Averages

Staff Planning Factors and Considerations

e. AN/TPQ-53 Counterfire Target Acquisition Radar (enhanced Q-36; US Army)

The AN/TPQ-53 is a new system currently entering Army service. It will replace all AN/TPQ-36/37 radars, which the Army now regards as legacy systems. Its advantages include not only increased performance but a smaller crew (four men) and “footprint.” For ground mobility it requires two MTV 5-ton trucks. One is for the radar and the other for the communication sub-system. Each truck also tows a generator. If the system operates in 90° search mode the radar antenna remains stationary and the search arc is limited to 90°. However, the radar can detect rockets, artillery or mortars out to 60 km. In the 360° mode the antenna continuously rotates and the radar searches in all directions but its maximum detection range is reduced to 20 km.



Figure 4-12:
AN/TPQ-53

f. Lightweight Counter Mortar Radar (LCMR) System (TAMCN A0169)



Figure 4-13:
AN/TPQ-50

This LCMR was developed to give a parachute deployable quick reaction capability to ARSOF units. The initial version, the AN/TPQ-48, has been phased out of service. Its target location accuracy was only barely sufficient to support counter-battery missions. The AN/TPQ-49 offered significantly better accuracy and reliability. It is in service with the Marine Corps (12 in 11th Mar, 10 in 10th Mar, 7 in 12th Mar & 5 in 14th Mar) as well as the Army. The Army also uses the substantially heavier but more capable AN/TPQ-50. All LCMR are L-Band systems able to operate (remotely, if required) from a tripod or a stationary vehicle. They offer 360° coverage at between 0 and 30° elevation. Search rate is 3 Hz. Minimum detection range is 1 km. When LCMR detects incoming fire it sends an initial warning message followed by a digital target location message fed directly to AFATDS. Two men can set it up in 20 minutes and break it down in five. See Table 4-30.



Figure 4-14: AN/TPQ-49

System	Detection		Dimensions (Radar only)	Weight	Power Requirements
	Range	CEP			
AN/TPQ-48	6 km	100m at 5km	unknown	120-lbs	? W; 120/220 VAC; 50-400 Hz
AN/TPQ-49	6.2 km	75m at 5km	1.25m (4') x 1.25m (4')	150-lbs	1,200W; 110/240 VAC, 50-60 Hz
AN/TPQ-50	10 km	50m at 10km	1.1m (3.6') x 2m (6.5')	500-lbs	3,000 W; 110/240 VAC; 50-400 Hz

Table 4-30: LCMR Characteristics

4012. The Targeting Process

Targeting is the process of selecting and prioritizing targets and matching the appropriate response to them, within operational requirements and capabilities. Targeting analysts identify specific targets and nominate them for attack. Attacks on these targets should exploit specific enemy vulnerabilities and further the commander’s objectives and mission.

Targeting is a continual decision-making process that begins with receipt of the mission and continues through the development and execution of the order. Targeting considers the friendly scheme of maneuver, tactical plan, weather, terrain, and the enemy situation. This assessment then identifies those enemy units, equipment, facilities, and systems that must be attacked or influenced to ensure success. Targeting includes specifying which targets are to be acquired and attacked, when they are to be acquired and attacked, and what is required to achieve the desired effects. Selected crucial targets are also identified for deliberate follow up action and analysis (combat assessment [CA]).

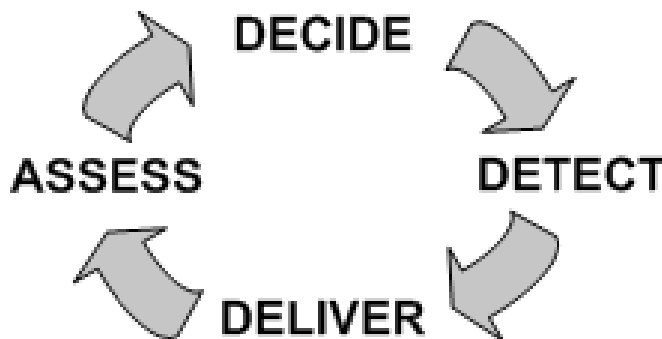


Figure 4-15: Marine Corps Targeting Methodology

There are two targeting processes: the “decide, detect, deliver, and assess” (D3A) methodology (see Figure 4-15) and the joint targeting cycle.

The D3A method is the doctrinal targeting process for the Army and the Marine Corps. The joint targeting cycle, sometimes referred to as the “Joint 6-step,” is a variation of an Air Force ATO model. It is part of the joint targeting process, detailed in JP 3-60, *Joint Targeting*. While the two planning methods differ in terminology and number of steps, both address the same basic functions needed for targeting.

Since MAGTF fires are a subset of the overall joint effort, MAGTF fires planners must understand how the two processes interact in order to leverage the joint process for external support. For example, fires planners may need to inject a D3A target nomination into the joint process when external capabilities are better suited for creating the desired effects on a MAGTF target or target system.

a. Decide, Detect, Deliver and Assess

Both the Army and Marine Corps use the “decide, detect, deliver, and assess” (D3A) targeting methodology (see Figure 4-15). While the following section discusses D3A as it applies to targeting, it is essential to realize how D3A applies to overall fires planning. As a subset of fires, targeting must be integrated into the overall fires planning process. For example, the priorities established by the commander in the “decide” phase are not for targeting alone. They also include his guidance for intelligence collection, fire support planning, and execution of fires. The four phases of D3A are inherently intertwined and overlapping. See MCWP 3-31 (ex-MCWP 3-43) *MAGTF Fires*, June 2011.

Step 1 - Decide: The OPT fires planners use D3A within the broader framework of the MCPP to decide—

- With what aspects of the battlespace, such as adversary capabilities, functions, formations, or individuals, do we need to interact to create favorable conditions for friendly COAs?
- Have we located these targets accurately enough to successfully attack them? If not, where should we look for them? What collection asset has the necessary accuracy? What level of production effort is required to develop the needed target intelligence?
- When will we attack these targets? As soon as we detect them? At a specific time in the operation? In a particular sequence?
- What fire support capability is best suited to achieve the desired effects?
- How will we assess the results of the attack?
- What impact will attacks on the targets have on the battlespace?
- What is the impact on the friendly COA if we do not achieve the desired effect? If necessary, how will we attack the target again and evaluate the effectiveness of that attack?

This step requires planners to determine which targets to attack, when, where, to what effect, by what capability, and how to assess the results. Once the deliberate decisions are made, the other steps occur in execution.

Step 2 - Detect: Located targets are validated and passed to the operators for a decision. At the MAGTF level, target detection focuses on observing the operation to gather fires-related information as a basis for decision-making. Since the CFS (Current Fires Section: part of the MAGTF force fires center) is both geographically and hierarchically removed from the action, it gathers information about the operation primarily through feedback from collection platforms and higher, adjacent, subordinate, and supporting units. As part of this phase the CFS identifies certain targets as High Value Targets (HVT: targets the enemy can least afford to lose) and High Payoff Targets (HPT: targets the MAGTF must engage/neutralize to accomplish its mission).

Intelligence support for detection comes primarily from the surveillance and reconnaissance center (SARC) and the operations control and analysis center (OCAC). The SARC plans and supervises the execution of organic, attached, and direct support intelligence collection and reconnaissance operations for the MAGTF. The SARC supports the execution of fires by coordinating, monitoring, and maintaining the status of all ongoing intelligence-collection efforts.

The OCAC is the main node for the overall coordination of MAGTF signals intelligence (SIGINT) operations. The OCAC performs SIGINT processing, analysis, exploitation, production, and reporting. The OCAC also coordinates with other intelligence nodes to plan, direct, and integrate SIGINT with other intelligence and reconnaissance operations. The OCAC supports the execution of fires by providing key operational intelligence and current locations of adversary command and control operations and facilities, weapon systems, and force composition and dispositions. Information provided through SIGINT can identify, help locate, and develop attack options for HPTs. The OCAC can support all-source intelligence assessments of the impact of fires on adversary targets. It can also direct the ground-based electronic warfare nonlethal activities of the radio battalion.

Subordinate commands, especially units in contact with the adversary, are among the most reliable sources of target intelligence. The artillery regiment's CBR platoon can detect the location of adversary indirect fire units. The ability of aviation units to observe the battlespace and report in near real-time gives the MAGTF commander a multi-dimensional capability. These units can view the entire area of operations in depth, supporting the early identification and location of HPTs. The LCEs can provide information on adversary targets located in the MAGTF's rear area. Feedback comes from all directions and in varying forms of maturity. Normally, most reported information travels over chat nets in command and control systems, such as the intelligence analysis system (IAS), AFATDS, JADOCS, TBMCS, or Microsoft™ internet relay chat. Unit SOPs tailored to theater-specific requirements should detail specific procedures for chat net use to include archiving instructions to enhance shared situational awareness. In today's collaborative environment, much of the intelligence reporting is available to the MAGTF and its MSCs at the same time. How that information is processed and eventually exploited depends on assigned responsibilities. If a sensor reports on a target in the GCE's area of operations, the CFS can ensure the GCE is aware of the report. Otherwise, the GCE is free to act on the information as it sees fit.

Step 3 - Deliver: During execution, friendly forces deliver fires on many of the targets previously located and validated. For emerging targets, execution tools, such as the AGM and BSM, help the CFS decide how to best proceed, since a competition for resources is likely. Both the AGM and BSM provide guidance relative to priority and weapon system selection. Priority options include—

- Drop everything (divert) and attack this target now.
- Re-task a subsequent fires mission.
- Incorporate the target into the subsequent planning cycle.

Using the CONOPS, POF, main effort, and commander's intent, the MSCs exercise subordinate initiative in the prosecution of fires. The CFS monitors and supports the MSCs within their areas of operations. The MAGTF commander provides updated guidance, direc-

Staff Planning Factors and Considerations

tion, and resource allocation when the situation dictates. The CFS uses the execution tools in Table 4-31 to help guide decision-making when developing targets.

The CFS uses TSSs to classify an adversary activity as a target or a suspected target. For instance, ground sensor platoon (headquarters company, intelligence battalion) sensors can identify suspected targets, but further validation is required to identify the type of unit and classify it as a target. In comparison, CBR acquisitions are more likely to be targets as they identify the type of adversary fire support system and can provide an accurate target location. All TSSs are based on reliability and target location error (TLE) of the sensor, the accuracy and responsiveness of the attacking system, and timeliness of the report. For example, in Table 4-31, the adversary's artillery (122/152-mm) is part of the HPTL (high payoff target list). The target is only valid if the TLE is estimated to be 500 meters or fewer. Additionally, the target location must be reported to the designated delivery system (Table 4-32) within 30 minutes—the assumption is that adversary artillery units will move upon firing and those targets must be re-acquired after a certain time to ensure the effectiveness of the attack.

High Payoff Target List (HPTL)	Attack System	Target Location Error/Time
Artillery (122-152-mm)	Aviation (F/A-18)	500-m/30-min
Hvy MRLS (220+mm)	Artillery (HIMARS)	500-m/30-min
RSTA System	Artillery (155-mm)	150-m/30-min
SAM/AAA	Artillery (155-mm)	500-m/15-min
Corps/Div HQ	Electronic Attack	1,000-m/3-hrs
CSS/Depots	Artillery (HIMARS)	1,000-m/6-hrs
Mech/Armor	Aviation (AH-1)	300-m/30-min

Table 4-31: Sample Target Selection Standards

EVENT or PHASE: Attack to secure Objective C					
Priority	Category	HPT	When	How	Effect
1	Air Defense	SAM Systems	P	Aviation	N/EW
2	Fire Support	Artillery/MRL	I	Artillery	N/EW
3	Engineer	Pontoon Bridge	A	Artillery	N
4	C3	MRR, MRD C3	P	Aviation	N/EW
5	Maneuver	1st Echelon Div.	P	Artillery	N
6	RSTA	DF Nodes	A	Aviation	N
7	NBC		A	Aviation	D
8	POL		P	Artillery	N

Legend: A = as acquired; D = destroy; DF = direction finding; EW = electronic warfare; I = immediate; MRR/MRD = motor rifle regiment/division; N = neutralize; P = planned

Table 4-32: Sample Attack Guidance Matrix

Step 4 - Assess:

The hierarchical layering of task and purpose inherent in Marine Corps operations creates a natural framework for assessment. Fires planners add structure to that framework by identifying targeting objectives, essential fire support tasks (EFST), and the desired effects of (lethal and/or non-lethal) fires. All of these goals established during planning provide a basis for comparison with the situation as it unfolds during execution. To further aid the assessment effort, fires planners can define criteria of success through the use of MOP (measure[s] of performance) and MOE (measure[s] of effectiveness). A MOP tracks the quality of friendly actions in pursuit of a task, objective, or desired effect. A MOE reports on the impact of friendly actions with the other elements in the battlespace. The assessment of previous and ongoing operations forms the basis for decisions and the cycle begins again.

Assessment is the continuous monitoring and evaluation of the current situation and progress of an operation. It allows for adaptation to a situation, keeping in mind the overall purpose and emerging opportunities. Assessment is comparing the current situation with planned goals. The difference between the two is a catalyst for decisions and subsequent actions. Assessment has four functions—

- Compare goals, objectives, tasks, mission, and purpose typically developed during planning.
- Provide feedback, allowing planners to approximate a current situation.
- Contrast the current and projected situations and analyze their causes.
- Recommend change, if warranted.

Commanders assess the effects of their units' actions toward the accomplishment of the mission. Fires personnel use combat assessment to contribute to the commander's overall operational assessment.

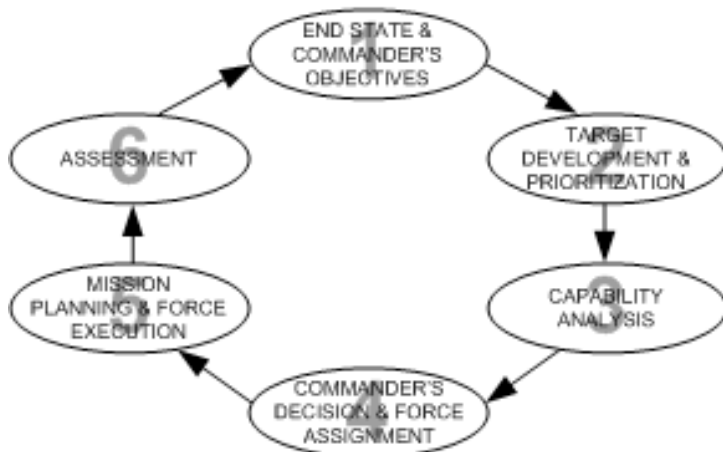


Figure 4-16: Joint Targeting Cycle

b. The Joint Targeting Cycle

- The joint targeting cycle is a six phase iterative process (see Figure 4-16 and Table 4-33). It is a joint responsibility of both the intelligence and operations sections of a joint headquarters.
- This process is not time-constrained nor rigidly sequential. It is, however, continuous. Steps may occur concurrently. However, it provides an essential framework to describe the steps that must be satisfied to conduct joint targeting successfully. The deliberate and dynamic nature of the joint targeting cycle supports joint operation planning and execution, providing the depth and flexibility required to support the CONOPS and commander's intent as opportunities arise and plans change.
- Joint targeting is not a static or inflexible process, but a dynamic process that must be continuously applied. Any given phase of the process can directly affect any of the other phases. For example, a given course of action may directly affect subsequent force application if mission results prove inadequate. Likewise, weaponing directly affects execution planning as weapons will influence execution tactics. See JP 3-60, *Joint Targeting*, January 2013.

c. Joint Air Tasking Cycle

Table 4-33 shows the actions of the JFC and MAGTF during each of the joint air tasking cycle phases.

Joint Air Tasking Cycle Phase	Joint Task Force	MAGTF
Phase 1: End State and Commander's Objectives	JFC guidance and objectives (36-48 hours prior to air tasking day): <ul style="list-style-type: none"> Targeting priorities. Joint Targets List (JTL)/ Joint Integrated Prioritized Target List (JIPTL) planning guidance. Fire support coordinating measures. Rules of engagement. Definition of component direct support sorties. JFC apportionment decision: <ul style="list-style-type: none"> Total expected effort by percentage and/or priority that should be devoted to the various air operations and/or geographic areas for a given period of time. Components informed through a guidance and intentions message. 	Direct support plan submitted
Phase 2: Target Development and Prioritization	Joint air operation center (combat plans) processes potential targets from the JIPTL. Components submit target information reports (TGTINFOREP): <ul style="list-style-type: none"> No later than 26 hours prior to air tasking day. Nominate targets, submit CA information, recommend no-strike targets, cancel, or renew targets 	The commander determines targeting objectives and priorities. The targeting board: <ul style="list-style-type: none"> Receives MSC target nominations for deliberation, deconfliction, and prioritization. Produces MAGTF target nomination list which includes direct support targets and common sourced target nominations.
Phase 3: Capability Analysis	Weaponing includes turning the JIPTL into the Master Air Attack Plan. During allocation the JFACC translates the apportionment decision into number of sorties. This is done through the exchange of air allocation requests (ALLOREQ).	MAGTF submits air support requests (AIR-SUPREQ) for preplanned targets for the next day's ATO. This is done no later than 24 hours prior to the air task day.
Phase 4: Commander's Decision and Force Assignment	SORTIEALOT sent by JFACC no later than 12-18 hours prior to air task day. It contains: <ul style="list-style-type: none"> Revisions to component allocations. Approval/disapproval of component requests. Revisions to mission data. JFC and JFACC guidance, target worksheets, the Master Air Attack Plan and component requirements are used to finalize the joint ATO, SPINS, and airspace control order. The joint ATO is transmitted 12 hours prior to the air task day.	Submit direct support Marine ATO for integration into the joint ATO. Submit critical changes to target requests and asset availability.
Phase 5: Mission Planning and Force Execution	JFACC directs execution and/or de-conflicts all capabilities/forces made available for the joint ATO. Capabilities/forces not apportioned for tasking, but included in the joint ATO for coordination purposes, will be redirected only with the approval of the respective component commander or designated senior JAOC liaison officer.	Complete transition of joint ATO between future operations and current operations (both at the command element and the aviation combat element). Manage critical changes to target requests, priorities, and asset availability.
Phase 6: Assessment	Done at all levels of the joint force. It determines if the required target effects are being achieved to meet the JFC's overall concept. JFACC/JFC staff continuously evaluates results of joint air operations and provide these results to the JFC for consolidation and overall evaluation of the current campaign	MAGTF conducts assessment. Submit MISREP(s), BDA reports, and TGTINFOREP(s) to the JFC.

Table 4-33: Actions During the Joint Air Tasking Cycle Phases

The joint air tasking cycle is a systematic process that matches available capabilities/forces with targets to achieve operational objectives. The cycle (see Figure 4-17) provides a repetitive process for the planning, coordination, allocation, and tasking of joint air missions/sorties, within the guidance of the JFC. The cycle accommodates changing tactical situations or JFC guidance, as well as requests for support from other component commanders. The joint air tasking cycle is an analytical, systematic approach that focuses targeting efforts on supporting operational requirements. Much of the day-to-day joint air tasking cycle is conducted through an interrelated series of information exchanges (through designated component liaison officers and/or messages), which provide a means of requesting and scheduling joint air missions.



AV-8B

Staff Planning Factors and Considerations

Usually, five joint ATO(s) exist at any given time:

- The joint ATO being accessed (yesterday's plan)
- The joint ATO in execution (today's plan).
- The joint ATO in production (tomorrow's plan).
- Two joint ATO(s) in planning (plans for each of the two days after tomorrow).

Figure 4-17 LEGEND

ACO	airspace control order
ALLOREQ	allocation request
ALLOT	allotment
AOD	air operations directive
ATO	air tasking order
JAOP	joint air operation plan
JIPTL	joint integrated prioritized target list
JTCB	joint targeting coordination board
MAAP	master air attack plan
ROE	rules of engagement
SPINS	special instructions

See JP 3-30, *Command and Control of Joint Air Operations* (02-2014).

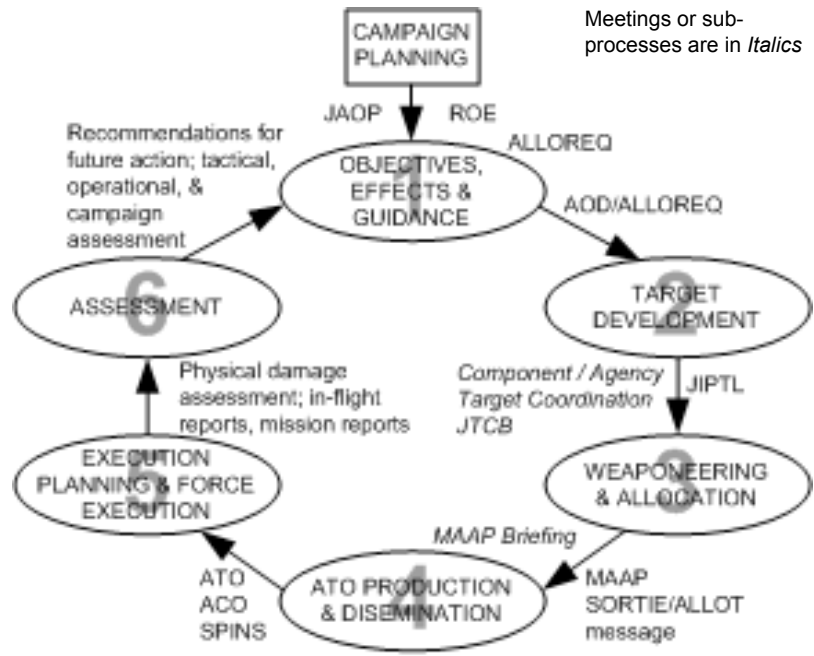


Figure 4-17: Joint Air Tasking Cycle

d. Targeting Process Comparison

While the Marine Corps targeting process differs from the joint targeting process and air tasking cycle, each of these processes achieves the same results. The MAGTF uses the D3A methodology for targeting within its AO using organic forces/capabilities. The MAGTF uses the joint targeting process for targeting outside its AO or when targeting inside its AO using other Services' forces/capabilities (other than joint air). The MAGTF interacts with the joint air tasking cycle (Figure 4-17) during joint air operations.

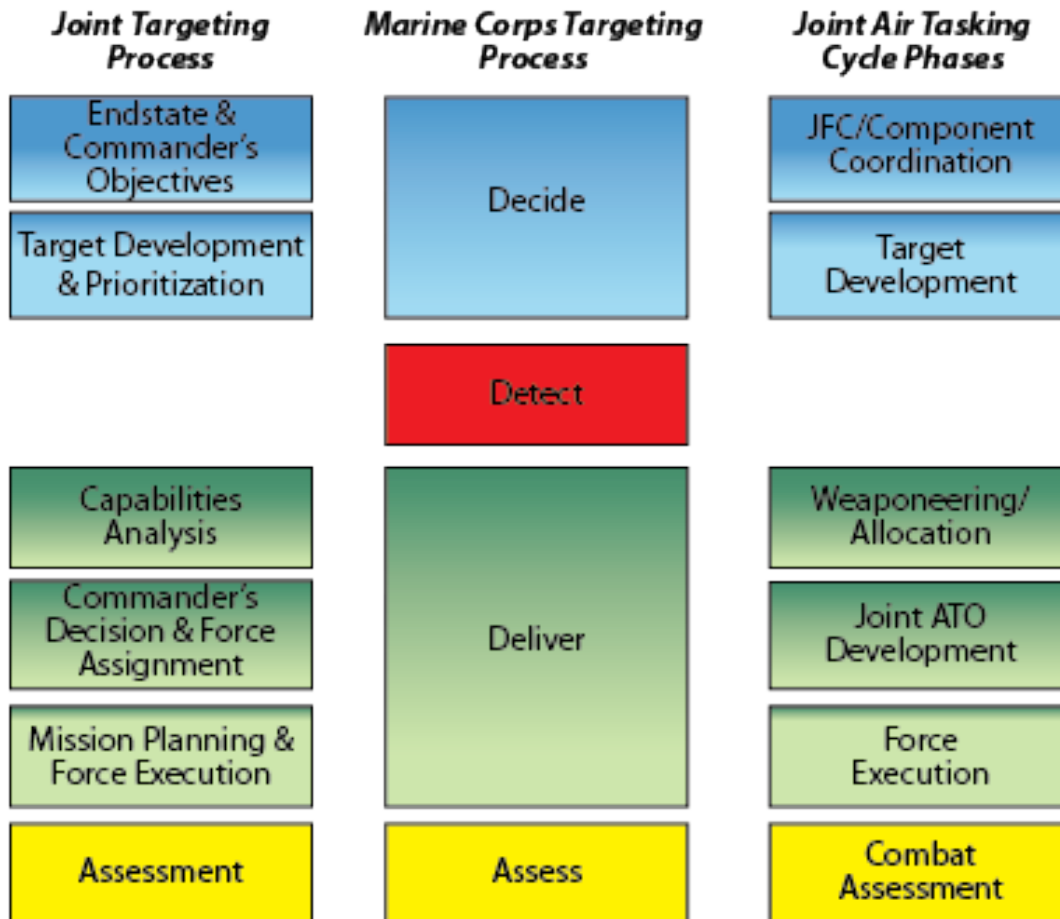


Figure 4-18: Targeting Process Comparison

4013. Naval Surface Fire Support Planning Factors

The only surface gun system currently in service with the US Navy and capable of supporting Marines ashore is the single-barreled 5-inch 54 caliber NM 42/MK 45. Each CG-47 class cruiser carries two. Each DDG-51 class destroyer carries one. These ships carry 600 rounds of ammunition per gun. A 155mm gun system intended to at first augment and eventually replace the 5-inch/54 is not funded and is increasingly unlikely to enter service. A 62-caliber version of the 5-inch gun (5"/62) has also been developed and is in limited service. It was intended to employ extended range (ER) ammunition that was not subsequently procured. This gun will fire the same ammunition as the 5"/54 but the longer barrel permits only a marginal improvement in range. Ships armed with the older 5-inch/38 gun system have been retired. The capabilities of the 5-inch/54 caliber MK-45 gun are as follows:

Maximum Range (M)	Rate of Fire	Projectiles	Fuzes	Danger Close	HE Burst Radius	Illumination
21,900 (12,200 with reduced charge)	20-30 rpm (max) 16-20 rep (sustained)	HE, HC, ILL, WP, RAP	PD, MT, CVT, VT	750 m	45 m	45-72 second burn time 2-10 m/s rate of fall

Table 4-34: NM 42/MK 45 5-inch/54 Caliber Gun System Capabilities

4014. NBC Defense Planning Factors and Considerations

a. Mission-Oriented Protective Postures

MOPP EQUIPMENT	MOPP LEVEL ZERO	MOPP LEVEL ONE	MOPP LEVEL TWO	MOPP LEVEL THREE	MOPP LEVEL FOUR
Mask	Carried	Carried	Carried	Worn*	Worn
Over-garment	Available	Worn*	Worn*	Worn*	Worn
Over-boots	Available	Available	Worn	Worn	Worn
Gloves	Available	Carried	Carried	Carried	Worn

*In hot weather coat or hood can be left open for ventilation.

Table 4-35: Mission-Oriented Protective Postures

b. Chemical Agent Persistency According to Ambient Temperature

Agent	GA / GF			GB			GD / HL			HD			VX		
	70°F	80°F	90°F	70°F	80°F	90°F	70°F	80°F	90°F	70°F	80°F	90°F	70°F	80°F	90°F
CARC**	0.71	0.71	0.33	2.45	2.45	1.35	4.64	4.64	2.36	6.33	6.33	2.8	634	634	241
Sand	1.24	1.24	1.48	4.28	4.28	6.07	8.12	8.12	10.62	11.07	11.07	12.6	1,109.5	1,109.5	1,084.5
Bare soil	3.19	2.84	1.32	11.02	9.8	5.4	20.88	18.56	9.44	28.45	25.32	11.2	2,853	2,536	964
Alkyd paint	0.92	0.92	0.42	13.18	13.18	1.75	6.03	6.03	3.06	8.22	8.22	3.64	824.2	824.2	313.3

** Chemical Agent Resistant Clothing

Information from FM 3-6

Numbers = hours

Table 4-36: Chemical Agent Persistency

c. Detailed Equipment/Troop Decontamination Water Requirements

Item to be Decontaminated	Number of Items	Gallons of Water
Individual	1,000	28,500
Casualty	1,000	1,200 (+28,500)
Small Vehicle	50	5,200
Large Vehicle	50	7,500
Small Jet / Helicopter	12	1,800
Large Jet	12	7,200

Table 4-37: Equipment/Troop Decontamination Water Requirements

d. NBC Defense First-Aid Equipment

Medicants	Per Man
Nerve Agent Antidote Kit (NAAK)	three kits
Nerve Agent Pretreatment Pyridostigmine (NAPP)	one blister pack
Convulsant Antidote Nerve Agent (CANA)	one

Table 4-38: NBC defense First-Aid Equipment (Individual Issue)

e. NBC Defense Reference Publications

- JP 3-11, *Operations in Chemical, Biological, Radiological and Nuclear (CBRN) Environments*, October 2013
- FM 3-6 or FMFM 7-11-H, *Field Behavior of NBC Agents (Including Smoke and Incendiaries)*, 3 Nov 1986

Staff Planning Factors and Considerations

- MCTP 10-10E (ex-MCWP 3-37) *MAGTF Operations in a CBRN Environment*, September 1998
- MCRP 10-10E.3 (ex-MCWP 3-37.1), *Multi-Service Doctrine for CBRN Operations*, July 2011
- MCRP 10-10E.8 (ex-MCWP 3-37.2), *Multi-Service, Tactics, Techniques and Procedures For CBRN Decontamination Operations*, April 2006 & Change 1- December 2009
- MCRP 10-10E.9 (ex-MCWP 3-37.3), *Multi-Service, Tactics, Techniques and Procedures For Nuclear Biological and Chemical Decontamination*, April 2006
- FM 3-11.9, *Potential Military Chemical/Biological Agents and Compounds*, 10 Jan 2005
- FM 3-11.11, *Flame, Riot Control Agents and Herbicide Operations*, 10 Mar 2003
- FM 3-11.14, *Multi-Service, Tactics, Techniques and Procedures For Nuclear Biological and Chemical Vulnerability Assessment*, 28 Dec 2004
- FM 3-11.19, *Multi-Service, Tactics, Techniques and Procedures For Nuclear Biological and Chemical Reconnaissance* 30 Jul 2004
- FM 3-11.21, *Multi-Service, Tactics, Techniques and Procedures For Nuclear Biological and Chemical Aspects of Consequence Management*, 1 April 2008
- FM 3-50, *Smoke Operations*, 31 Dec 2008
- FM 3-90.15 *Sensitive Site Operations*, 25 Apr 2007
- FM 4-02.7, *Health Service Support in a Nuclear, Biological, and Chemical Environment, Tactics, Techniques and Procedures* 15 Jul 2009
- FM 4-02.283, *Treatment of Nuclear and Radiological Casualties*, 20 Dec 2001
- TC 3-10, *Commander's Tactical NBC Handbook*, 29 Sep 1994

4015. Engineer Bridging Considerations

When making a determination to perform a tactical river or gap crossing you must consider the following:

- For gaps greater than 200 meters, rafting is generally more efficient due to currents and time to assemble.
- Assume all bridging must sustain Class 70 loads. Match the assets available to the need. If you can use a floating/ribbon bridge to meet your needs instead of a medium girder bridge (MGB), use it.

a. Medium Girder Bridge (MGB)

The Medium Girder Bridge (TAMCN B0152) is a two-girder, hand assembled deck bridge that fits inside a 20' ISO sea container. Its two longitudinal girders, with deck units between, provide a 4.0m wide roadway. Girders of top panels can form a single-story bridge configuration suitable for a short span and light loads. A second story of triangular bottom panels produces a double story bridge adapted for a longer span and heavier loads. A single MGB set has 12 bays but two MGB sets in double story configuration can be joined together to create an even larger span of up to 22 bays and two end pieces. Adding a Link Reinforcement Set (LRS TAMCN B1720) to two MGB in double story configuration enables the bridge to utilize its full MLC (70 tons for tracked vehicles and up to 100 tons for wheeled) out to its maximum length. An MGB can operate as a floating bridge if pontoons are available. Under FSRG, the number of MGB(s) per Marine Engineer Bridge Company will increase from three to four. (USMC TM 08676A-10/1-1 or USA TM 5-5420-212-10-1 and MCTP 3-34A [ex-MCWP 3-17.8]/ATTP 3-90.4)

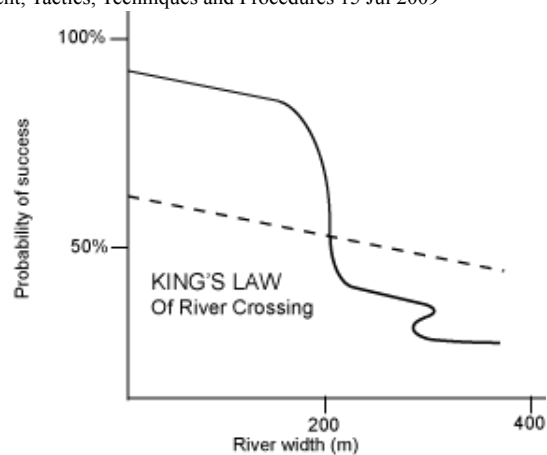


Figure 4-19: King's Law of River Crossing



Figure 4-20: Double Story MGB with LRS in Iraq

Configuration	Single Story (one MGB set)			Double Story (DS) (one MGB set)			DS (two MGB sets)		DS (two MGB w/LRS)	
	No. of Bays (1)	4 - 5	6 - 8	9 - 12	1 - 4	5 - 8	9 - 12	13 - 18	19 - 22	13 - 18
Gap Width (m) (2)	3.7 - 9.0	7.4 - 14.4	12.9 - 21.8	6.4 - 14.5	13.7 - 21.8	21.0 - 29.1	28.3 - 40.1	39.3 - 47.4	28.3 - 40.1	39.3 - 46.2
MLC (3)	70 (T)	40 - 30	24 - 16	70 (T)	70 (T)	70 (T)	50 - 30	24 - 16	70 (T)	70 (T)
Work Party (4)	9	17	17	25	25	25	25	25	34	34
Work Time (Day)	30 min	45 min	60 min	45 min	60 min	90 min	105 min	120 min	165 min	180 min
Work Time (Night)	45 min	60 min	75 min	75 min	90 min	120 min	165 min	180 min	240 min	270 min

Table 4-39: Medium Girder Bridge Capabilities and Assembly Requirements

NOTES: (1) Double Story bridges require two end pieces in addition to the number of bays shown.

(2) The AR gap, or the distance between the edge of firm ground on the near bank to the edge of firm ground on the far bank.

(3) MLC is for wheeled vehicles except where there is a (T) for tracked vehicles. An MLC of 70 for tracked vehicles is supposed to be equivalent to 100 for wheeled vehicles but this has not been fully tested.

- (4) Some DS bridges may also require an anchorage party of eight men.
- (5) Work times assume firm dry ground, good weather and the use of trained personnel. They do not include time to prepare approaches. Increase times by 20% for untrained personnel. Add 30% for unfavorable ground and another 30% for inclement weather.

b. M-18 Dry Support Bridge (DSB) and Rapidly Emplaced Bridge System (REBS) (US Army Only)

The Army is replacing its MGB sets with DSB (four per multi-role bridge company). The DSB is an automated modular system that fits on seven PLS flatracks (MK-1077). The usual configuration is one PLS and three PLS/HEMTT trucks, all four with PLS trailers. A full DSB system can erect one bridge covering a 40 meter gap or two bridges covering 20 meter gaps. The roadway is 4.3 meters (13.4 feet) wide. Once a site is prepared eight personnel can erect any DSB within 90 minutes. They can recover the bridge from either end within 150 minutes. The normal MLC rating for a 46 meter bridge is 80 tons (tracked) or 96 tons (wheeled). The maximum MLC tested is 120 (wheeled only). Army *Stryker* Brigades (SBCT) also use REBS, an MLC 30 rated system (MLC 40 with caution) similar to but lighter than the DSB. Transporting it requires only one HEMTT truck. Its two-man crew can erect or recover it from either end in 10 minutes. It spans a 42 meter gap with a 13.4 foot wide roadway. (MCTP 3-34A [ex-MCWP 3-17.8]/ATTP 3-90.4, *Combined Arms Mobility Operations*)

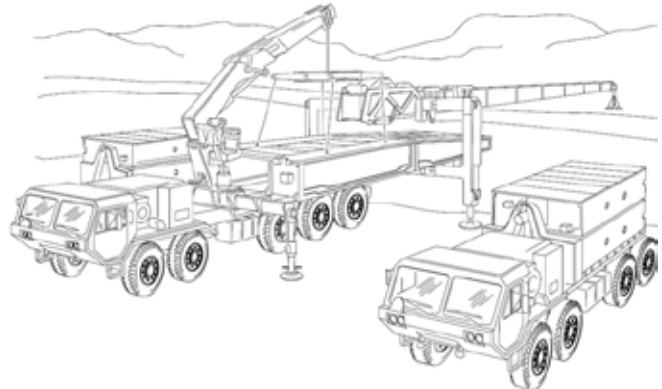


Figure 4-21: M-18 Dry Support Bridge System

c. Ribbon/Assault Floating Bridge

In 1988 the US Army introduced the Standard Ribbon Bridge (SRB) and the Marine Corps began fielding it in 1991. This was the first US MLC 70 bridge system adopted to accommodate the weight of the new M1 series tanks. The Marine Corps introduced the Improved Float Bridge (IFB) in FY01 but the Army adopted the redesigned Improved Ribbon Bridge (IRB, TAMCN B0155) in FY03. The Marine Corps adopted the IRB in FY08. However, SRB/IFB bridge components remain in inventory and may be issued as IRB substitutes.

(T) = tracked vehicles (W) = wheeled vehicles	Standard Ribbon Bridge (SRB)		Improved Float Bridge (IFB)		Improved Ribbon Bridge (IRB)	
	Ramp Bay	Interior Bay	Ramp Bay	Interior Bay	Ramp Bay	Interior Bay
MLC	70 (T)	70 (T)	70 (T) 90 (W)	70 (T) 90 (W)	80 (T) 100 (W)	80 (T) 100 (W)
Length	18' 9"	22' 8"	18' 9"	22' 6"	22' 4"	22' 8"
Width (unfolded)	28' 3"	26' 8"	28' 3"	26' 8"	28' 4"	28' 4"
Traffic Lanes	Single	Single	Single	Single	Double	Double
Width per Lane	4.1 m (13' 5")	4.1 m (13' 5")	4.1 m (13' 5")	4.1 m (13' 5")	3.3 m (11')	3.3 m (11')
Weight	12,000#	12,000#	14,000#	14,000#	14,000#	14,000#
Walkways	4 ft. either side	4 ft. either side	4 ft. either side	4 ft. either side	4 ft. either side	4 ft. either side

Note: SRB/IFB ramp bays have folding ramps. IRB ramp bays have fixed ramps and are less susceptible to damage.

Table 4-40: Comparison of Ribbon/Assault Bridge System Capabilities

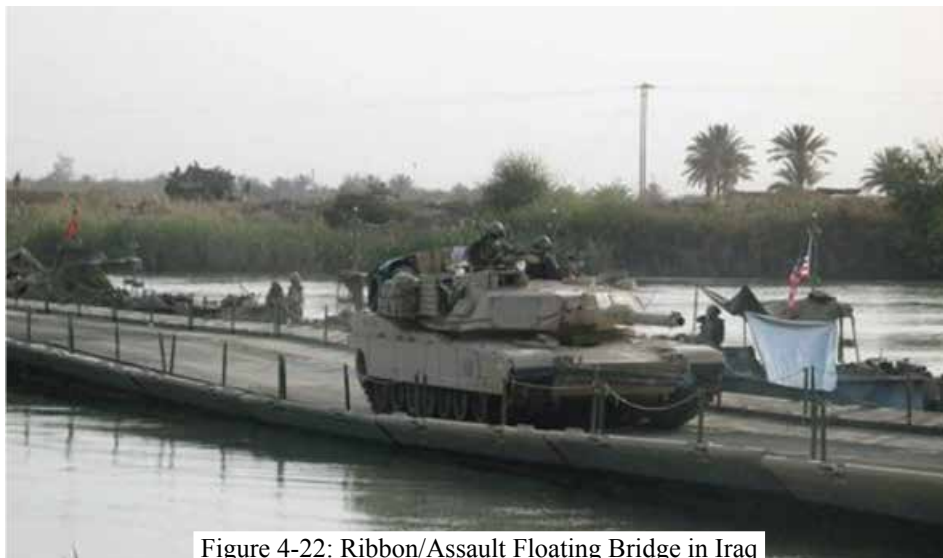


Figure 4-22: Ribbon/Assault Floating Bridge in Iraq

Staff Planning Factors and Considerations

SRB/IFB equipment is interchangeable. IFB components may be included in IRB bridges but if they are the bridge is reduced to a single vehicle traffic lane and an MLC of 70 (tracked) or 90 (wheeled). For each lane about 200 vehicles per hour, spaced at least 30 meters apart and moving at 16 km (10 miles) per hour can cross a ribbon bridge. The current velocity at the crossing site should not exceed ten feet per second.

Bridge Length by Type		Number of Bays		Launch Sites Desired	Bridge Erection Boats (Note 1)		Assembly Time (Note 2)
SRB/IFB	IRB	Ramp	Interior		Minimum	Desired	
80 ft / 24.38 m	87.8 ft / 26.78 m	2	2	2	3	4	20 min
102 ft / 31.1 m	109.8 ft / 33.48 m	2	3	2	4	4	25 min
124 ft / 37.8 m	131.8 ft / 40.19 m	2	4	2	4	5	30 min
146 ft / 44.5 m	153.8 ft / 46.89 m	2	5	2	5	5	35 min
168 ft / 51.2 m	175.8 ft / 53.6 m	2	6	3	5	6	40 min
190 ft / 57.9 m	197.8 ft / 60.3 m	2	7	3	6	6	45 min
212 ft / 64.6 m	219.8 ft / 67.01 m	2	8	3	6	7	50 min
234 ft / 71.3 m	241.8 ft / 73.71 m	2	9	3	6	7	55 min
256 m / 78 ft	263.8 ft / 80.42 m	2	10	3	7	7	60 min
Additional 0-66 ft / 20 m (Note 3)		-	add up to 3	-	add 1 per 1-3 bays	add 1 per 1-3 bays	add 5 min/bay
Additional 0-88 ft / 26.8 m (Note 4)		-	add up to 4	-	add 1 per 1-3 bays	add 1 per 1-3 bays	add 5 min/bay
Additional 0-132 ft / 40 m (Note 5)		-	add up to 6	-	add 1 per 1-3 bays	add 1 per 1-3 bays	add 5 min/bay

Table 4-41: Ribbon/Assault Floating Bridge Assembly

- NOTES: (1) For bridges totalling 12 bays or less the table gives the number of Bridge Erection Boats (BEB - see 4015d) needed to hold the bridge in place if the current (water velocity) is eight to nine feet per second. If the current is nine to ten feet per second an anchorage system must be used. If the current is any faster a bridge cannot be built. In slower currents only one BEB per three bays (in currents of five to eight feet per second) or four bays (in currents under five feet per second) will be needed.
- (2) Indicated times are approximate and assume a best case scenario; i.e. daylight, good weather and trained crews. Planners should note that it usually takes more time and effort to move and off-load bridging assets than it does to assemble them.
- (3) Up to three additional interior bays may be added if the current (water velocity) does not exceed eight feet per second
- (4) Up to four additional interior bays may be added if the current (water velocity) does not exceed six feet per second
- (5) Up to six additional interior bays may be added if the current (water velocity) does not exceed three feet per second

Ribbon bridge components can be assembled into rafts to serve as ferries in lieu of bridges. They can be assembled more quickly than bridges and can operate from multiple sites to reduce their vulnerability. They are often the initial crossing means for tanks and other heavy vehicles. Their use is essential when the water gap to be crossed is too wide for a bridge.

River Width	75 m 246 ft	125 m 410 ft	150 m 492 ft	225 m 738 ft	300 m 964 ft	350 m 1,148 ft	400 m 1,312 ft	500 m 1,640 ft	600 m 1,968 ft	700 m 2,296 ft	800 m 2,824 ft	1,000 m 3,280 ft	1,200 m 3,936 ft
Minutes per round trip	8	9	10	12	16	18	20	24	26	26	29	38	45
Round trips per hour	7	6	6	5	3	3	3	2	2	2	2	1	1
No. of rafts per centerline	1	1	2	2	3	4	5	5	6	6	6	6	6

Table 4-42: Raft Crossing Capabilities (MCTP 3-34A [ex-MCWP 3-17.8])

Raft Size	Raft Type	Assembly Time (1)	Load Space	Rafting Method (2) Longitudinal (L) Conventional (C)	Current Velocity in meters per second (fps) and MLC (3)							
					≤ 0.9 (3)	1.2 (4)	1.5 (5)	1.75 (6)	2 (7)	2.5 (8)	2.7 (9)	3.0 (10)
3 bays (2 ramp, 1 interior)	SRB/IFB	8 minutes	6.7 m (22')	L	45	45	45	40	40	35	30	25
				C	45	45	35	25	15	10	0	0
4 bays (2 ramp, 2 interior)	SRB/IFB	12 minutes	13 m (44')	L	70	70	70	60	60	60	55	45
				C	60	60	60	55 (3)	40 (3)	40 (3)	15 (3)	0
4 bays (2 ramp, 2 interior)	IRB	12 minutes	13 m (44')	L	70	70	70	70	65	65	60	60
				C	70	70	70	70 (3)	60 (3)	60 (3)	30 (3)	30 (3)
5 bays (2 ramp, 3 interior)	SRB/IFB	15 minutes	20.1 m (66')	L	75	75	75	70	70	70	60	60
				C	75	70	75	70 (3)	60 (3)	50 (3)	25 (3)	0
5 bays (2 ramp, 3 interior)	IRB	15 minutes	20.1 m (66')	L	90	90	90	90	85	85	80	80
				C	90	90	90	90 (3)	75 (3)	75 (3)	40 (3)	40 (3)
6 bays (2 ramp, 4 interior)	SRB/IFB	20 minutes	26.8 m (88')	L (wheel/track)	96/80	96/80	96/80	96/70	96/70	96/70	70/70	70/70
				C (wheel/track)	96/70	96/75	96/70	70/70	70/70	55/55	30/30	0/0
6 bays (2 ramp, 4 interior)	IRB	20 minutes	26.8 m (88')	L	105	105	105	105	100	100	95	95
				C	105	105	105	105 (3)	100 (3)	100 (3)	60 (3)	60 (3)
7 bays (2 ramp, 5 interior)	IRB	24 minutes	33.5 m (110')	L	115	115	115	115	110	110	105	105
				C	115	115	115	115 (3)	105 (3)	105 (3)	65 (3)	65 (3)
7 bays multiple (2 ramp, 5 interior)	IRB	24 minutes	33.5 m (110')	L	140	140	140	140	135	135	130	130
				C	140	140	140	140 (3)	125 (3)	125 (3)	80 (3)	80 (3)

Table 4-43: Ribbon Raft Capabilities (MCTP 3-34A [ex-MCWP 3-17.8])

- NOTES:** (1) Assembly times assume ideal conditions (daylight, good weather, trained crews). Site preparation time is extra. Add 50% for nighttime operations.
- (2) When determining rafting method, L refers to longitudinal rafting and C refers to conventional rafting (Figure 4-23).
- (3) Figures indicate the maximum payload a given raft can carry at the indicated current velocity in meters per second (feet per second). Each raft must have two ramp bays and one or more interior bays. It also needs at least two Bridge Erection Boats (BEB) for propulsion. If a raft has four or more bays (total) and is configured in the "conventional" (push) method and the current velocity exceeds five feet per second then it will need a third BEB.
- (4) If the current velocity in the loading/unloading area exceeds five feet (1.5 meters) per second then conventional (rather than longitudinal) rafting must be used.
- (5) Vehicles should only be loaded on interior bays.
- (6) The draft of a fully loaded ribbon raft is 61 centimeters (24 inches). If water depth is under two meters (6 feet, 7 inches) and the current velocity is four feet (1.2 meters) per second or greater, a raft's MLC rating will be reduced.
- (7) In rafting operations SRB and IRB components should not be mixed. IFB and IRB components may be mixed.

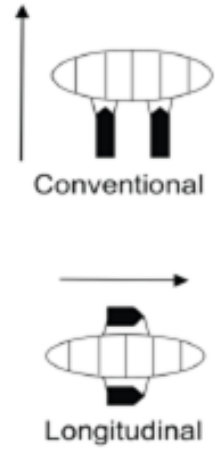


Figure 4-23: Rafting Methods

The Marine Corps is also changing its accountability system for SRB/IFB/IRB components. Previously they were grouped in bridge sets (TAMCN B0155) of 12 interior and five ramp bays each (one ramp bay was a spare) and raft sets of five interior and two ramp bays (B1625). Each engineer bridge company had three bridge sets and each MPS squadron had two raft sets (raft sets could, of course be used for bridges). Under the new system they will be accounted for as individual interior bays (B0121) or ramp bays (B0122). Under the new system a bridge company will have 36 interior and 15 ramp bays and an MPS squadron, 10 interior and four ramp bays.

Note that the figures given in Table D-5 of MCTP 3-34A [ex-MCWP 3-17.8]/ATTP 3-90.4 for the number of SRB/IFB/IRB components in a Marine Engineer Bridge company are valid only for one bridge set and not the whole company. This will be corrected in a future change.

d. Bridge Erection Boat (BEB)

The BEB (TAMCN B0114) is a truck or CH-53/C-130 transportable, hydro-jet propelled, aluminum hull boat designed to maneuver the components of floating bridges. It can also propel rafts, hold a ribbon bridge in place, support diving operations, assist in maritime construction projects, serve as a troop and cargo carrier, and patrol inland waters (it mounts an M240 machinegun). It carries a crew of three and a payload of 12 troops or 4,400 pounds of cargo. It will also tow 4,400 pounds. At low speeds it can turn within its own length. Its maximum speed (fully loaded) is about 15 knots (19 knots empty). Its draft is 22-inches (normal) or 26-inches (full load). It operates in all weather and has a 75-gallon fuel tank. It weighs 8,800 pounds but for traveling it requires a 2,000 pound cradle or a trailer. It is transportable by truck (MTVR or LVSR) or CH-53E. Launching from trailer or cradle requires about five minutes. There are two versions, the Mk 1 and the Mk 2. The Mk 2 has a simplified cooling system. A Marine engineer bridge company rates 21 BEB(s). An Army multi-role bridge company rates 14. (See TM 1940-10/1 or TM 5-1940-277-10B and MCTP 3-34A [ex-MCWP 3-17.8]/ATTP 3-90.4)

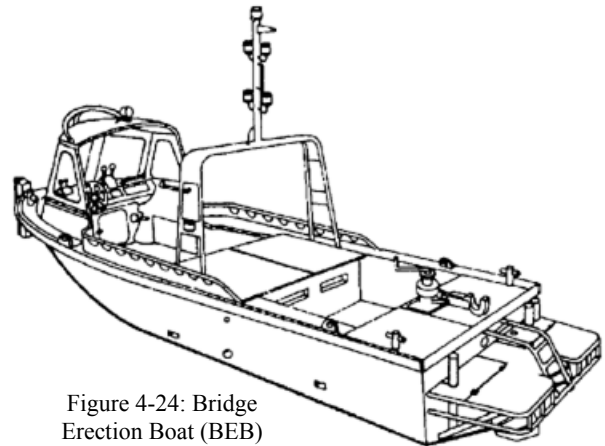


Figure 4-24: Bridge Erection Boat (BEB)

e. Armored Vehicle-Launched Bridge (AVLB)

The AVLB (TAMCN E0150) consists of an M48A5 or M60A1 tank hull with an integrated launcher unit originally carrying an MLC 60 or 70 aluminum scissors bridge. Its crew of two can launch the bridge from under armor in two to five minutes. The bridge spans small streams, gullies, ravines or enemy placed obstacles. The vehicle can retrieve it from either end but this requires 10 minutes and one crew member must dismount to connect the bridge to the launcher unit. The MLC 60 bridge is 63 feet long with a 12 foot roadway. It spans a gap of up to 60 feet (with prepared abutments) or 57 feet (without). It can support a 70 ton vehicle if the gap is limited to 50 feet. This bridge weighs 29,300 pounds. Since 1997 an MLC 70 version of this bridge has been available. This bridge is slightly heavier (30,000 pounds) but supports 70 tons over its maximum span (57 or 60 feet). The Marine Corps used to maintain two bridges per AVLB (one as a spare) but now maintains only one.

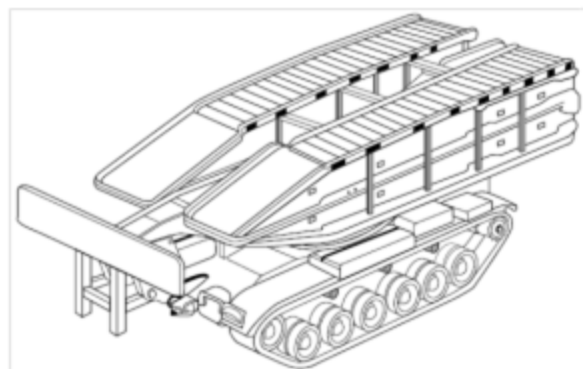


Figure 4-25: Armored Vehicle-Launched Bridge (AVLB)

The AVLB lacks the ground mobility, armor protection, and parts commonality with the M1 series tanks it supports. The Army's response to this was the Joint Assault Bridge (JAB - B0057). The JAB uses the same bridge (launched and recovered in the same way) as the AVLB but with an M1 tank chassis. This resolved the AVLB's armor and mobility shortfalls but the Army wanted an improved bridging capability. Therefore it rejected JAB in favor of the M104 *Wolverine*, a system also based on the M1 tank chassis but with a longer heavier bridge retrievable without dismounting a crew member. In FY10 the Army decided the *Wolverine* was too expensive, cut its planned procurement to 44, and (in FY11) reinstated the JAB. In May 2012 it awarded General Dynamics a JAB development contract and in June solicited bids on 168 JAB(s) for itself (some Reserve/National Guard units will retain the AVLB) and 29 for the Marine Corps. Deliveries were to start in FY15 and run through FY20. The Army is currently upgrading the AVLB/JAB MLC 70 bridge to MLC 85.

Staff Planning Factors and Considerations

The Marine Corps has transferred its AVLB(s) from its tank battalions to its Combat Engineer Battalions (CEB). 1st and 2d CEB each have five AVLB. Each MPS squadron has two. The JAB is not yet a program of record in the Marine Corps but if procured it will replace all AVLB(s) during FY17-22. Each of the 41 Army engineer Mobility Augmentation Companies (MAC) has six AVLB. The Army will build enough *Wolverines* for six MAC(s) and should acquire JAB(s) for another 23-25. The remaining MAC(s) will retain their AVLB(s).

4016. Engineer Breaching Considerations

See MCTP 3-34A [ex-MCWP 3-17.8]/ATTP 3-90.4, *Combined Arms Mobility Operations*, and MCRP 3-34.1 (ex-MCRP 3-17A) or TM 3-34.85 (ex-FM 5-34) *Engineer Field Data* (10-2013). Breaching procedures follow the acronym SOSRR (Suppress, Obscure, Secure, Reduce, Resupply). Other tips are as follows:

- Find a bypass, if possible (be careful to avoid kill zones).
- A battalion needs 2-Lanes.
- A regiment needs 4-Lanes.
- Space lanes at least 500m apart.
- Go for more lanes than you need.
- Attack flanks (weak points) of obstacles or defense.

a. Breaching Sequence

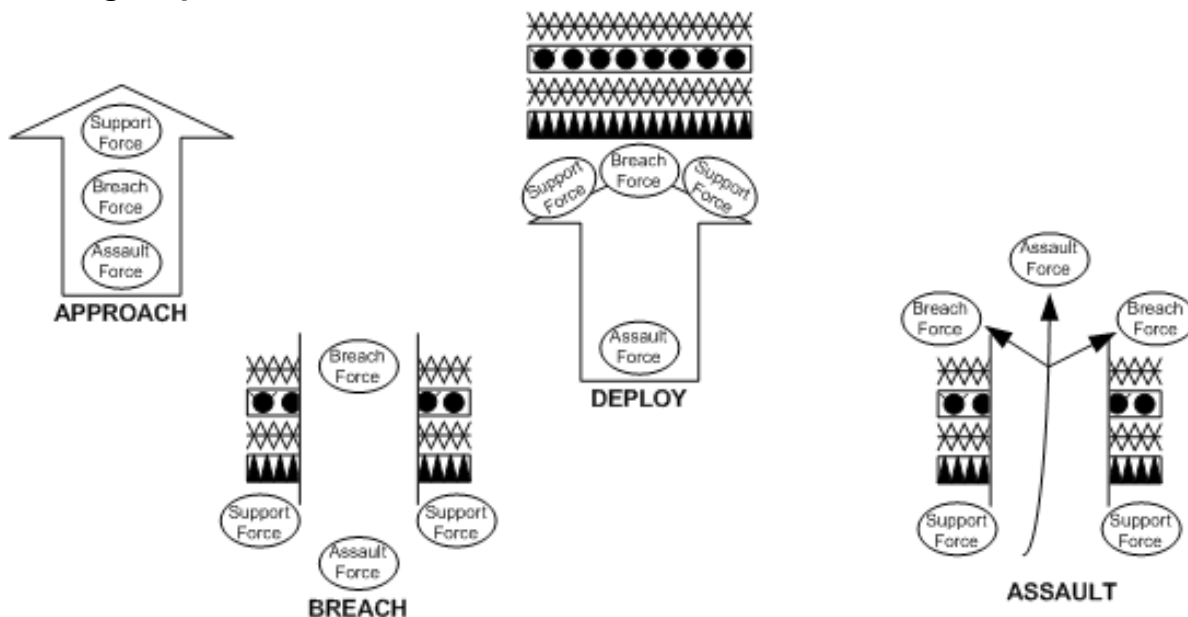


Figure 4-26: Breaching Sequence

b. Breach Complexity

Table 4-44 shows the complexity and time factors for expeditious planning of a breach when briefing at the division or higher level.

Action	Element	Time (Minutes)	Controlled
Develop situation (verifying boundary of enemy obstacle system)	Force in contact	M to 2	S3/G3
Maneuver support force into overwatch position	Support	M + 2 to 15	Support CDR
Maneuver assault force into covered assault position	Assault	M + 2 to 15	Assault CDR
Call of Artillery	DS Artillery	M + 2 to 15	FSO
Build smoke	Mortars	M + 5 to 10	FSO
Suppress enemy with direct fires	Support	M + 15 to 29	Support CDR
Suppress enemy with artillery fires	DS Artillery	M + 10 to 29	FSO
Maintain smoke	DS Artillery / mortars	M + 10 to 30	FSO
Maneuver breach force to breach location	Breach	M + 20 to 30	Breach CDR
Reduce obstacle prepare two lanes	Breach	M + 23 to 30	Engineer Leader
Place smoke pots	Breach	M + 23 to EOM	Breach CDR
Shift direct fires off the OBJ	Support	M + 29 to 30	Assault CDR
Shift indirect fires off the OBJ	DS Artillery	M + 29 to 30	Assault CDR
Assault to destroy enemy on far side of objective	Assault	M + 30 to 45	Assault CDR
Reorganize to continue the mission	TF	M + 45 to EOM	S3

M = contact with obstacle EOM = End of Mission

Table 4-44: Breaching Complexity and Time Factors

c. Breaching and Clearing Methods

System	Type	Mines Cleared	Weight (lbs)	Maximum Lane Cleared		Assembly Time (with crane & crew)	Employment Time in Minutes (Speed)
				Width	Length		
MK 155 MCI (1 MICLIC)	Trailer Mounted	AT / AP	3,200	8 m (26 ft.)	100 m (328 ft.)	35 minutes	4 (25 mph)
MK 154 MCL (3 MICLIC)	AAV or AVLM Mounted	AT / AP	10,690	8 m (26 ft.)	300 m (984 ft.)	60 minutes	1 (30 mph)

MICLIC = Mine Clearing Line Charge MCL = Mine Clearing Launcher

Table 4-45: Explosive Breaching and Clearing

System	Type	Mines Cleared	Weight (lbs)	Width Meters (ft.)	Preparation time (with crane & crew)	Employment Time in minutes (speed)
Roller	Tank mounted	AT / AP	20,000	2 @ 1.1 (3.6)	45 minutes	4 (5 mph)
Plow	Tank mounted	AT / AP	12,000	2 @ 1.8 (6)	45 minutes	4 (3 mph)

Table 4-46: Mechanical Breaching and Clearing

d. Breaching and Clearing Equipment

TAMCN	Nomenclature	Quantity	Location
B0476	AN/PSS-14 Mine detector	74	CEB
B0589	M9 ACE	16	CEB
B0160	Assault Breaching Vehicle	8	CEB
B1298	MK 155 Line Charge w/ M353 Trailer	38	CEB
B1315	MK 154 Line Charge (for AAV or AVLM)	12	AA BN
E0996	M1A1 Tank Track width mine plow	16	Tank Bn

Table 4-47: Breaching and Clearing Equipment in a Marine Division

e. Breaching Fundamentals (from MCTP 3-34A [ex-MCWP 3-17.8]/ATTP 3-90.4, *Combined Army Mobility Operations*)

Breaching includes breaching, gap crossing, and route clearance operations. The fundamentals are described by the memory aid SOSRA— (sometimes taught as SOSRR – suppress, obscure, secure, reduce, and resupply)

- **Suppress:** Temporarily degrade enemy fires to a level that allows friendly forces to carry out their mission(s).
- **Obscure:** The use of cover and concealment and battlefield obscuration (such as smoke) to degrade enemy observation and target acquisition capabilities as the breach force reduces the obstacle and the assault force passes through the obstacle. (See FM 3-11)
- **Secure:** Protection of a unit, facility, or geographical location from damage/destruction by enemy action; breaching forces secure the reduction area to prevent enemy interference with obstacle reduction and the subsequent passage of the assault force.
- **Reduce:** The creation and marking lanes through, over, or around an obstacle sufficient to allow an attacking force to pass through it as rapidly as possible. Follow-on units further reduce or clear the obstacle as required.
- **Assault:** The attacking force attacks through the obstacle, seizing the far side objective, and eliminating enemy direct and observed indirect fires on the reduction area; and battle handover (if planned) with follow-on forces has occurred.

f. Breaching Organization

The commander organizes his forces for a breaching operation in three elements as follows:

Element	Primary Mission	Responsibilities	
Support Force	Secures the operation against enemy interference	<ul style="list-style-type: none"> • Isolate the reduction area • suppress enemy weapons 	<ul style="list-style-type: none"> • Employ obscurants to obstruct enemy fire/observation
Breach Force	Reduce, proof and mark lanes around/through the obstacle	Subdivides into a security element and a reduction element. <ul style="list-style-type: none"> • The security element (mainly maneuver units) protects the breaching element • The breaching element (mainly combat engineers) breaches, proofs and marks the obstacle. • As a planning factor, a reinforced engineer platoon should breach and mark each lane created. A battalion sized task force requires at least two lanes (one per assaulting company) 	
Assault Force	Pass through the breach created by the breach force and seize objective(s) on the far side of the obstacle	<ul style="list-style-type: none"> • At battalion and above the breach and assault forces operate as separate entities but at company level and below they operate as a single entity • Control of fires is essential to prevent support and breach force fires from interfering with the assault force after it begins its attack. • The assault force assumes control of direct fires against the far side objective as support and breach force fires are lifted or shifted 	

Table 4-48: Force Responsibilities in Breaching Operations

Staff Planning Factors and Considerations

g. Reverse Planning

Reverse planning for breaching operations is performed using the following six steps:

Step 1: Identify Available Reduction Assets: Available reduction assets are determined based on the current task organization and running estimates. Examples of reduction assets used for breaching operations include combat engineer squads, MICLIC(s), ACE(s), mine plows, mine rollers, and ABV(s).

Step 2: Template Enemy Obstacles: Performed during the initial IPB as part of mission analysis and is continually refined based on new information resulting from ISR efforts.

Step 3: Understand the Scheme of Movement and Maneuver: Schemes of movement and maneuver are created for each COA being developed during the planning process. Engineer planners must fully understand the mission, the commander's intent, and the scheme of movement and maneuver. They also consider risk as stated in the commander's guidance in determining the redundancy of breaching systems in step 5. Engineer planners use the maneuver sketch created for each COA as the basis for graphically depicting the scheme of maneuver. Templated enemy obstacles are added to this sketch (roughly to scale) to show relative location with the scheme of movement and maneuver. A sample sketch is shown below:

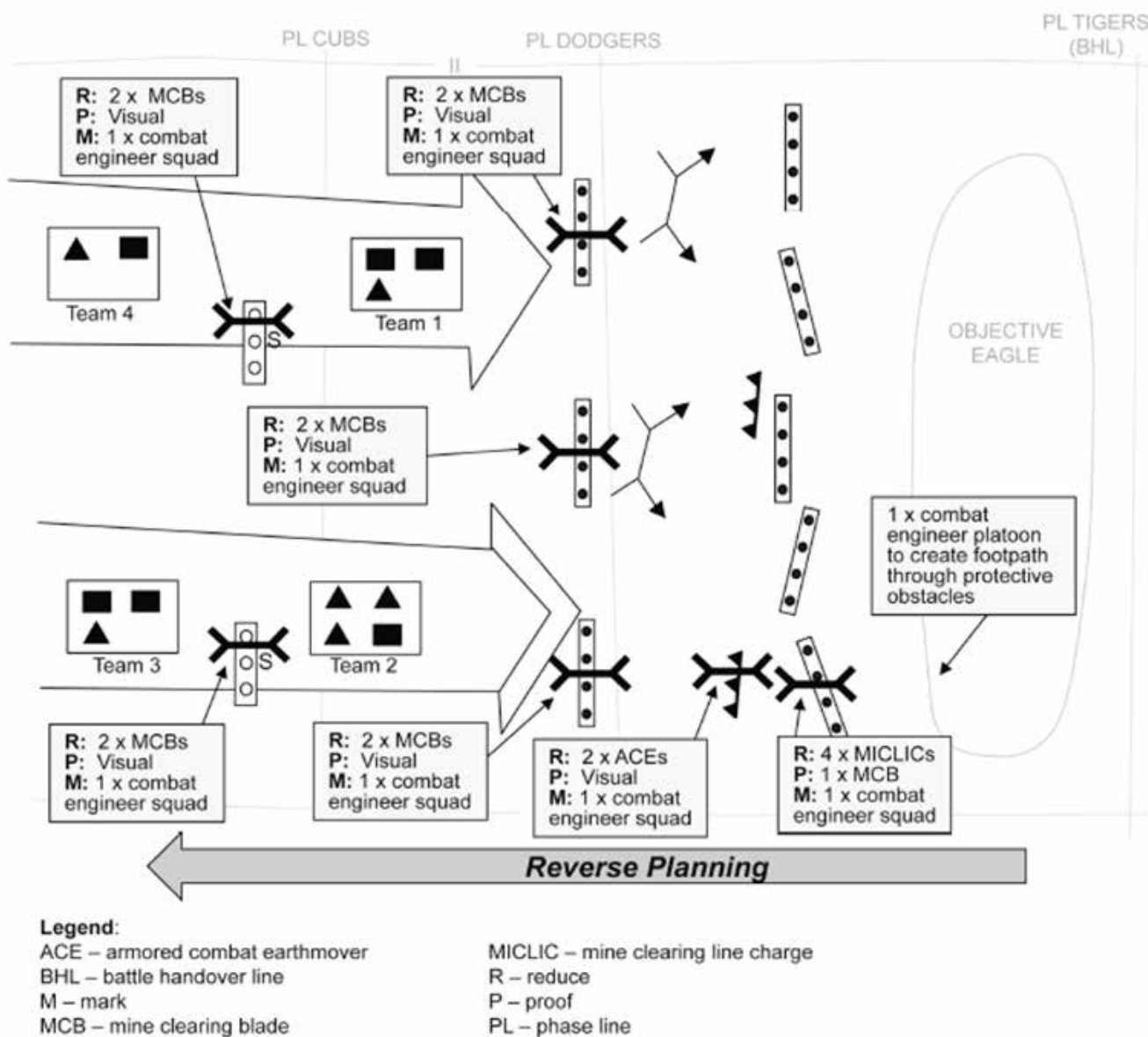


Figure 4-27: Obstacle Breaching Reverse Planning Diagram

Step 4: Identify the Number of Required Breach Lanes: Using the sketch developed in Step 3, engineer planners indicate the number of breach lanes that will be required to support the scheme of movement and maneuver. Included in this analysis is the consideration of proper distance between lanes as discussed in paragraph 3-50. They start with protective obstacles at the objective and work back to the line of departure (LD) using the following planning factors as a minimum:

- One lane for company-size units (tactical obstacles).
- Two lanes for battalion-size units (tactical obstacles).
- One footpath per assaulting platoon (protective obstacles).
- One engineer or infantry platoon can create a footpath (redundancy is already included).

Step 5: Identify Assets Required to Reduce, Proof, and Mark Lanes: Starting with the main effort, Planners

- Identify primary and alternate reduction means for each lane identified during step 4 based on the known or suspected composition of the obstacle, the enemy, and the effects of terrain.
- Use the available reduction assets (from step 1) and planning factors and operational experiences to allocate the appropriate assets needed to reduce, proof, and mark each lane (this is indicated on the sketch by using the letters R, P, and M respectively as demonstrated in previous image).
- Develop options to maximize the assets available.
- Coordinate the resupply of breaching systems within the scheme of sustainment/logistics and the shifting of breaching assets within the scheme of movement and maneuver.
- Consider time-distance factors for reloading, moving, and/or linking up assets within the supported unit to ensure that the generated options are feasible.
- Anticipate the challenges in shifting and linking up breaching assets once an operation commences, address them during wargaming,
- Ensure that the necessary detailed information needed for execution is placed in the order (or in an SOP) and included in rehearsals.

Step 6: Task-Organize Reduction Assets within the Maneuver Force: Based on the assets needed to reduce, proof, and mark each lane and command and control considerations, planners:

- Determine the best arrangement of those assets within the task organization for each COA being developed.
- Strive to keep breaching assets within their parent organization as much as possible to facilitate command and control but without sacrificing the principal of mass.
- See FM 5-0 and MCWP 5-10 (ex-MCWP 5-1), *Marine Corps Planning Process*, for the fundamentals of task organization.

h. Mass Combat Power

Breaching operations must mass the effects of overwhelming combat power against selected portions of the enemy force with a tempo and intensity that cannot be matched by the enemy. When conducting breaching operations in complex or restrictive terrain, the ability to achieve mass may be more difficult and time-consuming since the number of lanes that can be created may be limited and the assault force may take longer to build up the desired combat power on the far side of the obstacle.

- Points of breach (POB) are planned where the enemy can be isolated, fixed, or disrupted to prevent them from massing their effects, and where converging fires on obstacles are minimized based on the terrain and disposition of the defending force.
- POB(s) (lanes) should be separated by a sufficient distance to prevent the enemy from massing fires on two adjacent lanes simultaneously (and reduce traffic congestion).
- Simultaneously breaching at separate locations prevents the enemy from concentrating fires and defeating a breaching force in detail. Skillful employment of surprise and tactical deception can also prevent the enemy from massing effects at the POB(s).

i. Synchronization

Breaching operations require the precise synchronization of breaching fundamentals by support, breach, and assault forces. Failure to synchronize effective suppression and obscuration with obstacle reduction and assault can result in rapid, devastating losses of friendly troops in the obstacle or the enemy engagement area (EA). Commander ensures synchronization through proper planning and force preparation. Fundamentals to achieve synchronization are as follows:

- Detailed reverse planning.
- Clear sub-unit instructions.
- Effective command and control.
- Well-rehearsed forces.

Critical Events to be synchronized may include:

- Occupying SBF positions.
- Suppressing the far side objective.
- Employing obscuration.
- Reducing the obstacle.
- Assaulting the far side objective.
- Consolidating on the far side objective.
- Passing of follow-on forces through the breach lanes.



Figure 4-28: Assault Breacher Vehicle Firing M163 Viper (see paragraphs 4016c & h).

Staff Planning Factors and Considerations

j. Occupying Support-By-Fire Positions (SBF)

As the support force moves from the LD to its SBF positions, it must be prepared to respond (bypass or breach) to enemy SCATMINES along its axis of advance. The support force may also need to adjust its planned SBF position based on the actual conditions on the ground (such as poor observation and fields of fire or changes in the enemy situation). Adjustments made to the SBF position are coordinated with the higher headquarters to facilitate clearance of indirect fires and establishing critical friendly zone (CFZ), and with the breach force commander to ensure the positioning of the breach and assault forces does not mask the support force's fires.

k. Suppressing the Far Side Objective

After the support force has occupied its SBF positions and the commitment criteria of the breach force have been met (achieved necessary suppression and obscuration), the higher commander orders the breach force to begin reduction. The movement of the breach force to the POB is coordinated with the support and assault forces to ensure that fires are lifted and shifted.

l. Employing Obscuration

The support force commander is responsible for controlling obscuration in the breach area. Obscuration is adjusted based on variances between planned and actual positions of the support, breach, and assault forces and the location of POB(s). Adjustments also account for the current weather conditions and changes in the timing of critical events.

m. Reducing the Obstacle

- When suppression criteria have been met, the breach force commander maneuvers the breach force toward the reduction area, leading with the security element. This allows it to establish nearside security to protect the reduction element as it moves to the POB. As the security element occupies its position, the reduction element commander conducts a reconnaissance to confirm the POB and composition of the obstacle, and refines the scheme of reduction as necessary. The actual location of the POB and the estimated time to reduce, proof, and mark the obstacle are reported to the higher headquarters. This information is also shared with the support and assault force commanders. Simultaneously, the breach force commander assesses the effectiveness of the suppression and obscuration, and determines if and how to reinforce or adjust support force fires.
- The assault force occupies assault position(s) and makes final preparations for assaulting the far side objective. Final preparations include coordinating any adjustments made in the plan and reorganizing to adjust to combat or mechanical losses. The support force continues its suppressive fires as long as the assault force remains in the assault position.

As the reduction continues, the support and breach force commanders provide updates to the higher headquarters, including the status on unit strength, ammunition, effectiveness of obscuration and suppression efforts, and the overall progress of the reduction effort. The breach force commander verifies who will be the assault force and where it will approach from so that he can assist in its passage. As the reduction effort nears completion (exact moment is determined based on time-distance factors between the assault positions and lanes and is included in the plan), the breach force commander reports (or uploads) the grid coordinates of the far recognition marker to allow the assault force to begin its advance from its assault position(s) to the lane(s). When reduction is complete, the breach force commander—

- Reports lane completion.
- Confirms grid coordinates of the far-recognition marker.
- Confirms and reports the lane-marking pattern and material.
- Establishes far side local security and assists in the assault force passage.

The reduced obstacle continues to be a choke point and danger area even after the assault force has passed through created lanes. The created lanes are monitored and maintained and/or improved to support the movement of follow-on forces. Additional lanes are constructed as required to increase traffic capacity and facilitate the timely passage of follow-on forces. Breaching assets are positioned near the POB(s) in case the enemy employs SCATMINE(s) to reconstruct the reduced obstacle. The lane-marking pattern is upgraded to intermediate. There are many ways this can be accomplished, the higher headquarters—

- Takes command of the POB and has some or all of the reduction element revert to its control and continue creating or expanding lanes in the obstacle for follow-on forces.
- Takes command of the POB and has additional reduction assets follow closely behind the assault force and create additional lanes to allow the reduction element to remain under unit control.
- Tasks the breaching unit to maintain lanes in tactical obstacles.
- Widens lanes to allow two-lane traffic through obstacles. They are marked with the full lane marking pattern. Deliberate marking and fencing systems are installed, and military police establish necessary traffic control. Eventually, follow-on engineer forces clear obstacles and eliminate the choke point.

n. Assaulting the Far Side Objective

When obstacle reduction is complete and the lanes have been reported or signaled as open for traffic, the assault force passes through the created lanes and assaults the far side objective. The support force continues to support by fire and lifts and shifts its fires to support the maneuver of the assault force. The assault force breaches protective obstacles as necessary and assaults through the objective. Once the assault force reaches the far side of the objective, selected elements clear remaining pockets of resistance while the bulk of the assault force prepares

for a possible enemy counterattack. After the assault force reaches the objective, the support force leaves its SBF positions and rejoins the assault force or moves to a blocking position to counter possible enemy counterattacks. Once the farside objective is secured, the assault force establishes clear routes from the reduction area to the BHL. The assault force must control and secure the AO far enough to its front that the follow-on force can pass through and re-form into a maneuver formation prior to contact with an enemy force. The breach force is prepared to breach in support of the assault force's seizure of the farside objective. The breach force is also prepared to assist in clearing routes established by the assault force.

o. Consolidating on the Far Side Objective

Once the assault force seizes the objective, they clear it of enemy forces and then occupy firing positions to prepare for an enemy counterattack. The assault force commander should preplan the location of each element. The assault force accomplishes reorganization actions (such as cross-leveling supplies, weapons, and equipment; and recovering, treating, and evacuating casualties, enemy prisoners of war, and damaged equipment) during consolidation and reports unit status to the next higher commander.

p. Passage of Follow-on Forces

The assault force, assisted by the breach force, clears and marks routes from the far-recognition marker to the battle handoff line (BHL) according to the plan. Just like any passage of lines, the stationary force is responsible for controlling traffic and, depending on the situation, may employ military police or other assets to support that effort. The passing unit is prepared to help maintain (or improve) these routes and positions the necessary mobility assets within its formation as appropriate. The higher headquarters of the forces involved exercises overall command and control of the passage and is responsible for keeping the lanes open, improving lanes, creating more lanes as necessary, upgrading lane markings to the intermediate lane marking pattern, and controlling traffic. See Chapter 5 of FM 3-90-2, *Reconnaissance, Security and Tactical Enabling Tasks* (March 2013) for information on planning and executing a forward passage.

4017. Representative Minefield Reduction Equipment (MCTP 3-34A [ex-MCWP 3-17.8])

a. Antipersonnel Obstacle Breaching System (AOBS)

This system is transportable in two backpack units. One weighs 65-lbs and consists of a rocket & launching rod and a 25 meter line with 60 grenades & detonating cord. The other weighs 55-lbs and consists of a 20 meter line with 48 grenades & detonating cord.

Preparing the system for use takes about 90 seconds. The two line charges are connected to each other and then to the rocket. The rocket is then placed on the launching rod and is ready to fire. The rocket carries the connected line over the obstacle. A drogue parachute provides stability during flight. The system allows a standoff range of about 35 meters from the obstacle. It clears a path of one meter by 45 meters (maximum). Both the Army and Marine Corps have used this system in Afghanistan. Compared to the Bangalore Torpedo (see below) the APOBS is lighter, clears a longer lane, allows for some standoff, and can be deployed faster.



Figure 4-29: AOBS

b. Bangalore Torpedo

Developed in 1912 as a breaching device it has been in use by the Army and Marine Corps since 1918. It consisted of a series of explosive filled metal pipes that could be connected together and then pushed through an obstacle (mainly barbed wire in the early days) and then detonated to create a 1.5 meter gap. Currently they are made in the UK for both British and US forces. It is issued as a kit of ten 5-ft tubes, weighting 8.8-lbs (4-kg) each. A nose piece attached to the forward end of the leading tube makes a set of connected pipes much easier to push into an obstacle. One kit can clear a path of up to one meter by 15 meters. Users should ensure there are no trip wires before deploying. It is effective against AP mines. Not effective against pronged, double-impulse, or pressure-resistant AT and AT mines. Also, it is not reliable for cutting modern, high tensile strength barbed wire obstacles.



Figure 4-30: Bangalore Torpedo

c. M1160 Assault Breacher Vehicle (ABV)

Built on an M1A1 tank chassis. It can clear lanes/obstacles explosively using the two M58 Mine Clearing Line Charges (MICLIC) mounted aft. The ABV can mount a variety of plows for mechanical lane clearing. The full-width mine plow clears a 14.5-ft lane to a depth of 14 inches (soil) or 10 inches in clay. With the dozer blade the ABV can clear non-explosive obstacles, plus rubble and debris. (TAMCN B0160)



Figure 4-31: Assault Breacher Vehicle

Staff Planning Factors and Considerations

Figure 4-32: MCB



d. Mine Clearing Blade (MCB)

A removable accessory that can be installed on the front of any M1 tank with about an hour's work. However, this must be done before an operation commences. The MCB lifts and pushes mines that are surface laid or buried up to 12 inches and creates a lane 42 inches wide in front of each track. It is effective against most types of mines regardless of how they are fused. (TAMCN E0996)

IMPORTANT: The MCB does NOT neutralize the mines! It only pushes them out of the lane the MCB is clearing.

Figure 4-33: MCR



e. Mine Clearing Roller (MCR)

Used primarily for mine detection they can also defeat most single-impulse, pressure-fuzed AT & AP mines. The Roller creates a 44 inch wide path in front of each track. The MCR can withstand multiple mine blasts (varies with the size of the mines) before sustaining damage. The main gun should be rotated to the side during mine clearing operations. A site selected for MCB/MCR lane clearing must be relatively flat and free of obstacles.

f. Mine Clearing Armor Protection Kit (MCAP)

The kit has two parts, a mine clearing rake and armor plate. The armor protects the operator and critical components from 7.62mm armor piercing ammunition and AP mine blasts.



Figure 4-34: D7 Dozer with MCAP

The rake attaches to the dozer blade and performs AP mine clearing and lane widening. It will create a 12-ft wide path clear (depending on soil type) to a depth of 12 to 18 inches. Originally designed for the D7 series dozers the current MCAP versions support the Medium Crawler Tractor (a John Deere product) which has replaced the D7 in USMC service. However, the Seabees still use the D7.

g. M9 Armored Combat Earthmover (ACE)

This is an armored, unarmed high speed (meaning it can make distance moves on its own without the need for a flatbed) bulldozer. It can reduce gaps and AT ditches. It can also serve as an asset for minefield proofing. While it can reduce an AP minefield it should not be used for this purpose except as a last resort. (TAMCN B0589)



Figure 4-35: M9 ACE

h. Mine Clearing Line Charge (MICLIC)

The M58 MICLIC is a rocket-projected explosive line charge that provides a "close-in" breaching capability for maneuver forces.

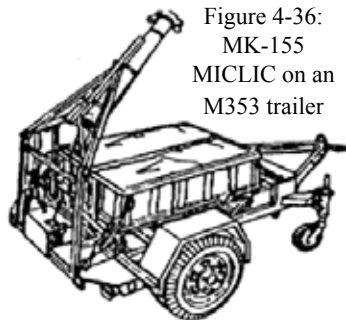


Figure 4-36: MK-155 MICLIC on an M353 trailer

When detonated it creates a lane of 8 meters by 100 meters. It can clear single impulse, non-blast resistant, pressure fused mines but deeply buried mines, non-pressure-fuse mines, and overpressure-resistant mines will likely not be detonated. Explosively created breaches should always be mechanically proofed. The MK-155 (TAMCN B1298) MICLIC system consists of a launcher assembly, firing kit, an M58A3 line charge, and a 5-inch MK22 Mod 4 rocket. The line charge is 350

Figure 4-37: Two MICLIC on an AVLM



Figure 4-38: AAV with MK-154 MICLIC

feet long and contains 5 pounds per linear foot of composition C4 explosive. It rides in a M353 3.5-ton trailer (included in the TAMCN). Reloading the trailer with a new line charge takes about 30 minutes. The MK-154 (TAMCN B1315) consists of three separate rockets and line charges that will all fit into an AAV. The AAV can use them to clear shallow water mines and can fire them while afloat.

The ABV (see 4016c, above) carries launchers for two MICLIC rockets and line charges. The AVLM (Armored Vehicle Launch MICLIC) is an M60 bridge layer equipped with two MICLIC launchers in lieu of its bridge. Both the ABV and AVLM are heavily armored and can withstand enemy fire much better than an AAV.

4018. Amphibious Breaching Operations (from Appendix C, MCTP 3-34A [ex-MCWP 3-17.8]/ATTP 3-90.4)

Breaching obstacles from the surf zone is a very difficult task that requires extensive coordination between the commander, amphibious task force (CATF) and the commander, landing force (CLF). Tidal range, shifting water currents, coral heads, rocks and other natural or man-made obstacles which affect landing craft must be taken into account. Naval mines pose a significant threat to an amphibious task force (ATF).

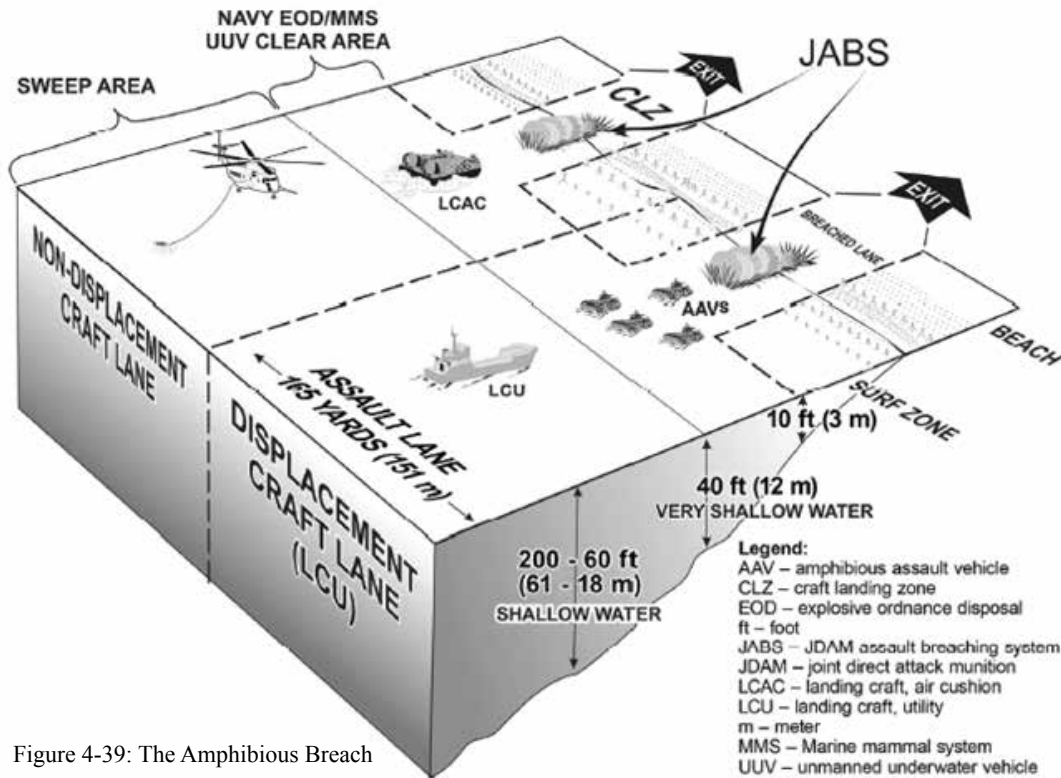


Figure 4-39: The Amphibious Breach

Naval Mines – use both contact and influence fuzing. Influence fuzing can be magnetic, acoustic, pressure, or a combination of thereof. They can be moored, placed on the seabed or float free.

Water Depth – to ease command and control for mine countermeasure (MCM), zones are established (as follows) according to water depth:

- Deep water: DW is over 200 feet. Mines here are most likely moored, either influence activated or contact. Only floating obstacles present a challenge to maneuver here.
- Shallow water: SW is 60 to 200 feet deep. Moored contact mine and bottom or moored single & multiple influence mines will be here. Obstacles are unlikely.
- Very Shallow: VSW is 10 to 40 feet deep. Mines here may include bottom or moored contact mines, bottom or moored single influence mines, bottom multiple influence mines, and ground tilt rod mines. Some obstacles may be here.
- Surf Zone: The SZ is from the beach to 10 feet deep. Mines here might be bottom contact, bottom influence, bottom pressure plate, ground tilt rod, moored contact, moored influence, and anti-invasion mines. Mines mixed with obstacles are highly probable.

Mine Countermeasures – Proactive MCM prevents the enemy from laying mines. Enabling MCM is active or passive.

- Passive: Minimizing the threat of a mine without attacking the mine itself
- Active: Physically clearing mines from a lane or route via minehunting or minesweeping.

Minehunting. Use air, surface, or subsurface sensor and neutralization systems to locate and dispose of individual mines. It eliminates mines in a known field when sweeping is not feasible or desirable, or when there is a need to verify the presence / absence of mines in a given area. To view the variety of available equipment see MCRP 13-10J.1 (ex-MCRP 3-31.2A) or NTTP 3-15.24 *Mine Countermeasures* 01-2008.

Minesweeping. Is clearing mines using mechanical, explosive, or influence sweeping equipment. Mechanical sweeping removes, disturbs, or otherwise neutralizes the mine. Explosive sweeping detonates, damages, or displaces the mine. Influence sweeping used acoustic and/or magnetic influence to detonate the mine. Sweeping can be done by helicopter or surface ships. See MCRP 13-10J.1 / NTTP 3-15.24.

a. Amphibious Breaching Fundamentals

The breaching fundamentals (SOSRA) previously described always apply, but may vary with the situation.

Shaping Operations: There are three complementary operations that amphibious force commanders may use to shape their environment. They are often done sequentially, but may be done simultaneously. The exact methods used depends on the type of amphibious operation, e.g. raid or assault, noncombatant evacuations operations (NEO) etc. These methods, in order of occurrence, are as follows:

Staff Planning Factors and Considerations

Supporting operations. May include establishing maritime superiority, initiation of MCM operations, deception, a hydrographic survey of potential landing beaches. Sea-and land-based supporting air operation may include establishing air superiority, ISR, and the attack of land targets. Special Forces operations may include psychological operations, civil affairs, special reconnaissance, and direct action.

Advance force operations. Are task-organized prior to the arrival of the amphibious force and may include: MCM operations with emphasis on clearing mines in the transport areas, fire support areas, and sea approaches to the beaches. Also, hydrographic reconnaissance, reconnaissance of the beaches and approaches, landing zones, drop zones, avenues of approach to the landing area, neutralization or destruction of enemy high-value assets.

Pre-assault operations. Done by the amphibious force prior to its assault. May include demolition of obstacles, clearing mines/ breach barriers to or on the beach, mark channels, target acquisition for naval surface fire support (NSFS), and initial terminal guidance for designated assault landings.

b. Amphibious Breaching Command and Control

Unity of command is critical in MCM or amphibious breaching operations. The CATF, with the assistance of the breach force advisor from the CLF staff, and supported by the MCM commander (MCMC), executes MCM from the surf zone to the beach to the line of demarcation between the CATF and CLF control of MCM.

- **Assault breaching** is a pre-planned fire support mission using precision-guided munition to neutralize mines and obstacle in the surf zone to the beach. Joint Direct Attack Munition Assault Breaching System (JABS), an air delivered munition, is currently the only means available of this. The MCMC will develop the mission, provide it to the CATF and CLF, who will forward it to the air component commander (JP 3-02) who will assign an aircraft to deliver the JABS and the method of coordination.
- **Mine Countermine Commander** has the majority of the MCM assets under his control and responsible for mine clearance from the sea through the VSW. Coordinate overall MCM with other ATF force through the CATF. Will advise the CATF of COA(s) to prevent, limit, or eliminate the impact of the enemy mining.
 - Airborne countermeasures clear mines from the DW zone into the VSW. While ...
 - Surface countermeasure ships clear mines in deep and shallow water
 - Underwater countermeasures include Navy EOD and other joint or combined underwater assets responsible for mine identification, location, and neutralization in DW, SW, and VSW

4019. Engineer Obstacle Considerations

Weapon Systems in Service with Friendly Nations				Former Soviet Weapon Systems in Service			
System	Range	System	Range	System	Range	System	Range
M203 Grenade Launcher	160m	25-mm M242 (LAV-25) AP	1,800m	GP-25 40mm grenade launcher	200m	14.5mm KPVT (BTR/BRDM)	2,000m
AT4 Antitank rocket	300m	25-mm M242 (LAV-25) HE	2,200m	RPG-7 Antitank grenade Inchr	300m	30mm 2A42 (BMP2/BTR)	1,000m
SMAW MK-153 rkt launcher	450m	Javelin ATGM	2,000m	RPG-29 Antitank grenade Inchr	500m	73mm 2A28 (BMP-1)	800m
M249 5.56mm SAW	800m	TOW ATGM	3,750m	RPK 7.62x39 lt machinegun	800m	AT-3C/D (BMP-1/grnd)	3,000m
M240 7.62mm machinegun	1,100m	Hellfire ATGM (AH-64)	8,000m	PK/PKS 7.62mm machinegun	1,100m	AT-4C Fagot ATGM (grnd)	2,500m
M2 .50-cal machinegun	1,800m	105mm M68A2 (Stryker)	2,000m	DShK-38/46 .50-cal machinegun	1,500m	AT-5 Konkurs (BMP/BRDM)	4,000m
MK19 40mm gren Inchr	1,600m	120mm gun M256 (M1 tank)	3,000m	NSV .50-cal machinegun	2,000m	AT-7/13 Metis (AT-7 1,000m)	2,000m
Artillery Weapons	Proj Type	Max Effective Range		Artillery Weapons			
60mm mortar M224	HE, WP	3,500m		100mm D10T (T54-55)	1,500m	AT-15 Khризantema (Laser)	6,000m
	ILLUM	3,200m		115mm U5TS (T62)	1,600m	AT-8/9/11/12 ATGM (fired from tank guns)	4,000m
81mm mortar M252	HE	5,800m		125mm 2A46 (T64-72-80 etc)	2,400m		
	120mm mortar M120/121	ILLUM	5,100m		100mm 2A70 (BMP-3)	4,000m	
WP		3,500m					
120mm mortar M327 EFSS	HE, ILLUM, WP	7,200m		60mm mortar Type 89 (Chinese)	2,700m	120mm mortar M1938/43	5,700m
105mm howitzer M119	HE, ILLUM, WP	7,900m		82mm mortar M1937/M1943	3,040m	120mm mortar 2B11 SANI	7,200m
	HE	14,500m		82mm mortar 2B14-1 PODNOS	4,050m	107mm MRL Rkt (Chinese)	8,500m
155mm howitzer M777	RAP	19,200m		122mm how D30 towed/2S1 SP 15,300m (HE-Frag); 21,900m (ER - RAP)			
	HE, ICM	18,000m		130mm M46 towed gun 27,400m (HE-Frag); 38,000m (ER - RAP)			
	Base Bleed (BB)	28,200m		152mm how D20 towed/2S3 SP 18,500m (HE-Frag); 24,000m (ER - RAP)			
HIMARS/MLRS	RAP	30,000m		152mm 2S19 SP howitzer 24,700m (HE); 29,000m (BB); 36,000m (RAP)			
	DPICM	32,000m		BM-21 Grad 122mm MRL 20,500m (old rockets); 30-40km (new rockets)			
	ER DPICM	45,000m		BM-22 Uragan 220mm MRL 35,000m (HE-Frag, Chemical, ScatMines)			
	GMLRS	70,000m		BM-30 Smerch 300mm MRL 90,000m (HE-Frag, ICM, AT, Scatmines)			

Table 4-49: Weapon Ranges to Determine Obstacle Coverage by Fire

- Obstacles should support weapon systems.

- Obstacles should not impede our own mobility.
- Obstacles must hinder enemy movement.
- Obstacles are emplaced in depth, as resources will feasibly support considering time manpower and logistical complaints.

a. Minefield Design

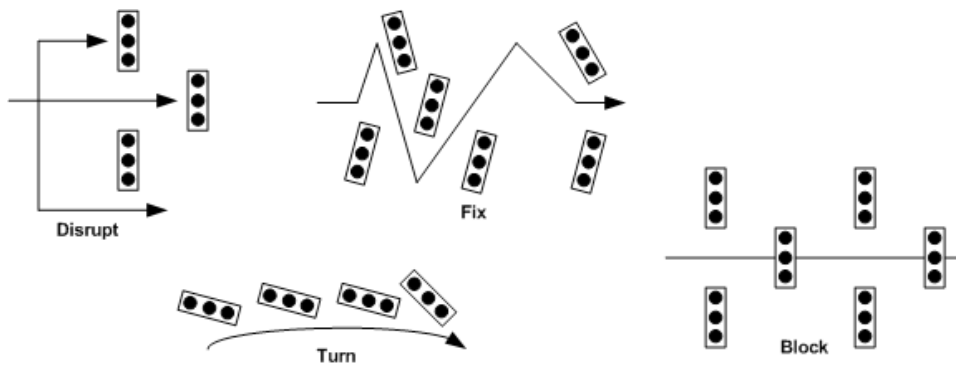


Figure 4-40: Minefield Design

b. Row Mining

Characteristics	Disrupt	Turn	Fix	Block
Frontage (m)	250	500	250	500
Depth (m)	100	300	120	320
AT full-width (number of rows)	1	4	1	4
AT track-width (number of rows)	2	2	2	2
Number of hours for a platoon to emplace	1.5	3.5	1.5	5.0
Number of hours for a company to emplace	0.5	1.5	0.6	2
Includes anti-handling devices?	No	No	No	Yes
Total AT mines (full width)	42	336	63	378
Total AT mines (track width)	84	168	84	168
Mine density	0.5	1.0	0.6	1.1

Table 4-50: Characteristics of Standard Row Minefields (hand emplaced)

c. Demolitions *Note: the table below is intended as a guide for exercise purposes only. See MCRP 3-34.1 (ex-MCRP 3-17A) Engineer Field Data*

TARGET		TNT (lbs)	40-lb Cratering Charge	40-lb Shaped Charge	Thermite Grenades (ea)	Hours to destroy (10 men)
Highway Bridge	over/under 400ft	1,200/800				3/2
Road Cratering (2-lane/4-lane)			7/19	2/12		2/4
Tunnel (highway/railroad)		12,000			50 (railroad only)	5
Railroad facilities	bridge over/under 400 ft one track	3,000/4,500				6/6
	bridge over/under 400 ft two-track	2,000/3,000				4/4
	Terminal/railyard	1,000			125	4
Railroad rolling stock (locomotive and 30 cars)		50				
POL facilities	Storage & handling	50			10	1
	Refining	100	15		15	1
	Distributing	20			2	0.2
Airfields	Runway (1,000 ft)	5,500	25			8
	Fuel tank above/below ground	400 (above grnd)		1 (below grnd)	1	0.2 / 1
	Radar/radio apparatus	30			10	0.5
Electric Power	Generator	150			10	1
	Transformer	100			25	1
Telecommunications	Microwave tower/ Telephone exchange	25				0.1 / 0.2
	Repeater/radio station	50			2	0.2
	Satellite dish	25			2	0.1
Waterways	Lock	2,000				1
	Levee wall		15	10		2
	Dam (navigational)	1,000				2.5

Table 4-51: Destruction of Operational Targets

Staff Planning Factors and Considerations

4020. Engineer Mounted Route Reconnaissance & Clearing (R2C) Considerations

Route reconnaissance and clearing operations concern the detection, marking, confirmation, classification, reduction, and communication of explosive hazards (EH) and non-explosive obstacles in order to maintain MAGTF ground mobility.

The existing route clearing platoons (RCP) in the 1st and 2d CEB mobility assault companies (MAC) have reorganized. Instead of one platoon of three sections the MAC now has six sections. Each section is now called a “platoon.” An RCP platoon/team has 25 or 26 personnel organized (officially) into a command element, a sweep section, an “assault” section and a security section. In practice the organization is more fluid (see below). Each platoon operates a standard RCP equipment set shown in Table 4-52 below.

TAMCN	Acronym	Per Eqpt Set		Description
		RCP	Mod RCP	
D0025	MRAP Cat I	2	0	<i>Cougar</i> 4x4; crew of two plus up to four passengers; has a weapon station (see 2001d, p. II-7)
D0051	MRAP Cat II	2	0	<i>Cougar</i> 6x6; crew of two plus up to eight passengers; has a weapon station (see 2001d, p. II-7)
B0035	MRAP Cat III	1	0	<i>Buffalo</i> 6x6; crew of two plus four; operating arm lifts up to 500-lb; extends 30-ft (see 2001s, p. II-7)
B0093	VMMMD	2	0	<i>Husky</i> Mk. III 4x4 vehicle mounted mine detector; crew of one; not armed; (see 2001s, p. II-7)
B0094	REDPACK	1	0	<i>Husky</i> parts and maintenance trailer for rapid repair of explosion damage (a <i>Husky</i> normally tows it)
B0095	HMDS	2	2	<i>Husky</i> mounted detection system; uses ground penetrating radar; visually marks suspected hazards
B0058	LWMRS	3	2	Light Weight Mine Roller System; attaches to the bumper of any <i>Cougar</i> ; detonates pressure mines.
B0088	LRCB	2	2	Light-weight Route Clearance Blade; a light (3-ton capacity) dozer blade; attaches to the bumper of any <i>Cougar</i> (CAT I is preferred); used to clear obstructions and debris
B0132	ENFIRE	2	1	Engineer Field Planning Recon, surveying and sketching set; a computer processor with rangefinders, GPS (DAGR), etc; receives, analyzes, and archives route, terrain and related geospatial data and transmits it to other computer systems. ENFIRE is normally carried in a CAT II <i>Cougar</i>
B0133	IAA	2	0	Interrogator Arm Assembly; an articulated interrogator arm with camera like that of a <i>Buffalo</i> but less capable; attaches to the front bumper of a CAT II <i>Cougar</i> ; lifts up to 50-lbs; extends to 25 feet.
A0156	VOSS	2	2	Vehicle Optical Sensor System; a multi-sensor optical device mounted on a telescopic mast attached to a Cat II <i>Cougar</i> ; it visually, optically/thermally scans 360 degrees for suspected explosive hazards (EH); the mast can raise the gimbal to over 25-ft above ground level; range is five to 1,000 meters.
A0378	CREW	4	0	Counter Radio controlled explosive device Electronic Warfare; it uses both active and reactive jamming techniques to disrupt radio frequencies and prevent signals from reaching an explosive device.
B0048	PackBot-510	2	0	Robots interrogate and possibly destroy actual/suspected EH; a CAT II <i>Cougar</i> carries each PackBot-510; the lighter/less capable SUGV-310 (2004b p. IV-16) serves as a PackBot 510 substitute.
E0110	SUGV-310	0	2	

Table 4-52: Engineer Route Reconnaissance and Clearing Equipment Sets

An RCP cannot use more than four of its seven LMRS, LRCB and IAA units at any one time. It must store the others. A Cat II *Cougar* carries a VOSS, an ENFIRE, a CREW, a PackBot-510 and either an LWMRS, IAA or LRCB. Each Cat I *Cougar* carries a CREW and either an LWMRS or an LRCB.



LWMRS

When organized for combat an RCP consists of a C2 element, a security element and a detection and reduction element. C2 personnel ride wherever they can best control RCP operations. Security personnel ride in the *Cougars*. They use their weapon stations to protect the unarmed *Buffalo* and *Huskies* as well as to cover the front and rear of the platoon. Some security personnel may dismount as necessary for sweeping or other operations. The *Husky* is the primary explosive hazard (EH) detection vehicle, though *Cougars* equipped with LWMRS and/or VOSS can assist. Detection consists of the detection and marking of suspected EH(s). Reduction consists of interrogating a suspected EH to determine if it really is an EH. The *Buffalo*, with its operating arm is the primary interrogator system but an IAA-equipped *Cougar* can substitute. Robots may interrogate suspected EH(s) and even place charges to blow them in place. However, EOD personnel (who have their own robots - see 2004b) are supposed to make safe any EH not detonated in the detection phase. An RCP on a deliberate route clearing mission normally has an EOD team (with a Cat I *Cougar* and two HMMWV) and a recovery vehicle (M88A2 or armored LVS-15) attached to, or in support of it.

For deliberate route clearing an RCP assumes a column formation with the *Huskies* in front, protected by two *Cougars* equipped with two LWMRS or with one LWMRS and one IAA. The *Huskies* stagger themselves so as to cover as great a width of roadway as possible. The *Buffalo* is typically near the center of the column. The other *Cougars* (with one or two LRCB) cover the rear. If there is a high risk of ambush or the RCP is traveling at speeds over five mph or is between areas requiring deliberate sweeps, *Cougars* with LWMRS will lead.

Besides sweeping for EH(s) an RCP conducts general engineer route reconnaissance (using ENFIRE). This includes checking bridge capacities, road condition/safety, non-explosive deliberate or non-deliberate obstacles, etc.

In FY12 the Marine Corps cut its planned procurement of RCP equipment sets from 52 to 23. A MAC in garrison now has only a training allowance of three RCP sets for its six RC platoons. When RC platoons deploy they use prepositioned sets. Additional sets are flown out as needed.

Besides 23 standard RCP sets, the Marine Corps is procuring seven modified RCP sets (one per standing MEU). A mod RCP set (see Table 4-52) sacrifices capability for a reduced “footprint.” It substitutes borrowed armored MTVR trucks for *Cougars* and uses armored construction or material handling equipment as *Husky* substitutes to employ HMDS. The 1st and 2d CEB each hold three mod sets and the 3d CAB holds one. Procurement of all standard and mod RCP sets will be complete in FY17.



Husky with HMDS

4021. Engineer Survivability Considerations

	Number of M9 Armored Combat Earthmovers (ACE) or MCT Dozers							
	2 ACE	2 MCT	4 ACE	4 MCT	6 ACE	6 MCT	8 ACE	8 MCT
LAR Platoon (rein) (7 LAV all types)	16 hours	8 hours	8 hours	4 hours	6 hours	3 hours	4 hours	2 hours
LAR Company (25 LAV of all types)	56 hours	26 hours	28 hours	13 hours	21 hours	10 hours	14 hours	6.5 hours
Tank Platoon (4 M1A2)	9 hours	8 hours	5 hours	4 hours	4 hours	3 hours	2.5 hours	2 hours
Tank Company (14 M1A2, 2 M88A2)	32 hours	26 hours	16 hours	13 hours	12 hours	10 hours	8 hours	6.5 hours
Field Artillery Battery (6 155mm guns)	14 hours	10 hours	7 hours	5 hours	4 hours	3.5 hours	3.5 hours	2.5 hours
Field Artillery Battalion (18 155mm)	40 hours	28 hours	20 hours	14 hours	15 hours	11 hours	10 hours	7 hours
AAV Platoon (12 P7A1)	27 hours	12 hours	14 hours	6 hours	10 hours	5 hours	7 hours	3 hours
AAV Company (43 P7A1, 2 C7, 1 R7)	103 hours	46 hours	52 hours	23 hours	39 hours	17 hours	26 hours	11 hours

Table 4-53: Time Required for the M9 ACE or the MCT Dozer to Complete a Fighting Position

- M9 ACE and MCT Dozers should operate in pairs or teams whenever possible. This increases productivity to about 2.5 for 2 blades.
- For each 3½-hours of dig time with an ACE or MCT, allow an additional ½-hour for maintenance and ½-hour for moving and marking.

4022. Engineer Bulk Fuel Considerations

The Marine Corps has developed a family of tactical fuel systems (TFS) based on a common set of standard components. This permits limitless combinations of tailored systems to meet mission requirements.

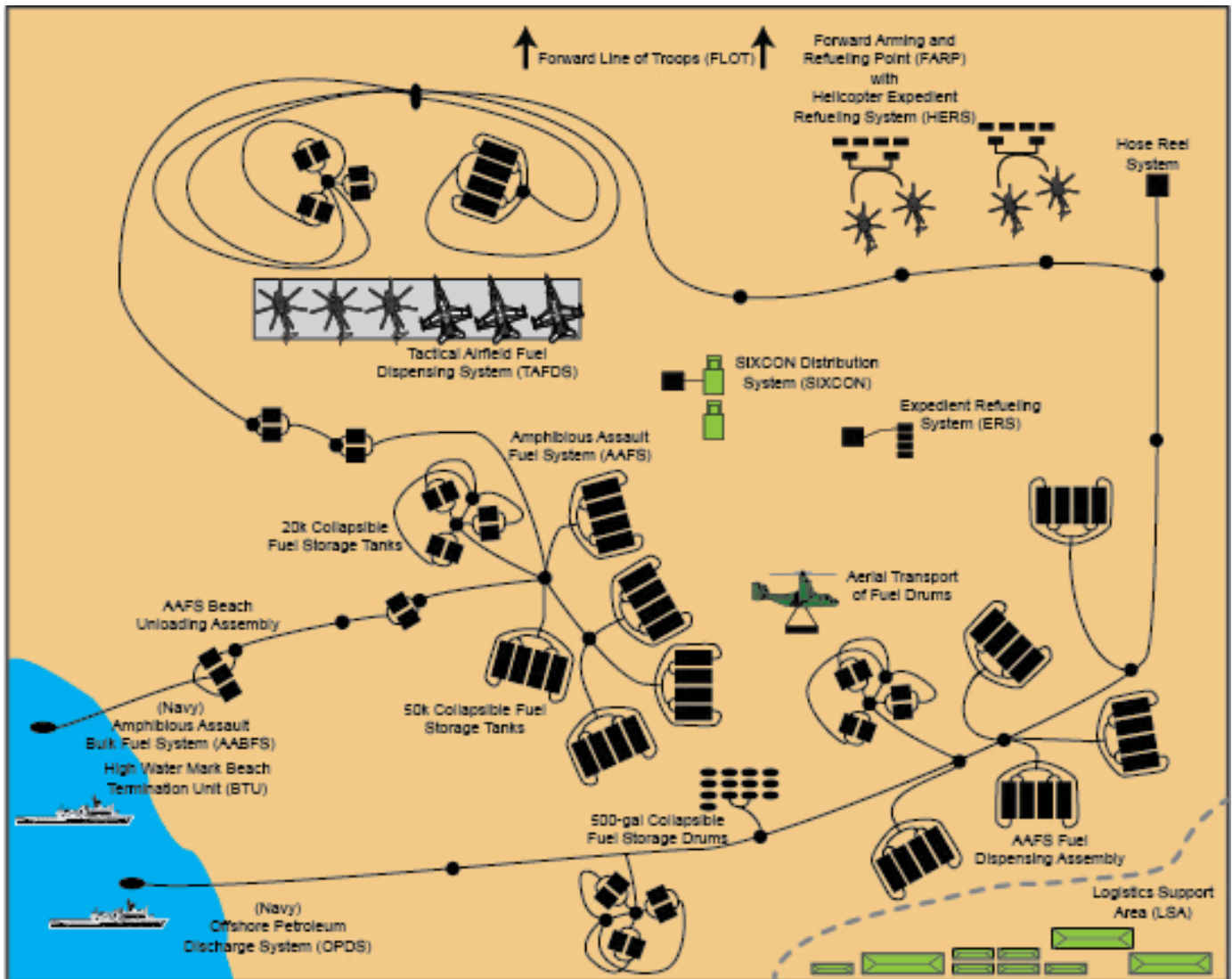


Figure 4-41: Current USMC Tactical Fuel Systems (overview)

Staff Planning Factors and Considerations

a. Amphibious Assault Fuel System (AAFS)

The Amphibious Assault Fuel System (AAFS) receives, stores, transfers, and dispenses bulk fuel for all elements of the MAGTF. The system receives and stores fuels and then distributes them to sub-systems (such as TAFDS, HERS, GERS and ERS, see below) for dispensing to aircraft, ground vehicles etc. An AAFS consists of six 20,000 gallon and twenty 50,000 gallon collapsible fuel tanks together with connecting hoses, pumping stations etc. An Engineer bulk fuel platoon operates one AAFS. An active force engineer bulk fuel company has only three platoons (reduced from four under FSRG). A full MEF requires eight AAFS (but a smaller FSRG MEF might get by with seven). However, the 6th Engineer Support Battalion, USMCR, has three bulk fuel companies (still with four platoons each) that a deploying MEF can call upon when needed. The time required to establish an AAFS can vary widely but a generally accepted rule of thumb is 96 hours.

CAPABILITY		CAPACITY
Storage		1,120,000 gallons
Receipt	Ship - to - shore	720,000 gallons per day
	From rail tanker to tanker trucks	1,110,000 gallons per day
Issue	Bulk or retail issues	550,000 gallons per day
	Assault hose line bulk distribution (HRS)	720,000 gallons per day (system pumping capacity is 600 gal per minute)

Note: All receipt, issue, and transfer capabilities are based on a 20 hour operational day (TM 11275-15/3C)

Table 4-54: Amphibious Assault Fuel System (TAMCN B0685)

b. Tactical Airfield Fuel Dispensing System (TAFDS)

The Tactical Airfield Fuel Dispensing System (TAMCN B0675) receives, stores, and dispenses aviation fuel at expeditionary airfields. With the single fuel on the battlefield concept, the system will be able to supply fuel to both aviation and ground assets. It has a storage capacity of 320,000 gallons (typically in four 50,000-gallon and six 20,000-gallon fuel bladders) and a pump capability up to 600 GPM. It can operate up to 12 aircraft refueling points simultaneously. It can receive up to 720,000 gallons of fuel per day (20 hours) from multiple sources (but usually tanker trucks or an AAFS hose line). Each MWSS is allowed three TAFDS.

c. Helicopter Expedient Refueling System (HERS)

The Helicopter Expedient Refueling System (TAMCN B1135) refuels helicopters in forward areas and remote sites. It is normally used in Forward Arming and Refueling Point (FARP) operations. It has a maximum capacity of 18,000 gallons (six 500-gallon and five 3,000-gallon bladders) and a pumping capability of 125 GPM. It can operate four refueling points and may be deployed as a whole, in part, or with other tactical fuel systems. Each MWSS has three HERS (see 3002c).

d. Expedient Refueling System (ERS)

The Expedient Refueling System (TAMCN B1570) refuels ground vehicles in advanced positions. It consists of a 125 GPM pump and several 500-gallon and/or 3,000 gallon bladders and other components necessary to establish two refueling points.

e. Hose Reel System (HRS)

The Hose Reel System (TAMCN B1139) provides the bulk fuel transfer capability within the MAGTF. A full HRS has two base units, two power units, 11 hose reels (four 600-foot sections of six-inch lay-flat lightweight hose per reel; or about five miles of hose per HRS) and ancillary components necessary to interconnect with the other fuel systems. The HRS has a lay rate to 2 to 2.5 miles per hour in powered mode (or up to 5 miles per hour manually) and a retrieval rate of 0.5 to 0.75 miles per hour. An HRS can transfer up to 600 gallon per minute or up to 720,000 gallons per 20 hour work day. A bulk fuel company is authorized one HRS per AAFS.

f. SIXCON Fuel Module System

The SIXCON fuel module system consists of steel framed modules containing either a 900-gallon tank (TAMCN B2085) or a 125 GPM pump system (TAMCN B1580). A similar system exists for bulk water. Six modules can combine to form a package of the same dimensions as an ISO 20-foot container (8' x 8' x 20') for shipboard transport. Ground vehicles or aircraft can move modules individually. A pump module and several tank modules can make a static (or mobile, if carried in ground vehicles) fuel distribution point. The widely-deployed SIXCON fuel module system can refuel or de-fuel aircraft, ground vehicles, and stationary equipment. (See 3002c for more info.)

g. Ground Expedient Refueling System (GERS)

The Ground Expedient Refueling System (GERS) stores and distributes fuel for ground vehicles and stationary support equipment. HMMWV or larger tactical vehicles can transport and/or operate GERS or GERS can function as a stand alone system. GERS can refuel multiple vehicles simultaneously while meeting specific host vehicle capabilities or mission profiles. It can operate the pumping mechanism with either its own power source or the host vehicle's. GERS is rapidly assembled from man-portable components. It can be scaled as either a small

(TAMCN B0037) or medium (TAMCN B0036) sized system. Both employ two 24 volt air compressors, fueling and air hoses and other supporting hardware but the small system uses six 28-gallon fuel bladders while the medium system uses four 155-gallon bladders.

h. Bulk Fuel Planning Considerations.

Refer to the following publications for guidance and planning purposes: MCRP 3-40B.5 (ex-MCRP 4-11.6), *Petroleum Operations*; TM 3835-OI/1A, *Installation and Operations of Marine Corps Tactical Fuel Systems*; *Aircraft Refueling NATOPS Manual* (NAVAIR 00-80T-109), and MIL-STD-3004A *DoD Standard Practice Quality Surveillance for Fuels, Lubricants, and Related Products*.

Type	Storage Capacity (gallons)	Time to construct (earthwork)
Helicopter Expedient Refueling Systems (HERS)	10,000	No earthwork required
Fabric Tank Linear Tank Farm	20,000	2 MCT dozer hours
Horse shoe tank farm layout	120,000	3 MCT dozer hours
AAFS with side by side linear tank farm berms	1,000,000	12 MCT dozer hours
Fabric fuel tank berm	50,000	1 MCT dozer hours
Horse shoe fuel tank	50,000	3 MCT dozer hours

Table 4-55: Time to Construct Various Tank Farm Configurations

4023. Engineer Expeditionary Airfield Considerations

The storage of these assets on MPF ships have reduced the US deployment time to any theater of operations in the world from 9-10 weeks to 2-3 weeks. Edge clamps, cruciform stakes, and earth anchors are used to secure AM-2 matting to the ground. Portable aircraft arresting gear and marking systems are installed to form a complete airfield that enables air activity at night, in inclement weather conditions, and otherwise unprepared environments.

CONFIGURATION	GRAPHIC	EQUIPMENT NEEDED	TIME TO CONSTRUCT
<p>96' X 96' VTOL pad</p> <p>Stakes are installed as vertical and horizontal load devices</p>		<p>(1 each) F70 – Field Tool Kit</p> <p>(15) F71 - 12' AM2 mat;</p> <p>(15) F72 - 6' AM2 mat</p> <p>(1 set) F74 - Anchors and accessories</p>	<p>Crew of 16 can construct in 8 hours with little to no groundwork</p>
<p>72' x 960' runway with 2 integral 96' x 96' VTOL pads on the ends.</p> <p>400' x 800' taxiway with parking hives for 11 MV-22 (designed for 26' x 102'), no ordnance.</p> <p>Sub-grade prepared to a minimum CBR of 25</p> <p>Stakes are installed as vertical and horizontal load devices</p>		<p>(1 each) F70 - Field Tool Kit</p> <p>(224 pieces) F71 - 12' AM2 mat</p> <p>(209 pieces) F72- 6' AM2 mat</p> <p>(6 sets) F74 - Anchors and accessories</p> <p>(4 sets) F77 - H- Connectors</p>	<p>Site preparation: A crew of 16 working 10 hrs per day can complete in 5 days with:</p> <ul style="list-style-type: none"> • 2 graders • 2 dump trucks • 2 compactors • 1 MCT dozer • 2 TRAM w/ buckets • 6-10K forklifts <p>Installation: A Crew of 36 working 10 hrs per day can complete in 4 days</p>
<p>72' x 960' runway with 2 integral 96' x 96' VTOL pads on the ends.</p> <p>48' x 1200' taxiways with parking hives for 11 AV-8B (designed for 32' x 56').</p> <p>Net explosive weight of 3,000 lbs considered for each aircraft. Sub-grade prepared to a minimum CBR of 25.</p> <p><u>Note:</u> If any other aircraft operate on this airfield, the configuration must be redesigned to accommodate new ordnance separation distance and aircraft clearance zones.</p>		<p>(1 each) F70 – Field Tool Kit</p> <p>(267 pieces) F71 - 12' AM2 mat</p> <p>(267 pieces) F72 – 6' AM2 mat</p> <p>(6 sets) F74 – Anchors and accessories</p> <p>(6 sets) F77 – H-Connectors</p>	<p>Site preparation: A crew of 16 working 10 hrs per day can complete in 5 days with:</p> <ul style="list-style-type: none"> • 2 graders • 2 dump trucks • 2 compactors • 1 MCT dozer • 2 TRAM w/ buckets • 6-10K forklifts <p>Installation: A Crew of 36 working 10 hrs per day can complete in 5 days.</p>

Note: Expeditionary airfields (EAF) can assume an infinite number of configurations. The three shown above are merely examples. There is no standard. Per the AM-2 Tech Manual, a 16 man crew can install 3,300 ft2 per hour.

Table 4-56: Time to Construct Various Expeditionary Airfield Configurations

Staff Planning Factors and Considerations

Type Aircraft	Minimum Parking Hide Requirements for Drive-in / Drive out (for 1 airframe)		Area required for 8 airframe	Time to Construct
F-18	Wing span w/ missiles Length Forward clearance Aft clearance Side clearance Overall area required	41' 56' 63' 6" 63' 6" 7' 6" 10,250'	81,984 square feet	Crew of 16, working 10 hour days can complete in 2.5 days
MV-22	Width (rotors turning) Length (rotors turning) Forward clearance Aft clearance Side clearance Overall area required	83' 57', 4" 25', 8" @ 75 NAC 25' 25' 14,136 ft ²	approximately 114,000 square feet	Crew of 16, working 10 hour days can complete in approximately 4 days
CH-53	Width (rotors turning) Length (rotors turning) Forward clearance Aft clearance Side clearance Overall area required	79 feet 85 feet 25 feet 25 feet 13 feet 23,712 ft ²	189,696 square feet	Crew of 16, working 10 hour days can complete in 6 days
UH-1	Width (rotors turning) Length (rotors turning) Forward clearance Aft clearance Side clearance Overall area required	48 feet 58 feet 49 feet 49 feet 13 feet 11,388 ft ²	91,104 square feet	Crew of 16, working 10 hour days can complete in 3 days
AH-1	Width (rotors turning) Length (rotors turning) Forward clearance Aft clearance Side clearance Overall area required	48 feet 58 feet 49 feet 49 feet 13 feet 11,388 ft ²	91,104 square feet	Crew of 16, working 10 hour days can complete in 3 days
AV-8B	Wing span w/ missiles Length Forward clearance Aft clearance Side clearance Overall area required	32 feet 47 feet 50 feet 50 feet 8 feet 6,808 ft ²	55,200 square feet	Crew of 16, working 10 hour days can complete in 2 days

Table 4-57: Time to Construct Expeditionary Airfield Parking Hides for Various Aircraft

4024. Engineer Water Supply/Production Considerations

a. Lightweight Water Purification System (LWPS)

The Lightweight Water Purification System (LWPS TAMCN B0071) is a reverse osmosis system currently in service with the Marine Corps and Army. Like TWPS (see below), the LWPS can purify NBC contaminated or salt water. It is mounted on modular skids. Four men can lift it and it will normally be transported in a 2-door HMMWV, though a helicopter or *Osprey* can also carry it. It can supply 125 gallons per hour (GPH) of potable water from a fresh water source or 75 GPH from a salt water source.

b. Tactical Water Purification System (TWPS)

The Tactical Water Purification System (TWPS - TAMCN B2605) is skid-mounted, generator-powered and able to produce potable water from any available raw water source at a rate of 1,200-1,500 gallons per hour. It replaces the 600-gallon per hour Reverse Osmosis Water Purification Unit (ROWPU - TAMCN B2604). It requires a 60 kw 416VAC generator (such as an MEP-1070) in order to operate. Fits in a 20-ft ISO shelter for travel but can operate from a skid. Procurement of TWPS is complete.

TWPS produces drinking water from a wide range of water sources including:

- Fresh water containing dirt (dissolved solids) and micro-organisms.
- Water containing nuclear, biological, or chemical warfare (NBC) agents.
- Brackish water containing dirt, micro-organisms, salt and other dissolved solids.
- Seawater containing dirt, micro-organisms and high concentrations of salt and other dissolved solids.

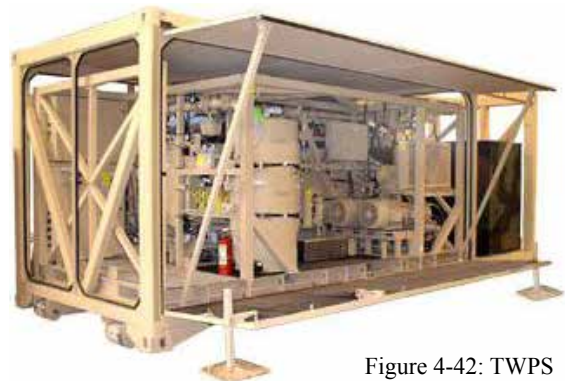


Figure 4-42: TWPS

The TWPS is fielded in two versions: a Marine Corps version designated MC-TWPS and an Army version designated A-TWPS. The differences between the two models centers primarily on the extended capability modules that are optional and packaged separately for the MC-TWPS but that are standard and packed with the A-TWPS. There is an Air Force version similar to that of the Marine Corps. Key differences between the Army and Marine Corps/Air Force versions of TWPS and ROWPU are summarized in Table 4-58, below.

	MC-TWPS (1)	A-TWPS (2)	MC-ROWPU (3)	A-ROWPU (3)
Production rate (gallons / hour) (4)	1,500 (using fresh water) 1,200 (using sea water)	1,500 (using fresh water) 1,200 (using sea water)	600 (maximum)	600 (maximum) (a 3,000-gal version also exists)
Weight (lbs) (dry) with out fuel	9,552 (operating); 12,703 (travel)	22,588	7,300	16,975
Length (feet)	20.00	20.00	9.45	19.01
Width (feet)	8.00	8.00	6.91	8.00
Height (feet)	8.00	8.00	5.68	8.08
Power (5)	60 kw generator	60 kw generator	30 kw generator	30 kw generator

- Notes:
- (1) The Marine Corps TWPS does not include its own generator. Extended capability modules (cold weather, waste water storage cleaning, ocean intake structure systems, NBC treatment and NBC survivability) are available separately. Fits in an ISO 20-ft shelter. Requires an MTVR for mobility.
 - (2) The Army TWPS is packed in a 20-ft ISO shelter that houses a generator and all extended capability modules. It also includes an extended distribution kit (not available for the Marine Corps version).
 - (3) The Army ROWPU includes a five-ton trailer and a generator. The skid-mounted Marine Corps ROWPU does not.
 - (4) These rates can be significantly reduced at low temperatures or when the water has a high content of dissolved solids. ROWPU cannot remove chlorine contamination but TWPS can.
 - (5) A 60 kw generator powering at TWPS cannot simultaneously furnish power to any other device.

Table 4-58: Comparison of the TWPS and ROWPU Water Purification Systems

c. LHS Compatible Water Tank Rack (Hippo)

The Load Handling System (LHS) Compatible Water Tank Rack (Hippo) replaces 3K and 5K gallon Semi-trailer Mounted Fabric Tanks (SMFT). Hippo consists of a 2,000 gallon potable water tank on an ISO frame with an integrated pump (125-gal/minute), engine, alternator, filling stand, and 70-foot hose reel with bulk suction and discharge hoses.

Hippo is fully functional mounted or dismounted and is rapidly transported or set up whether full, partially full or empty. It can operate in cold weather environments and prevent water from freezing at -25° F. It can directly fill containers as small as canteens. Operating or supporting it requires only minimal equipment and personnel. Currently, this is only an Army system. The Marine Corps has not yet announced any plans to adopt it.

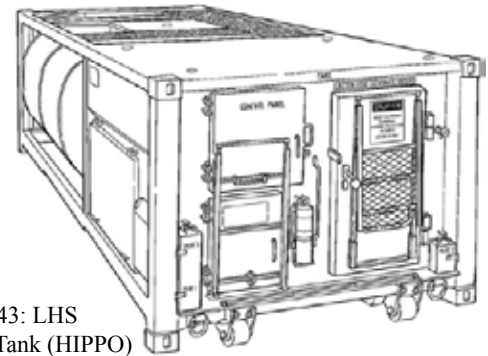


Figure 4-43: LHS Water Tank (HIPPO)

d. Water Supply Support System

The water supply support system consists of modular components to provide flexible and responsive water support. The ability to alter the system configuration and the interchangeability of components allows for the creation of limitless combinations of tailored systems to meet any mission requirement. Table 4-59 lists major water supply support systems for each MEF and MPSRON (data for FY13).

TAMCN	Nomenclature	Total Per MPSRON (1)	With the Ships (1)	Fly-In Element (1)	I MEF	II MEF	III MEF
B0071	Light-weight water purification system	19	0	19	46	44	17
B0571	500 gallon water drum	42	36	6	86	78	60
B0676	Forward area water point supply support system (FAWPSS)	7	6	1	13	12	1
B1581	SIXCON water pump module	43	43	0	105	99	64
B2086	SIXCON water tank module	167	153	14	335	346	232
B2130	3,000 gallon collapsible tank	75	71	4	541	509	340
B2131	Tank farm interconnection set	16	14	2	20	20	3
B2391	TWDS Pump station (2)	6	6	0	4	4	0
B2392	TWDS storage assembly (2)	2	2	0	2	2	0
B2393	TWDS distribution point (2)	2	2	0	2	2	0
B2394	TWDS 600 GPM water pump (2)	12	6	6	18	18	4
B2395	TWDS 5 mile segment kit (2)	1	1	0	2	2	0
B2605	1,500 gallons per hour TWPS	20	18	2	44	42	35
B2631	50,000 gallon water tank	18	18	0	4	4	0
B2632	20,000 gallon water tank	16	14	2	38	38	24

- Notes:
- (1) Figures are for MPSRON-2 as of FY13; MPSRON-3 figures will differ slightly
 - (2) TWDS = Tactical Water Distribution System.

Table 4-59: Water Supply Support System Allowances

4025. Class I (Subsistence, excluding water) Planning Data

a. Rations

In a joint operation Class I (subsistence) support normally becomes an Army responsibility after D+60. The Army has developed a “family” of field rations which the Marine Corps has largely adopted. It consists of individual rations, group rations, special feeding rations and ration enhancements. Group rations require milk (fresh or preserved using an ultra high temperature [UHT] process) as a supplement to meet minimum Surgeon General nutritional standards. Enhancement items like salad, bread and fruit can supplement any ration.

The Marine Corps Field Feeding Program (MCFPP) assumes that in a given operation most personnel ashore will eat packaged operational rations (POR; an MRE is a POR) exclusively through D+20. From D+21 only 20% of personnel ashore subsist on POR alone. Another 30%

Staff Planning Factors and Considerations

get two UGR (Unitized Group Rations)-H&S (with milk supplement plus enhancements) and one POR per day. The remaining 50% get two UGR-A/B (with supplements and enhancements) and one POR per day. UGR-H&S rations (see Table 4-60) are pre-cooked and packaged in sealed trays. They require no refrigeration and no preparation except immersion heating in a TRHS (see below). They feed troops at locations too remote for UGR-A/B. Both UGR A and B are “institutional” type food requiring field kitchens (and trained food service personnel) for preparation (see Table 4-60). Troops should not eat POR more than once per day unless no other feeding options exist. Hospital patients should get UGR (with medical diet supplements) exclusively and eat POR only in emergencies.

Type & Category	U/I (Unit of Issue)	Servings per U/I	U/I per Pallet	Servings per Pallet	Pallet Weight	Pallet Dimensions (L-W-H)	Pallets per Container		Shelf Life
							20' ISO	40' ISO	
Packaged Operational Rations (POR) - or individual rations									
MRE (Meal Ready to Eat)	case	12	48	576	1,098#	43"x52"x44"	***8	***18	60 mo @ 40°F 36 mo @ 80°F 6 mo @ 100°F
<i>Use of MRE or other POR as sole sustinment for periods over 21 days is not recommended; Flameless Ration Heater (FRH) will heat MRE</i>									
MCW (Meal Cold Weather)	case	12	48	576	758#	43"x52"x44"	***8	***18	84 mo @ 40°F
LRP (Food Pack Long Range Patrol - Special Ops)									48 mo @ 80°F 18 mo @ 100°F
<i>MCW will not freeze and has extra drink mixes to counter dehydration. LRP is a restricted calorie ration for use when resupply not available.</i>									
FSR (First Strike Ration)	case	9 (x3)	48	432 (x3)	1,098#	43"x52"x44"	***8	***18	24 mo @ 80°F
<i>An FSR is a one-day ration (three meals) issued to troops involved in highly mobile/intense combat action. ***Single layer of pallets only.</i>									
Group Field Feeding (Unitized Group Rations, or UGR)									
UGR-H&S (Heat & Serve)	module	50	8	400	1,036#	48"x40"x42"	***8	***19	24 mo @ 40°F
UGR-E (Express)		18	18	324	816#	48"x40"x36"			18 mo @ 80°F 3 mo @ 100°F
<i>Both UGR H&S and UGR-E are precooked rations packaged on trays. H&S rations are heated with a TRHS (an arctic supplement is available); UGR-E is for troops in locations too remote for UGR-H&S; it is heated with chemical pads. ***Single layer of pallets only.</i>									
UGR-A* (1 box perishable)	module	50	24	1,200	**642#	48"x40"x40"	***8	***19	5 mo @ <32°F for perishables; 18 mo @ 80°F for semi-perishables
UGR-A* (2 boxes semi-perishable)			12	600	**844#				
UGR-B* (3 boxes semi-perishable)			8	400	**1,045#				
UHT Milk* (Meal Supplement)	case	27	120	3,240	1,970#	48"x40"x43"	***8	***19	10 mo @ 80°F
<i>*UGR-A perishables require refrigeration. UGR-B (USMC only) substitutes canned items for perishables; UHT is a mandatory UGR supplement. UGR-A/B are not pre-cooked and require field kitchens (EFK or E-TRHS) and MLG/MWSS food service personnel. Battalion and regimental mess teams can only serve/issue UGR-H&S, UGR-E or POR. **Exact weight varies with the menu. ***Single layer of pallets only.</i>									
Special Field Feeding									
Religious meal (Kosher/Halal)	case	12	30	360	540#	43"x52"x44"	***8	***18	6 mo @ 80°F
HDR (Humanitarian Daily Ration)		10	48	480	1,237#				no data
<i>Both are considered POR (a Passover version of the religious meal is available); civil affairs personnel order/control HDR</i>									
Meal Enhancements (common types only - not an exhaustive list; does not include medical diet supplements)									
Pouch Bread	box	96	15	1,440	330#	48"x40"x46"	***8	***19	no data
Cereal (add to UGR breakfast menu)	case	72	50	3,600	460#	48"x40"x65"	***8	***19	
FF&V (Fresh Fruit & Vegetables)	18-26# fruits or 5# salad per 50 personnel				*1,500#	48"x40"x48"	***8	***19	variable
Health & Comfort Pack (HCP I)	box	10	12	120	736#				24 mo @
HCP II (female); HCP III (body wipes)		10	16	160	328#				50° to 72° F
Bottled Water (0.5 liter bottles)	case	24	72	1,728	2,128#				N/A
Bottled Water (1.0 liter bottles)		18	60	1,080	2,620#				
Bottled Water (1.5 liter bottles)		12	50	600	2,140#				
<i>*Exact weight varies by menu unit; an ice/frozen food pallet weighs about 1,960#. HCP issued for deployments above 15 days when PX unavailable; one HCP = 30 day supply for 1 person. Bottled water issued when TWPS/LWPS unavailable. ***Single layer of pallets only.</i>									

Table 4-60: Army Class I (Subsistence) Planning Data (ATP 4-41 12-2015 & MCRP 3-40G.1 [ex-MCRP 4-11.8A] 12-2013)

b. Field Feeding Equipment

The primary Marine Corps field feeding equipment items are as follows:

Field Refrigeration Systems: The Large Field Refrigeration System (LFRS) (TAMCN B0049) is a refrigerated 20' ISO container (8'x 8' x 20'). The Small Field Refrigeration System (SFRS) (TAMCN B0075) is a tricon or one third of a 20' container (or 8'x 8'x 6.5'). An MEP-1040 (MEP-803A) (TAMCN B0891) or equivalent generator powers one LFRS or up to three SFRS. (Ship power is used at sea.) Empty weight is 6,922-lbs (LFRS) or 3,350-lbs (SFRS). Storage space is 944 (LFRS) or 282 cu fi (SFRS). Max. gross weight (LFRS) is 52,910-lbs. Moving an LFRS/SFRS requires MTRV/LVSR lift and forklift support. An LFRS/SFRS operates in either refrigerator or freezer mode.

Expeditionary Field Kitchen: The EFK is a kitchen module (TAMCN C0034) that folds for travel into a 20-foot ISO container. It includes two Tray Ration Heating Systems (TRHS TAMCN C6621 - see below). It travels on an MMC20 flatbed DSS trailer (TAMCN E0070), which requires an MTRV as prime mover. An EFK requires an MEP-1040 or similar generator for electric power. It weighs 14,000-lbs (empty), uses

an airtronic burner for conventional cooking and has 46-cf of refrigerator space. A supervisor and four personnel can convert it from travel to operating mode in 45 minutes. It can prepare UGR-A/B or H&S rations for 500-700 troops twice daily. (See Figure 4-44).

Enhanced Tray Ration Heating System. E-TRHS (TAMCN C0035) is an intermediate level field kitchen contained in an SFRS. In travel mode the SFRS is switched off and loaded with a TRHS, two M1959 field ranges (TAMCN C5820), tables, tentage and other gear needed for a field kitchen. Upon arrival at the operating site, Marines unload the equipment from the SFRS and set it up outside. They then power up the SFRS and fill it with perishable or semi-perishable food. Once up and running an E-TRHS can prepare UGR-A/B or H&S rations for 250 personnel twice daily. Its maximum gross weight is 15,000 pounds. (See Figure 4-45.)

Tray Ration Heating System. The TRHS (TAMCN C6621) heats up to 250 UGR-H&S rations simultaneously in boiling water within 40 minutes. It fits in a HMMWV and can heat rations while en route to a feeding site. It uses JP-8 fuel (a five gallon tank supports ten hours' operation) and 120 VAC, 60 Hz electric power. It feeds up to 250 personnel a day at one site or up to 500 at three sites. It weighs 285-lbs empty or 400-lbs with water and rations (see Figure 4-46).

Equipment Distribution: An MLG food service company rates 14 EFK, 10 E-TRHS, 2 LFRS, 5 SFRS (plus 10 included in E-TRHS) and 15 TRHS (plus 38 included in EFK and E-TRHS). An MWSS has 2 EFK, 1 E-TRHS, 2 LFRS, 4 (+1) SFRS and 7 (+5) TRHS. A GCE battalion food service section typically has one or two SFRS and three TRHS. A medical battalion H&S Company has one LFRS. A surgical company has four SFRS. In FY16 I MEF rated 22 EFK, 14 E-TRHS, 27 LFRS, 67 (+14) SFRS and 121 (+58) TRHS. II MEF rates 21 EFK, 16 E-TRHS, 26 LFRS, 64 (+16) SFRS and 111 (+58) TRHS. III MEF rated 16 EFK, 12 E-TRHS, 13 LFRS, 45 (+12) SFRS and 66 (+44) TRHS.



Figure 4-44: Expeditionary Field Kitchen (EFK)

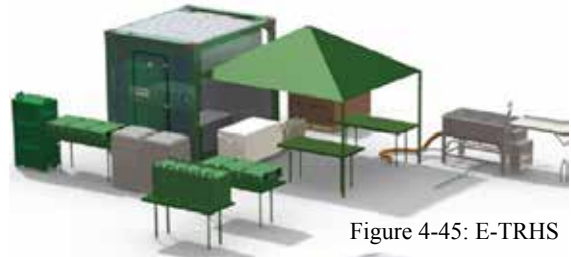


Figure 4-45: E-TRHS



Figure 4-46: TRHS

4026. Sea Container Planning Factors

Any long distance strategic movement or line of communication is likely to involve the extensive use of ISO (International Standards Organization) sea containers. Planners should be familiar with the basics of this equipment. Containers exist in a wide variety of types and sizes. Originally, a dry cargo container was a steel or aluminum box 20 or 40 feet long by 8 feet wide by 8 feet high but since then the ISO has increased standard container height by six inches. The weights and measurements of typical 20' and 40' steel containers are as follows:

Container Type	Dimensions (length x width x height)		Door Opening (width x height)	Tare (empty) Weight	Maximum Gross Weight	Cube
	Exterior (inches)	Interior (inches)				
20-ft Steel	238" x 96" x 102"	231" x 92.5" x 93.75"	92" x 89.25"	5,000-lbs	67,000-lbs	1,169 cf
40-ft Steel	480" x 96" x 102"	474" x 92.5" x 93.75"	92" x 89.25"	8,000-lbs	67,000-lbs	2,387 cf

Note: Exact dimensions vary slightly by manufacturer

Table 4-61: Dimensions and Weights of Standard ISO Sea Containers (steel)

“High cube” containers are a foot taller than standard. Open top containers (essentially flatracks with sides) carry cargo that requires vertical loading. Commercial shippers also use extra long 45 and 53 foot containers. They use aluminum containers as well. These are about 15% lighter than similar steel containers but are much less durable and therefore less common. In theory all containers (regardless of size) carry approximately the same maximum payload weight (29 to 30 ST). However, in practice road, bridge, and material handling equipment restrictions plus cargo type/density will greatly reduce this.

To get realistic figures the 2009 Logistic Management Institute (LMI) study AR738T1 examined supply shipments sent to Kuwait in support of OIF between January and June 2003. It measured weight and volume by supply class. CASCOM (Combined Arms Support Command) approved the results for transportation planning. Table 4-62 presents data relating to 20' sea containers. In the lighter supply classes loads for 40' containers would be more than twice as large (which is why they predominate in commercial shipping) but would not exceed 20-25 ST. For comparison break bulk loads within a container footprint (8' x 20') but not more than 4' high (because trucks are not normally loaded above their sideboards) are included. Container load weights do not include the weight of the container itself (about 2.5 ST).

Type/Supply Class	Class I	Class II	Class III(p)	Class IV	Class V	Class VI	Class VII	Class VIII	Class IX
cargo weight by supply class in lbs per cu ft	19.50	10.310	20.550	24.520	28.540	12.190	10.210	12.000	15.420
breakbulk cargo (20'x 8'x 4') wt. in Short Tons	6.24	3.299	6.576	7.846	9.120	3.901	2.267	3.840	4.934
20' container cargo wt. in ST (payload only)	6.57	3.230	5.640	7.600	10.050	N/A	3.590	4.050	3.510

Table 4-62: 20-foot Container - Breakbulk Load Comparison by Weight and Supply Class (LMI AR738T1 study)

Note: Container ships are rated by the number of containers they can carry, expressed in twenty foot equivalent units or TEU. For example, space for one 40' container equals two TEU. Space for four 45' containers equals nine TEU. Space for three 53' containers equals eight TEU, and so forth (see ATP 4-12, *Army Container Operations*, May 2013).

Staff Planning Factors and Considerations

4027. Movement Control Planning Factors

See MCRP 3-40F.7 (ex-MCRP 4-11.3H) *Multi-Service Tactics, Techniques, and Procedures for Tactical Convoy Operations* 04-2014, and ATP 4-16, *Movement Control* 04-2013.

Movements are measured by calculating how long it takes to move a given distance. The three methods of measurement are speed, pace, and rate of march. They are defined as follows:

- Speed is the speedometer rate at which a vehicle is moving at a given time. It is expressed as KPH or MPH.
- Pace is the regulated speed of a convoy or an element as set by a lead vehicle, the pacesetter. It is constantly adjusted to suit road, terrain, and weather conditions. Pace is also expressed as KPH or MPH.
- Rate of march is the average distance covered in a specific time period. It includes short halts and delays, but not long halts, such as those for meals or for overnight stops. It is expressed in KMH or MPH. Rate of march is used in movement calculations.

a. Concept

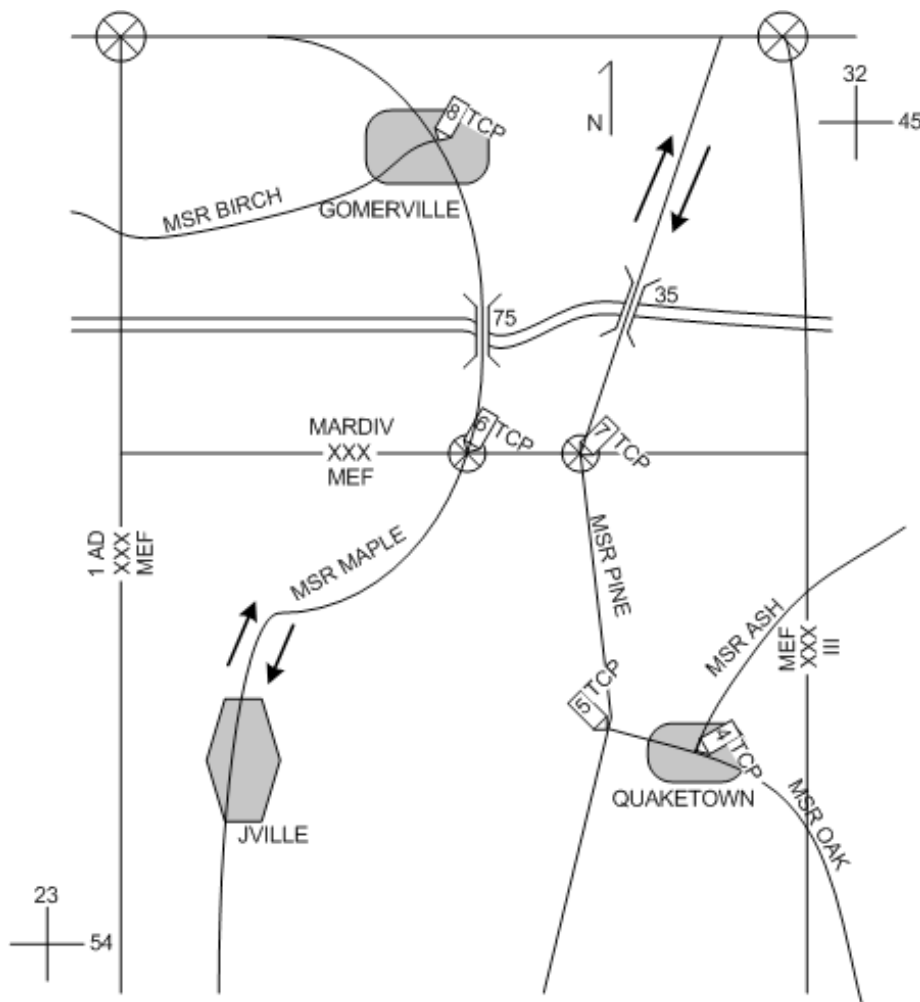


Figure 4-47: Movement Control Diagram

b. Time-Distance Factors

Time and distance factors are used to perform a wide range of calculations for planning highway movements. They can be used to develop movement tables and to conduct expedient planning and calculating to deconflict movement requests.

c. Distance Factors

Distance factors are expressed in kilometers or meters. The following terms are used to describe distance factors:

- Road space - length of a column, plus any space (safety factor), added to prevent conflict with preceding or following traffic.
- Gap - space between vehicles, march units, serials, and columns. Gap is measured from the trail vehicle of one element to the lead vehicle of the following element. The gap between vehicles is normally expressed in meters. The gap between march elements is normally expressed in kilometers.

- Length of any column or column element = the length of roadway it occupies, measured from the front bumper of the lead vehicle to the rear bumper of the trail vehicle and including all gaps.
- Lead - linear spacing between the heads of convoy elements or between successive vehicles, march units, serials, or columns.
- Road distance - the distance from point to point on a route, normally, expressed in kilometers.
- Road clearance distance - the distance that the head of a column must travel for the entire column to clear the RP or any point along the route. Road clearance distance equals the column's length or road space plus road distance.

d. Time Factors

Time is expressed in hours or minutes. The following terms are used to describe time factors:

- Pass time (or time length) - time required for a column or its elements to pass a given point on a route.
- Time space - time required for a column or its elements to pass any given point on a route plus any additional time (safety factor) added to the pass time.
- Time gap- time measured between vehicles, march units, serials, or columns as they pass a given point. It is measured from the trail vehicle of one element to the lead vehicle of the following element.
- Time lead - time measured between individual vehicles or elements of a column, measured from head to head, as they pass a given point.
- Time distance - time required to move from one point to another at a given rate of march. It is the time required for the head of a column or any single vehicle of a column to move from one point to another at a given rate of march.
- Road clearance time - total time required for a column or one of its elements to travel the road distance and clear a point along the route or the RP. Road clearance time equals the column's pass time or time space plus time distance.

e. Distance, Rate, and Time Calculations

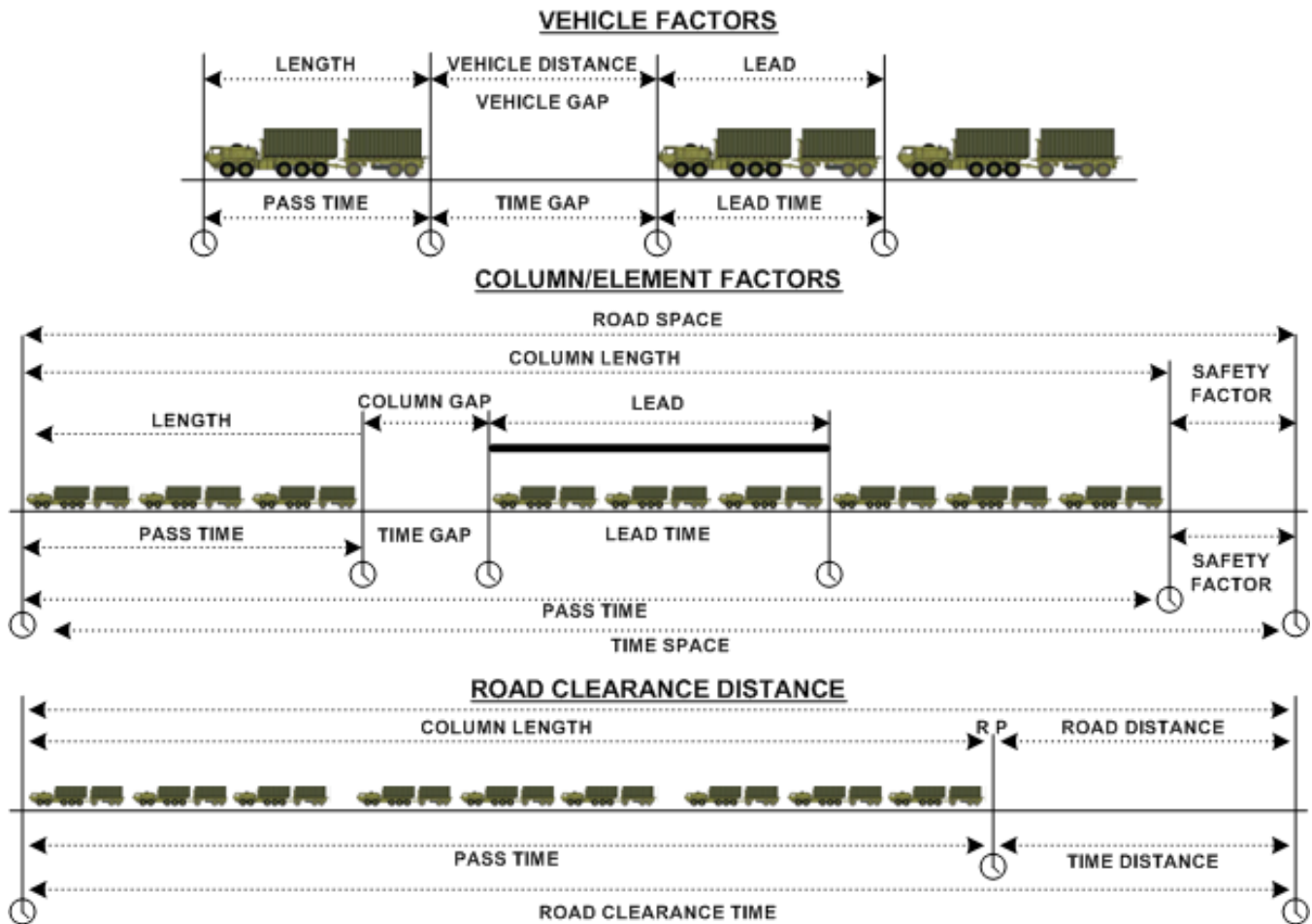


Figure 4-48: Time and Distance factors

Distance, Rate, and time factors are used to make scheduling calculations for columns of any size. When two of the three factors are known, the third can be determined using one of the equations shown below. These factors are determined using the following formulas—

Staff Planning Factors and Considerations

Distance equals rate multiplied by time. If the rate of march is 40 KMPH and time is 4 hours, the distance is 160 kilometers. $40 \times 4 = 160$

Rate equals distance divided by time. If a convoy travels for 5 hours to complete a 190 kilometer trip, its rate of march is 38 KPH.

$$190 \div 5 = 38$$

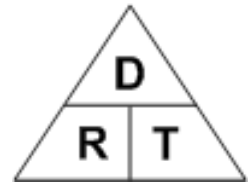
Time equals distance divided by rate. If the distance is 210 kilometers and the rate of march is 42 KPH, the time is 5 hours.

$$210 \div 42 = 5$$

f. Finding an Unknown Factor of Distance, Rate, or Time

Divide a triangle as shown. To find an unknown factor, cover it. The uncovered portion of the triangle give you the formula for finding the unknown.

For example, if the distance (D) is unknown, cover it and RT (rate x time) remains. If rate (R) is unknown, covering R leaves D/T. Do the same for time (T), and you find D/R.



g. Arrive and Clear Time Calculations

Arrive and clear times are not the same as time factors. The time factors measure a quantity of time or distance. Arrive and clear times represent actual time as displayed on a clock. The “arrive” time is the time the first vehicle in the column will arrive at an SP, CP, or RP. It is derived from the time distance. The clear time is the time the last vehicle in the column will clear that SP, CP, or RP.

- Calculating Arrive Times. The “arrive” time at the SP is the same as the SP time. To calculate the arrive time at the first CP, take the distance from the SP to the first CP, divide by the planned rate of march, and multiply by 60 (minutes). Add this time to the “arrive” time at the SP to determine the “arrive” time at the first CP.

Example: Distance from SP to first CP: 10 km
March rate: 50 KPH

Solution: $10 \div 50 = .20 \text{ hrs} \times 60 = 12 \text{ min}$

If the arrive time at the SP was 0800, then the “arrive” time at the first CP would be 0812.

To calculate the arrive time at the second CP, take the distance from the first CP to the second CP, divide by the rate of march, and multiply by 60. Add the amount of time to the “arrive” time at the first CP to determine the “arrive” time at the second CP.

Example: Distance from first to second CP: 15 km
March rate: 50 KPH

Solution: $15 \div 50 = .30 \text{ hrs} \times 60 = 18 \text{ min}$

If the arrive time at the first CP was 0812, then the “arrive” time at the second CP would be 0830. Continue this method to calculate the “arrive” time at succeeding CP(s) through the RP.

- Calculating Clear Times. To calculate the clear times at each CP, planner must determine the pass time. Calculating pass time requires four calculations: density, time gaps, road space, and pass time. These four calculations are determined using the following formulas:

$$\text{Density} = 1,000 / \text{Vehicle gap} + \text{average length of vehicle}$$

Note: Vehicle gap is expressed in meters, representing the gap between vehicles. Average length of vehicle is expressed in meters, representing the average length of the most common vehicle in the column.

Example: If the vehicle gap is 100 meters and the average vehicle length is 18 meters, then—

$$\text{Density} = 1,000 / 100 + 18 = 1,000 / 118 = 8.5 \text{ vehicles per kilometer}$$

Time gaps = [(number of march units - 1) x (march unit time gap)] + [(number of serials - 1) x (serial time gap - march unit time gap)].

Example: If a column has two serials with two march units each and the gap between march units is 5 minutes and the gap between serials is 10 minutes, then—

$$\text{Time gaps} = [(4 - 1) \times 5] + [(2 - 1) \times 5] = [3 \times 5] + [1 \times 5] = 15 + 5 = 20 \text{ minutes}$$

$$\text{Road space} = \text{number of vehicles} / \text{density} + \text{time gaps} \times \text{rate} / 60 \text{ (minutes)}$$

Example: number of vehicles = 87

Density = 8.5 per km

Rate = 50 KPH

Time gaps = 20

$$\text{Road space} = 87 / 8.5 + 20 \times 50 / 60 = 10.2 + 16.8 = 26.9 \text{ km}$$

$$\text{Pass time} = \text{road-space} \times 60 / \text{rate}$$

Example: Continuation from above.

$$\text{Pass time} = 26.9 \times 60 / 50 = 1,614 / 50 = 32.2 \text{ or } 33 \text{ minutes}$$

In this example, the clear time at the SP is 33 minutes after the first vehicle crossed the SP. If the arrival time at the SP is 0800 the clear time at the SP will be 0833. If the arrival time at the first CP is 0812, the clear time at the first CP will be 0845. Use this same method to calculate the “arrive” and clear times at succeeding CP(s) to the RP. This movement can be depicted as:

CP	Arrive Time	Clear Time
1	0800	0833
2	0812	0845
3	0845	0930

Table 4-63: Example of Clear and Arrive Times 1.

The pass time will stay the same throughout the route as long as the march rate and density do not change. If the march rate or density changes, then recalculate the pass time to determine the new clear time.

- Rest Halts. The march rate allows for short halts, but not scheduled rest halts. Plan scheduled rest halts during the movement planning process. When planning rest halts, allow time to get vehicles off the road and staged, time to rest, and time to get vehicles back on the road. If you need 10 minutes for a rest halt, then schedule 15 minutes for the halt to ensure time to get vehicles on and off the road.

If a rest halt is scheduled at a CP, the “arrive” time at the CP does not change. What changes is the clear time at that CP and the “arrive” and clear times at succeeding CP(s). Adjust the clear time by the scheduled halt time. If a rest halt is scheduled between CP(s), adjust both the “arrive” and clear times at the next CP by the scheduled halt time. Continuing, with the previous example, if you plan a 15-minute rest halt between CP 2 and CP 3, you must adjust the times as follows:

CP	Arrive Time	Clear Time
1	0800	0833
2	0812	0845
3	0845	0918

Table 4-64: Example of Clear and Arrive Times 2.

Note the 15-minute delay in arriving and clearing CP 3. If you planned the rest halt at CP 2, your adjustments would be as follows:

CP	Arrive Time	Clear Time
1	0800	0833
2	0812	0900
3	0845	0918

Table 4-65: Example of Clear and Arrive Times 3.

Note the 15-minute delay in clearing CP 2, arriving at CP 3, and clearing CP 3.

The pass time will stay the same throughout the route as long as the march rate and density do not change. If the march rate or density changes, you must recalculate the pass time to determine the new clear time. Follow these guidelines to simplify calculations:

- Prepare and use conversion tables for changing US common distances to metric distances, number of vehicles to time length, and distance to time.
- Standardize variables to reduce calculation time. When possible, use standard march rates and density.

4028. Movement Planning Data

a. Unopposed Foot March

	Visibility	Rate of March (km/hr)	Normal March (8 hrs = # km)	Forced March (12 hr = # km)
Roads	Day	4	32	48
	Night	3	24	36
Cross Country	Day	2	16	24
	Night	1	8	12

Note: Computed on a 50-minute hour, allowing a 10 minute halt every hour

Table 4-66: Movement Planning for Unopposed Foot March

b. Unopposed Vehicle Movement Speed

	Visibility	M1/AAV/BFV	Wheeled Vehicle
Maximum Unopposed Road Speed	Day	40 km / hr	35 km / hr
	Night	30 km / hr	25 km / hr
Maximum Unopposed Off the Road Speed	Day	20 km / hr	10-15 km / hr
	Night	10 km / hr	5-10 km / hr

Table 4-67: Movement Planning for Unopposed Vehicle Movement

Staff Planning Factors and Considerations

c. Opposed Vehicle Movement Speed (Delaying)

	Visibility	M1/AAV/BFV	Wheeled Vehicle
Maximum Opposed Road Speed vs. Enemy Delaying	Day	6 - 10 km / hr	6 - 10 km / hr
	Night	2 - 4 km / hr	2 - 3 km / hr
Maximum Unopposed Off the Road Speed vs. Enemy Delaying	Day	4 - 6 km / hr	2 - 4 km / hr
	Night	2 - 3 km / hr	1 - 2 km / hr

Table 4-68: Movement planning for enemy delaying vehicle movement

d. Opposed Vehicle Movement Speed (Defending)

	Visibility	M1/AAV/BFV	Wheeled Vehicle
Maximum Opposed Road Speed vs. Enemy Defending	Day	1 - 2 km / hr	1 - 1.5 km / hr
	Night	1 km / hr	0.5 - 1 km / hr
Maximum Unopposed Off the Road Speed vs. Enemy Defending	Day	1 - 1.5 km / hr	0.5 - 1 km / hr
	Night	0.5 - 1 km / hr	.05 km / hr

Table 4-69: Movement Planning for Enemy Defending Vehicle Movement

e. Typical Pass Times for a Tactical Road March (U.S. Army)

	Heavy Division on one route			Brigade on one route		
Rate (km/hr)	40	30	25	40	30	25
Column length	301	245	180	70	55	40
Pass time	7 hrs, 30 mins	8 hr, 15 mins	7 hrs, 15 mins	1 hr, 45 mins	2 hrs	1 hr, 40 mins

Table 4-70: Typical Pass Times for a Tactical Road March

f. Movement Planning

Speed miles / Km per hour	Rates of March Miles/Km per hour*	Minutes to Travel one Km*	Meters per minute	Minutes to travel 1 mile
10 mph 16 kph	8 mph 12 kph	5	200	7.5
10 mph 15 kph	9 mph 15 kph	4	250	7.5
15 mph 25 kph	12 mph 20 kph	3	333	5
20 mph 32 kph	16 mph 25 kph	2.4	417	3.75
25 mph 40 kph	19 mph 30 kph	2	500	3
30 mph 48 kph	25 mph 40 kph	1.5	667	2.4
35 mph 48 kph	30 mph 46 kph	1.3	767	2
40 mph 64 kph	35 mph 53 kph	1.13	883	1.5

This table provides the time required to travel 1 km or 1 mile while using specified march speeds.

* The travel times are calculated based upon rates of march (miles / km in 1 hour) and include time for scheduled short halts and time lost due to road and traffic conditions. The time for long halts must be added to the total time traveled (miles or km) by the travel time factor for 1 mile or 1 km for the designated speed.

Pass Time Computation

$$\frac{\text{Vehicles}}{\text{Number of passages points (PP)}} = \text{Vehicles per Passage Point}$$

$$\frac{\text{Rate of Movement (MPH)}}{\text{Column Interval (X Km)}} = \text{Vehicle per hour at PP}$$

$$\frac{\text{Vehicles per PP}}{\text{Vehicles per hour at PP}} = \text{Pass Time}$$

Table 4-71: Movement Planning

4029. Logistics Concept

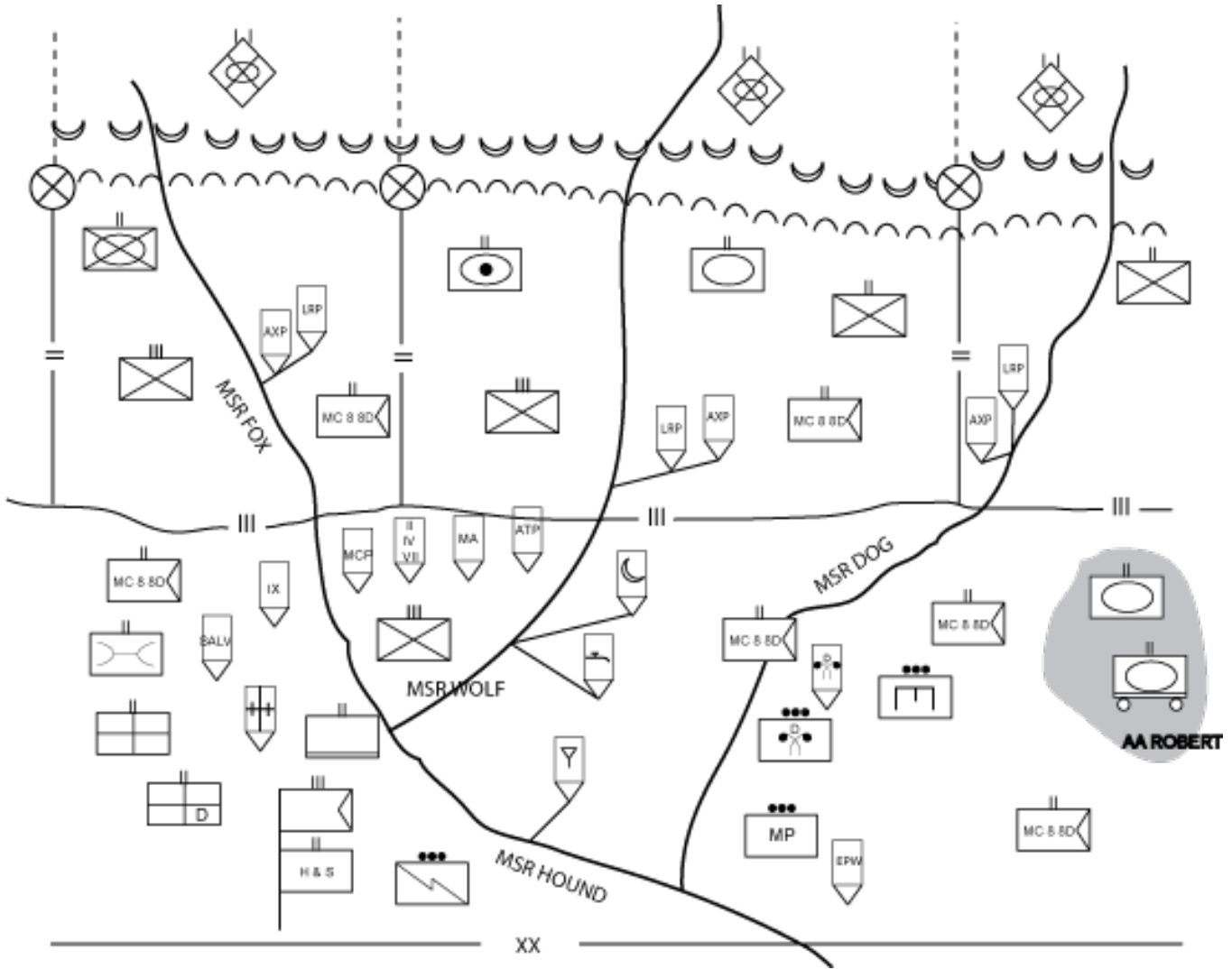


Figure 4-49: Logistics Concept Diagram

4030. Logistics Planning Factors

a. Marine Expeditionary Force Supply Requirements

	Daily	30 days of supply (DOS)	60 DOS
Class I (stons)	196	5,594	11,788
Class II (stons)	83	2,500	5,000
Class III Packaged (P) (stons)	40	1,200	2,400
Class III Bulk (B) (gallons)	950,010	28,500,300	75,000,000
Class IV (stons)	139	4,183	8,366
Class V (stons)	1,600	74,000	96,000
Class VI (stons)	26	780	1,560
Class VIII (stons)	3	100	200
Class IX (stons)	41	1,240	2,480
Water (gallons)	260,300	7,809,000	15,618,000
Mail (stons)	34	1,020	2,040

Table 4-72: Marine Expeditionary Force Daily Supply Requirements (Draft MCRP 4-11A CSS Field Reference Guide 2000)

Staff Planning Factors and Considerations

b. Class I (Food)

Ration/Item Type	Pallet Type (l x w)	Weight per Pallet	Servings per Pallet	Cases/Modules per pallet	Pallets per 500 personnel/day
MRE	43" x 52"	1,098-lbs	576	48	2.6 (3 meals/day)
FSR	43" x 52"	1,098-lbs	1,296*	48	1.15 (3 meals/day) *432 rations of three meals each
MCW/LRP	43" x 52"	758-lbs	576	48	2.6 (3 meals/day)
UGR-H&S	48" x 40"	1,036-lbs	400	8	2.5 (2 meals/day) + 0.86 pallets of MRE (1 meal/day)
UGR-A (perishable)	48" x 40"	642-lbs	1,200	24	0.83 (perishable) + 1.67 (semi-perishable) (2 meals/day) + 0.86 pallets of MRE (1 meal/day)
UGR-A (semi-perishable)	48" x 40"	844-lbs	600	12	
UGR-B (semi-perishable)	48" x 40"	1,045-lbs	400	8	2.5 (2 meals/day) + 0.86 pallets of MRE (1 meal/day)
UHT Milk Supplement	48" x 40"	1,970-lbs	3,240	120	0.31 (add-on to UGR-A/B/H&S) (2 meals/day)

32 pallets per LCAC (single stack -- must be used in 4 - 8 ft. seas)
64 pallets per LCAC (double stack -- may be used in 0 - 4 ft. seas)

917 lbs per new pallet x 64 pallets = 58,688 lbs per LCAC (in 0 - 4 ft. seas) = 29.34 STONS
847 lbs per new pallet x 64 pallets = 54,208 lbs per LCAC (in 0 - 4 ft. seas) = 27.10 STONS
1,098 lbs per old pallet x 64 pallets = 70,272 lbs per LCAC (in 0 - 4 ft. seas) = 35.13 STONS

Table 4-73: Class I (Food) Planning Factors for LCAC Cargo Movement

c. Class I (Water)

Function	Conventional Theater (S=Sustaining; M=Minimum)								Integrated Theater (S=Sustaining; M=Minimum)							
	Hot Climate				Temperate Climate		Cold Climate		Hot Climate				Temperate Climate		Cold Climate	
	Tropical		Arid		S	M	S	M	Tropical		Arid		S	M	S	M
	S	M	S	M					S	M	S	M				
Universal Unit Level*	6.91	4.87	7.27	5.23	5.26	3.22	5.81	3.77	7.46	5.41	7.82	5.77	6.36	4.31	5.81	3.76
Role I & II Medical	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Role III & IV Medical	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hygiene: Showers**	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87	2.07	1.87
Mortuary Operations	0.03	0.03	0.22	0.22	0.03	0.03	0.03	0.03	0.03	0.03	0.23	0.23	0.03	0.03	0.03	0.03
CBRN Decontamination	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.05	1.05	2.12	2.12	1.05	1.05	1.05	1.05
Total Potable	9.92	7.68	10.47	8.23	8.27	6.03	8.82	6.58	11.52	9.28	13.15	10.90	10.41	8.18	9.87	7.63
Hygiene: Laundry**	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12	0.26	0.12
Mortuary Operations	0.19	0.19	N/A	N/A	0.14	0.14	0.14	0.14	0.20	0.20	N/A	N/A	0.15	0.15	0.15	0.15
Engineer Construction	1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00	1.98	0.00
Aircraft Maintenance	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Vehicle Maintenance	0.36	0.36	N/A	N/A	0.19	0.19	0.19	0.19	0.36	0.36	N/A	N/A	0.19	0.19	0.19	0.19
CBRN Decontamination	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.91	1.91	N/A	N/A	1.91	1.91	1.91	1.91
Total Non-Potable***	2.93	0.81	N/A***	N/A***	2.72	0.60	2.72	0.60	4.86	2.73	N/A***	N/A***	4.64	2.52	4.64	2.52
Theater Total	12.86	8.49	12.86	8.49	10.99	6.63	11.54	7.18	16.38	12.01	15.54	11.17	15.07	10.69	14.52	10.14

* Includes GPMD for drinking, personal hygiene, field feeding, heat injury treatment, vehicle maintenance, and a 10% loss factor

** Central (vice personal) hygiene covers two showers and 15-lbs laundry per week per individual; *** In arid regions only potable water is used

Table 4-74: Class I (Water) requirements in Gallons per Man Day (GPMD)

Unit	Daily Production Rate (gallons)	Storage (gallons)
CLB, MLG	78,000	96,000
CLB, MEU	78,000	45,600
ESB, MLG	840,000	746,000
MWSS, MAG	153,000	300,000

Table 4-75: Marine Corps Water Production & Storage

Notes: **Sustaining** water consumption supports, without degradation, all functions dependent on water for periods in excess of one week. **Minimum** consumption sustains the force for less than one week. An **integrated theater** is one in which CBRN weapon use is anticipated. Source for Tables 4-74 and 4-75 is MCRP 3-40D.14 (ex-MCRP 3-17.7Q), *Water Supply in Theaters of Operation* (10-2015).

d. Class II (PMD)* (*Per Man Day)

THEATER	Class II w/o CDE	Add if CDE required	Remarks
Southwest Asia (SWA)	2.091	4.038	CDE figures are from the 1986-88 Institute of Defense Analysis Study of Chemical Defense Equipment (CDE)
Northeast Asia (NEA)	3.367	3.270	

e. Class III (P): 0.51 PMD

A recommended method for calculating the bulk fuel requirement of a given unit per day is to use a simple roll up starting with each type of equipment end item in a given unit's Table of Equipment and adding their estimated consumption rates together. For example, the daily fuel consumption for equipment is shown in Table 4-76 below, computed for FY 2010 and FY 2015.

	Baseline MEF (2010)		Future MEF (2015)	
	Assault Rate (GPH)	Sustained Rate (GPH)	Assault Rate (GPH)	Sustained Rate (GPH)
CE	25,700	19,300	42,500	29,000
GCE	134,100	77,900	328,900	168,900
ACE	931,900	929,400	1,281,100	1,276,100
LCE	101,600	122,500	128,700	148,500
Total	1,193,400	1,249,100	1,781,200	1,622,600

Table 4-76: Class III (POL) MEF-Level Planning Factors
(estimated MEF fuel consumption rates from the MAGTF Logistics Planning Factors Study, DCMC I&L 2006)

f. Class IV (PMD)

	NEA	SWA
Construction	3.67	3.80
Barrier	6.25	4.29
Total	9.92	8.09

Table 4-77: Class IV Requirements (per man day)

g. Class V (W)

The primary source for ammunition planning is the 1997 Marine Corps Order 8010.1E Class V (W) Planning Factors for Fleet Marine Force Combat Operations which is based enemy unit composition (i.e. armor, infantry, combined). Table 4-78, below was created using information from "Marine Artillery in the Battle of Nairiyah" by MAJOR Walker M. Field in Field Artillery magazine, Nov-Dec 2003 and it provides a contrast with the plan compared the actual ammunition usage in a urban environment.

Illumination		High Explosive		Dual-purpose improved munition		Base-bleed dual purpose improved conventional munition		Rocket assisted projectile		Smoke	
Planned	Used	Planned	Used	Planned	Used	Planned	Used	Planned	Used	Planned	Used
4%	1%	30%	55%	25%	33%	10%	6%	15%	6%	7%	1%

Table 4-78: Class V (W) Usage Example of 1997 Planned vs. 2003 Actual

Note that Class V (W) is ammunition for ground combat weapons while Class V (A) is ammunition for aviation weapons.

h. Class VI (PMD) (After D + 60)

Temperate	Tropical / Arid
2.06	3.40

Table 4-79: Class VI Requirements (after D+60) (per man day)

i. Class VIII (PMD)

NEA	SWA
1.10	1.47

Table 4-80: Class VIII Requirements (per man day)

4031. Maritime Prepositioning Force Employment Considerations

The following items are considered for MPF employment—

- A permissive environment.
- Adequate strategic airlift.
- Adequate aerial tanker support for Flight Ferry aircraft.
- Adequate offload forces (OPP, LFSP, AAOG, NSE) at the POD.
- Suitable road network between the port and/or beach and the associated airfield.
- Recover and launch C-17 and C-5 military and commercial wide-body equivalent (WBE) aircraft, based on the size/capacity of a B747-100.
- Recover and launch 30 AMC (Air Mobility Command) transport aircraft per 24-hour period.
- Provide for offloading of aircraft safely using available apron space.
- Provide an overflow area for passengers and cargo.
- Provide a helicopter buildup area.
- Provide minimal air traffic control activities.

Staff Planning Factors and Considerations

- Operate tactical aircraft.
- A rotary-wing site that is both VFR and IFR capable.

If a usable port is available, the following should be considered—

- Accommodate the ship's stern ramp and vehicle weight to the pier.
- Allow for maximum ship drafts at pier side (Maersk and Amsea classes draw 33 feet; Waterman class draws 34 feet; and "E" Ships/LMSR class draw 35 feet).
- Accommodate a surge offload of vehicles for staging or initial corrective maintenance at the MCC, as well as an area for staging containers at the container operations terminal lot (preferably hard stand).
- Accommodate the offloading of fuel, water, ammunition, and possible storage of same.

If no usable ports are available, the following alternatives should be considered—

- Instream offload of MPE/S with access to improved road networks.
- Provide sufficient staging/maintenance areas suitable for the offload of MPE/S.
- Increased offloading time and force standup.

Command relationships—

- MPS are operationally assigned to the FLTCDR or NCC of the appropriate unified combatant command.
- ADCON resides with COMSC.
- Administrative direction and support of Navy and Marine Corps forces and the control of the MPE/S resides with the type commander.
- The initiating directive will specify the command relationships in the various MPF operational phases and ID the CNSF and the OPCON of forces assigned to the MPF mission.

Sustainability—

- A combination of prepositioned material and airlifted elements associated with a MEF (Fwd) for up to 30 days.
- A MEU sized MAGTF may be sustained for a greater amount of time depending on the size of the force and the number of MPS in support of the operation.

4032. Maritime Prepositioning Force (Enhanced) Capabilities

a. Expeditionary Airfield

The expeditionary airfield (EAF) consists of two hundred and eighty containers of equipment and provides the capability to build a notional EAF 2000. This capability is designated to include: 96 foot wide by 3,850 foot long runway, 75 parking spaces for tactical aircraft, 3 parking spaces for transport aircraft, fueling area and revetments, arresting gear, airfield lighting and visual landing aids, and arresting gear. The EAF is normally spread to three ships in the squadron in three modules, which support the following:

SHIP 1: 470,448 sq ft parking; R/W fuel pit; accommodates parking hides and connecting surfaces to support 4 CH53, 4 MV-22/CH46 and 4-A/UH1.

SHIP 2: 470,448 sq ft parking; R/W fuel pit accommodates parking hides and connecting surfaces to support 4 CH53, 4 MV-22/CH46 and 4 A/UH1

SHIP 3: 706,968 sq ft parking; F/W fuel pit; accommodates parking hides and connecting surfaces to support 20 AV-8B and 14 F-18

Any reduction in the equipment identified will result in an equivalent reduction in capability (e.g., shorter/narrower runway, less parking, or no arresting gear). Three ships together can be configured to support C-5 aircraft.

b. Naval Mobile Construction Battalion

A naval mobile construction battalion (NMCB) pack-up consists of tools and equipment supporting a 584 man Naval Mobile Construction Battalion aboard each squadron. This equipment is divided into 5 capability sets: three core sets, one basic set, and one heavy set. A core set supports 195 Seabees. It includes dump trucks, dozers, graders, loaders, MTRV trucks, and other gear. A basic set augments a core set with additional camp support and vertical construction assets. A heavy set provides additional horizontal or earth moving equipment. The NMCB(s) maintain their flexibility and can further deploy several detachments from a downloaded MPF pack-up.

MPS Seabee gear is usually loaded on three ships in core, core-basic, and core-heavy configurations. Class IV (construction material) supplies are not pre-positioned. Seabee capabilities include building pre-engineered buildings, bunkers, towers, runways, or piers. They can survey, generate power, purify water, or drill wells. With FOE assets they can (among other things) quarry and crush rocks, drive piles or build and operate batch plants.

c. Expeditionary Medical Facility

An "Expeditionary Medical Facility" (EMF) is a modular scaleable equipment set. It can be set up in alternate sets of 10-50 beds, 50-150 beds, or 150- 250 beds (EMF-250). An MPF squadron includes two 20-bed sets. Each is mounted on 16 pallets and fits in a 40-foot sea container.

4033. Maritime Prepositioning Force Engineer Equipment FY15 (Selected Items)

TAMCN	Description	CE	GCE	ACE	LCE	Total	*FIE
A0116	Survey Instruments, Azimuth (includes a D0022 HMMWV)		2			2	0
A0156	Video Optical Surveillance System (VOSS) R2C		2			2	4
B0035	Category III MRAP Bomb Service Truck (6x6) <i>Buffalo</i> Mk. III R2C		1			1	4
B0036	Tank & Pump Unit Ground Expeditionary Refueling System (GERS) Small				10	10	22
B0037	Tank & Pump Unit Ground Expeditionary Refueling System (GERS) Medium				10	10	22
B0038	All Terrain Crane, Truck mounted 40-ton			4	4	8	0
B0040	Multi-Terrain Loader 277C		6	4		10	18
B0048	Robot PackBot-510 R2C		**0			**0	6
B0055	Bath Shower Unit, Expeditionary, Field	1		10	1	12	7
B0058	Light Weight Vehicle Mounted Mine Roller System (LWMRS) R2C		3			3	6
B0060	Mdm Crawler Trctr (MCT) (Deere) 850J		9	6	3	18	9
B0063	Scoop Loader Type 624KR		10	16	18	44	22
B0071	Light weight Water Purification System (LWPS)		6	5	8	19	0
B0075	Small Field Refrigeration System (SFRS)		1			1	51
B0078	Motorized Road Grader (120M)			4	3	7	4
B0088	Light Weight Route Clearance Blade (LRCB) R2C		2			2	4
B0093	<i>Husky</i> vehicle of the VMMD (vehicle mounted mine detector) system R2C		2			2	4
B0094	Parts Trailer (Red Pack) for VMMD System R2C		1			1	2
B0095	<i>Husky</i> Mounted Detection System (HMDS) R2C		2			2	4
B0114	Bridge Erection Boat (plus BEB trailer B0115 & cradle B0129)				6	6	11
B0121	Improved Ribbon Bridge (IRB) Interior Bay				10	10	26
B0122	Improved Ribbon Bridge (IRB) Ramp Bay				4	4	11
B0133	Interrogator Arm Assembly (IAA) R2C		2			2	4
B0152	Medium Girder Bridge, Dry Gap				1	1	3
B0160	Assault Breacher Vehicle (ABV)		5			5	2
B0392	Kalmar Rough Terrain Container Handler			4	10	14	0
B0395	250cfm Air Compressor (trailer mounted)		1	2	7	10	6
B0446	7.5-ton Air Mobile Crane LRT-110	2		4	6	12	0
B0589	M9 Armored Combat Earthmover (ACE)		6			6	5
B0626	Fire Supression System (includes a D0022 HMMWV)			2		2	12
B0675	Tactical Airfield Fuel Dispensing System (TAFDS)			5		5	1
B0685	Amphibious Assault Fuel System (AAFS)				4	4	0
B0730	Generator Set 3KW/60Hz Skid Mtd. MEP-831A	27	71	40	8	146	0
B0891	Generator Set MEP1040 Skid Mtd 10Kw/60Hz	4	13	18	7	42	140
B0921	Generator Set MEP813A Skid Mtd 10Kw/400Hz		6			6	12
B0953	Generator Set MEP1060 Skid Mtd 30Kw/60Hz	9	28	37	4	78	32
B0980	Generator Set MEP531A Lt Wt Man Portable		8	2	2	12	48
B1016	Generator Set MEP816B Skid Mtd 60Kw/400Hz			6		6	0
B1021	Generator Set MEP1070 Skid Mtd 60Kw/60Hz	9	6	26	7	48	52
B1045	Generator Set MEP807A Skid Mtd 100Kw/60Hz			16	4	20	20
B1135	Helicopter Expedient Refueling System			6		6	0
B1298	Kit, Launch Line Charge, M353 Chassis Trailer Mounted		14		4	18	0
B1785	Roller, Compactor, Vibratory, Self Propelled			2	1	3	3
B1922	Scraper, Tractor, Wheeled 621G			2	3	5	3
B2085	Storage Tank Module (Fuel) SIXCON		40	18	38	96	99
B2086	Storage Tank Module (Water) SIXCON		24	54	87	165	66
B2127	Sweeper, Rotating, Vehicle Mounting			2		2	2
B2130	Tank, Fabric, Collapsible, Water, 3,000-gal	2		30	12	44	79
B2460	Tractor Full Track w/ angle blade (T-5 light) M1150		3	4	5	12	6
B2464	Tractor, Full Track, w/ multipurpose bucket M1155				5	5	0
B2483	Loader, Backhoe (BHL)		3	4	3	10	6
B2561	Truck, Extended Boom Forklift (EBFL) (5-ton)		7	23	14	46	0
B2566	Forklift, RT, Light Capability (LRTF)		8	8	8	24	11
B2605	Tactical Water Purification System (TWPS)			6	12	18	4
B2685	Marine Corps Tactical Weld Shop (MCTWS)		6	2	7	15	6
D0007	7-ton MTRV Armored Dump Truck (including unarmored variant D1073)		4	16	25	45	0
D0025	Category I MRAP (4x4) <i>Cougar</i> R2C		3			3	8
D0051	Category II MRAP (6x6) <i>Cougar</i> R2C		2			2	4
D0211	Flatrack Refueling Capability (2,000 gallons) (carried on an LVSR Mk18 or PLS trailer)		11	3	10	24	2
D0215	Refueler Semi-Trailer MK-970 (5,000 gallons) (towed by an MTRV truck tractor)			18	12	30	13
D0235	M870A2 40-ton Semi-Trailer (for engineer equipment) (towed by an LVSR Mk16 tractor)		4	4	7	15	16
E0064	MTRS EOD Manpack Robot				**0	**0	8
E0066	MTRS <i>Talon</i> EOD Robot				**0	**0	16

Table 4-81: Maritime Prepositioning Force Engineer Equipment (extract)

Note: Figures for MPS-3 (MPS-2 differs slightly); valid only for exercise purposes. Data is from MCPIC (<http://www.mcpic.bic.usmc.mil/>) but frequently changes. USN (NCF/FH) equipment not included. *Fly-in-Echelon. **Robots are not pre-positioned because they require frequent software upgrades.

Staff Planning Factors and Considerations

4034. Maritime Prepositioning Force Offload Planning Data

a. Time Requirements

<i>Navy Day (Offload Day – 1)</i>	Hours
Offload Improved Navy Lighterage System (INLS) Warming Tug (WT) , LCM-8, and Utility Boat (UB)	WT 1.5. UB and LCM 1.0
Moor-Anchors	6.0
Offload INLS Causeway Ferrys (CF)	3.0
Position Ships Ramp	0.5
Assemble Power Module (PM), Intermediate Module (IM), and Beach Module (BM)	3.5
Install Fenders	1.5
Discharge AAVs	2.0
Install Amphibious Bulk Liquid Transfer System (ABLTS)	2.0
Assemble Roll-on-Roll-Off Discharge Facility (RRDF)	36-40
Discharge Rough Terrain Container Handlers (RTCH)	1.0
Remove Hatch Cover	1.0

Table 4-82: Maritime Prepositioning Force Offload Time Requirements

b. Lighterage Characteristics

	INLS PM	INLS IM	WT	LCM-8	UB	INLS BM
Length (feet)	90	82	82	74	44' 1"	88' 8"
Beam (feet)	21	22	21	21	14' 5"	24
Loaded draft (feet)	4	4	5.2 (aft)	4.85 (aft)		4
Capacity (tons)	70	100	N/A	65	5	92
Speed (knots)	Empty Loaded	10 7	N/A N/A	N/A N/A	12 9	30+ N/A

Table 4-83: Lighterage Characteristics

c. Causeway Ferry Capabilities

	Vehicles	Containers
INLS + 2 CF	13	14
INLS + 1 CF	8	6
LCM-8	2	1

Table 4-84: Causeway Ferry Capacities

d. Bulk Fluid Offload Times

5,000 feet from shore	700 gallons per minute
10,000 feet from shore	300 gallons per minute

Table 4-85: Bulk Fluid Offload Times

4035. Weather Conditions - Sea States

Beaufort Wind Force	Wind Range (Knots)	Sea Indications	Wave Height (feet)
0	Less than 1	Mirror like	0
1	1-3	Ripples with appearance of scales	0.25
2	4-6	Small wavelets; glassy appearance; no breaking	0.5 to 1
3	7-10	Large wavelets; some crests begin to break; scattered whitecaps	2 to 3
4	11-16	Small waves becoming longer; fairly frequent whitecaps	3.5 to 5
5	17-21	Moderate waves; pronounced long form; many whitecaps	6 to 8
6	22-27	Large waves begin to form; white foam crests are more extensive; some spray	9.5 to 13
7	28-33	Sea heaps up; white foam from breaking waves begins to blow in streaks along the direction of the wind	13.5 to 19
8	34-40	Moderately high waves of greater length; edges of crests break down into spindrift foam blown in wellmarked streaks in the directions of the wind	18 to 25
9	41-47	High waves; dense streaks of foam; sea begins to roll; visibility affected	23 to 32
10	48-55	Very high waves with overhanging crests; foam in great patches blown in dense white streaks; whole surface of sea takes a white appearance; visibility affected	29 to 41

Table 4-86: Sea States – Beaufort Scale (MCRP 3-05.2 [ex-MCRP 3-11.3A] *SF Waterborne Operations*)

4036. Typical Principal End Items Carried on an MPSRON to Support a MEB

Ordnance		MT / Communication Equipment		Engineer Equipment	
LAV AT	4	LVS Front Power Unit	109	TWPS	20
LAV 25	14	LVS Wrecker RBU	4	AVLB	2
LAV LOG	3	LVS Cargo Rear Body Units	105	Rough Terrain Container Handler	14
LAV RECOV	3	7-Ton Trucks	319	MCT Dozer	17
AAVC7	9	P-19 Fire Truck	8	Variable Reach Fork Lift	46
AAVR7	4	HMMWV troop / cargo	473	TRAM Rubber Tire Tractor	35
AAVP7	96	MRC-145	65	M9 ACE	6
M1A1	58	MRC-138	60	MC1150 Tractor	12
Armed HMMWV TOW/HMG	48/63	MRC-142	21	Line Charge	18
M777 Howitzer	30	M970 Refueler Semi-Trailer	12	SIXCON	111

Table 4-86: Typical Principal End Items Aboard a MPSRON to Support a MEB.

4037. Command, Control, Communications, Computers Planning Considerations

Communications planning is inextricably linked with operations planning. The goal of C4 planning is to support mission accomplishment. The process C4 planner's use is generally the same regardless of the mission or geographical area. The checklist can be applied to other C4 staffs—single-Service, subordinate component, and multinational. Numerous sources of information may be used to answer the checklist questions. The following list is representative:

- Existing operation plans and operation orders.
- The MAGTF and joint force commander's battlespace area evaluation (CBAE).
- Area studies.
- Unit files.
- MCWP 3-30 (ex-MCWP 3-40.1), *MAGTF Command Element Operations*
- MCTP 3-30B (ex-MCWP 3-40.2), *Information Management*
- MCRP 3-30B.1 (ex-MCRP 3-25B), *Multi-Service Brevity Codes*
- MCRP 3-30B.2 (ex-MCWP 3-40.3), *MAGTF Communication Systems*
- JP 5-0 Joint Operations Planning Dec 06
- JP 6-0 Joint Communications System Jun 10
- Joint Communications Support Element Planning Guide.
- Contingency Planning for DoD Mission-Critical Information Systems Feb 08
- Lessons-learned from previous operations and exercises to include Joint Universal Lessons Learned System (JULLS).
- Time-Phased Force Deployment Data (TPFDD) schedule.

a. Common Questions

These questions apply to any mission. They elicit background information, and each serves as a data point to answer other questions. This list of questions is not all-inclusive. These questions should be asked repeatedly throughout the planning process as C4 planners adapt to an evolving operational and tactical situation. They provide a framework for supporting C4 planning for each phase of an operation, focusing C4 planners on the mission and how the JFC intends to accomplish it.

Parameters

- What is the JTF mission?
- What is the signal and/or communications unit mission?
- What is the geographic operational area?
- What is the JFC's estimate of the mission and vision (intent and concept of operations) to accomplish it?
- What are the JFC's communication requirements?
- Who are the subordinate component and supporting forces? What are the command relationships?
- How will the forces deploy (means of transport), and what is the deployment timeline?
- Are there any transport and/or lift restrictions (availability of assets, departure and arrival locations)?
- Are there any satellite landing rights?
- When are the operations planning meetings scheduled? How will communications planning meetings fit into this schedule?

Staff Planning Factors and Considerations

- Has DISA been involved regarding coordination of technical requirements?
- Are there any planning constraints?
- Are there any special communications requirements? Who has them?
- What national space-based assets are required and/or available to support the operation? Has a USSPACECOM Joint Space Support Team been contacted?
- What communications capabilities are available to the joint force: SHF and/or UHF commercial satellite, DSCS, fleet satellite communications, MILSTAR satellite terminals, JWICS, MILSTAR, HF and VHF radio, tropospheric and LOS microwave systems, LANs and WANs, AUTODIN, DISN, land mobile radio, personal communications systems?
- What frequencies are available for the joint operations area?
- What are the general communications security (COMSEC) requirements? Will the Inter-theater Communications Security Package (ICP) be used? Who will draft the callout message?
- Who is the potential adversary? What are their capabilities to conduct offensive information warfare? Does a joint force plan exist to counter the threat?
- What are the releasability requirements for multinational operations?

Subordinate Component Forces

- Where will communications nodes be located?
- What are their communications requirements?
- What are their communications capabilities?
- What type of communications systems do they have (power, frequency bands, interoperable and compatible with other subordinate components' equipment, mobility)?
- Who is the component communications staff point of contact for planning and technical management and direction?
- Are there any special communications requirements resulting from the mission and the JFC's estimate, intent, and concept of operations?
- Are subordinate and supporting communications plans consistent with the supported JFC communications plan?

Supporting Forces and Activities

- What is the mission of the supporting forces and/or activities (this includes allies and coalitions)?
- What are their communications capabilities?
- What information does the supported JFC need from the supporting forces and/or activities (intelligence, weather, imagery, mapping, deployment) and how will it be accessed?
- What communications support will the supporting forces or activities require from the supported JFC?

Non-organic Communications

- DISA
- Does the operational area have a DISA Regional Control Center or field office?
- Who is the DISA point of contact?
- What is the DISN infrastructure in the operational area?
- Are sufficient gateways available? What are the interface requirements to access the gateways? Is the equipment available?
- Is Telecommunications Service Provisioning and/or National Security Emergency Preparedness involving authority provided and current?
- What are the anticipated DSCS and commercial satellite requirements?
- Has modeling of space networks been initiated by DISA?

Commercial Networks

- Are commercial networks available for use? Who can approve access to them? Are funds available? Has DISA been contacted to ensure required lead times for normal allocations? (1) Satellite (2) Data (3) Voice?
- What special interfaces are required to access the commercial network and where are the access points?
- What are the locations and types of switches in the commercial network? What are their technical parameters?
- Where are the locations and types of systems providing the backbone transmission network?
- What type of power is used—voltage, current, commercial grid, or generator?
- Does the operational area have a cellular network? What are the transmission media, frequency band, and interface requirements?
- What are the system standards? Is the system available for use?

- CJCS Controlled C4 Assets.
- What CJCS controlled assets are available?
- What capabilities are available?
- Will JCSE support be required in the operational area, or will other defense and commercial assets be sufficient?
- Will JCSE support be needed for en route communications?
- Has a CJCSI 6110.01, "CJCS-Controlled Tactical Communications Assets," support request for CJCS controlled C4 assets been submitted?
- What are the JCSE logistic support and electrical power requirements?
- What are the JCSE airlift considerations, allocations, and/or priority?

Other Communications Support

- Is communications support needed from specialized communications units?
- Who are the points of contact and what are the request procedures?
- What are the units' communications capabilities and limitations?

b. Planning Activities

This section assumes that the basic questions have been answered and covers high-level and detailed communications planning. Although these functions are listed separately, they are concurrent rather than sequential actions. The planners interact to refine the planning products, communications estimates, Annex K, and JCEOI.

High Level Planning

- What nodes will be necessary to provide a global communications network and where will they be located?
- Which nodes will have to be connected?
- What transmission media will be used to interconnect the nodes?
- What types of communications equipment will be located at each node (equipment strings, interoperability of the equipment)?
- What are the frequency requirements for each node? How will the frequencies be allotted (joint, multinational, and subordinate components)? Are there potential frequency conflicts?
- What are the call signs and/or words for each node?
- What units will provide, install, operate, and maintain the equipment for each node? What is their operational readiness status?
- What lift assets are available to deploy these units? When will the units deploy and activate the nodes or network?
- Is the deployment schedule of communications assets consistent with the phases of the plan? Will it permit the provision of communications support when and where needed?
- What is the phased buildup of communications in the operational area?
- Has communications scheduling information been added to the time-phased force and deployment data and/or time-phased force and deployment list?
- Have the JFC and J-3 been informed of potential communications shortfalls and recommended solutions?
- How will keying material be managed (ordering, generation, storing, distribution, transferal, and destruction)? What are the procedures for handling compromises? Is a COMSEC logistics management activity needed in the joint operations area? What access will allies have to U.S. COMSEC?
- Are network and node diagrams available?
- Have special communications requirements been addressed (search and rescue, SOF, en route communications, embarkation and debarkation connectivity)?
- How will the joint, JSOTF, subordinate component, and supporting forces networks interface with non-organic networks (DISN, commercial, JCSE)?
- When and where will the Joint Communications Control Center be established?
- Are the subordinate component, JSOTF, and supporting communications plans consistent with the joint communications plan?

Detailed Planning

Circuit Switches

- Does a circuit switch network diagram exist that shows information about the switch and circuit switch network connectivity (switch type, area code, trunk groups, capacity)?
- How does the switch route calls: flood, deterministic, or circuit switch routing task execution plan?
- Where do circuit switches need to be located? How will they be connected?
- What special features or restrictions will be imposed on subscribers? Who will authorize and enforce these restrictions?

Staff Planning Factors and Considerations

- Where are the Defense Switched Network (DSN) interfaces? Are precedences authorized? By whom?
- How will subscriber assistance be handled?
- Where is the greatest anticipated traffic load? Does sufficient capacity exist to handle it?
- What types of status reports are required, and when will they be submitted?
- How will traffic metering and network loading be measured, modeled, and managed?
- Who will publish telephone directories and how will they be distributed?
- How will MWR calls be accommodated?

Data Networking

- What are the anticipated JTF component data requirements?
- Has automation been planned and/or engineered into the network (x.25, IEEE802.3, TCP/IP)?
- What and/or where are the network identifications and gateways?
- Will data of various classifications “ride” a secure tactical backbone? How will traffic of various classifications be controlled and managed? Are multi-level information systems security initiative devices needed? Are resources available?
- What is the joint architecture topology?
- Who is the joint data networks manager?
- What are the NIPRNET, SIPRNET, and JWICS connectivity requirements?
- What Integrated Tactical Strategic Data Networking points of presence will be used? Has a gateway access request been submitted in accordance with DISA contingency and/or exercise plans?
- What is the addressing scheme?

Message Switches

- Where are message switches required?
- What is the trunking plan?
- What is the network connectivity of all message switches?
- Have routing indicators been developed and routing tables established?
- Is this an R and/or Y network?
- Has a plain language address directory been created?
- How will special category traffic be handled? Who will be authorized to have access?
- What are the intra nodal and inter nodal terminals?
- What types of status reports are required and when will they be submitted?
- What AUTODIN Switching Centers are connected to the message switch?
- Who is the Automated Message Process System Security Officer?
- Who will act as the AUTODIN controller?

Transmission Systems

- Are the circuit requirements, routing, channelization, and other parameters identified in high-level planning valid? Have satellite access requests been submitted? Have frequency requests been approved and published?
- What are the characteristics and connectivity of multi-plexers in the network? Are they compatible?
- What are the timing requirements for the network components? How will timing be accomplished?
- What types of status reports are required and when will they be submitted?

Video Teleconferencing

- What data rate is to be used?
- Who are the participants?
- What is the schedule?
- Who is providing the bridging and MCU?

c. Technical Management and Direction Joint Communications Control Center

- What are the operational procedures for the JCCC?
- How will the JCCC be manned?
- What reports will be required, how often will they be required, and when will they be submitted?
- How will network reconfiguration be accomplished?

- Who are the points of contact at the subordinate control centers?
- Who will submit the Telecommunications Service Request and Telecommunications Service Order?
- Who will coordinate changes to connectivity with the DISN? With the commercial networks?
- What kind of statistics will be kept? Who will analyze them? What will be done with them?
- How will changes caused by the evolving tactical situation be handled?
- Can the JCCC direct changes within subordinate component networks to optimize C4 within the joint operations area?
- Where is the boundary between technical direction and operational direction?
- How will frequency deconfliction be managed? How can potential conflicts be anticipated?
- Who will control frequency spares and authorize their use?
- Who manages the allocated satellite bandwidth used by the geographic joint forces?

Joint Communications Support Element

- Who is the JCSE POC?
- How will JCSE participate in the technical management process?
- Are there any special reporting requirements for systems provided by the JCSE?

d. Other Planning Functions

Spectrum Management

- What are the provisions and procedures for frequency planning and use for opposed and/or unopposed entry operations into an operational area?
- What frequency allotments and assignments are available for the operational area?
- Can the allotted and assigned frequencies support the equipment deployed to the operational area (communications, computer LAN(s) and/or WAN(s), sensors, surveillance radars, GPS, airspace control radars)?
- Will the frequencies work (propagation and topographic analyses)?
- Does the allocation and assignment of frequencies to subordinate component commands contribute to mission accomplishment?
- How can the enemy interfere with allotted and assigned frequencies? Does a joint plan exist to counter the threat?
- How will meaconing, interference, jamming, and intrusion (MIJI) be reported?
- Who will submit MIJI reports to the Joint Spectrum Center (JSC)?
- Will the JCCC resolve electromagnetic interference issues? Will JSC support be required to resolve interference issues?
- Are sufficient spare frequencies available?
- What emission control measures will be applied?
- Will the JFC implement an electronic deception plan? Are sufficient frequencies available to support this plan?

Security

- Will the cryptographic equipment inter-operate?
- What are the keying material requirements?
- Does a key management plan exist?
- How will cryptographic compromises be detected and corrected?
- What computer security measures will be employed on the LAN(s) and WAN(s) in the operational area?
- How will access to the various networks be controlled (electronic and physical)?
- Have COMSEC emergency destruction procedures been established?
- What is the logistics plan for the cryptographic equipment?
- Are equipment and keymat sufficient to support planned and unplanned operations?
- Have key change times been established and promulgated?
- Have provisions been made for over-the-air-re keying where applicable?
- Is an ICP available? Is it needed?
- What will we transition to and when?
- What is the foreign information warfare threat facing the communications system?
- Are virus detection software applications installed and operational? Are passwords issued and in use? Has a contingency plan been developed to guide recovery actions should data be modified or destroyed by unauthorized intrusions?
- Do remotely accessed computer systems possess features to identify users and substantiate their identification before allowing information to be processed?

Staff Planning Factors and Considerations

4038: Information Operations Considerations

a. Introduction

According to MCDP-1, war is characterized by the interaction of physical, moral, and mental forces. The physical characteristics of war are generally easily seen, understood, and measured: equipment capabilities. The mental forces provide the ability to grasp complex battlefield situations; to make effective estimates, calculations, and decisions; to devise tactics and strategies; and to develop plans. The moral characteristics are less tangible. (The term “moral” as used here is not restricted to ethics, although ethics are certainly included, but pertains to those forces of a psychological rather than tangible nature.) Moral forces such as national and military resolve, national or individual conscience, emotion, fear, courage, morale, leadership, or esprit are difficult to grasp and to impossible quantify.

Although material factors are more easily quantified, the moral and mental forces exert a greater influence on the nature and outcome of war. This is not to lessen the importance of physical forces, for the physical forces in war can have a significant impact on the others. For example, the greatest effect of fires is generally not the amount of physical destruction they cause, but the effect of that physical destruction on the enemy’s moral strength. Because it is difficult to come to grips with moral and mental forces, it is tempting to exclude them from our study of war. However, any doctrine or theory of war that neglects these factors ignores the greater part of the nature of war.

The focus of Information Operations (IO) is the mental and moral factors of war. Specifically, IO activity is conceived, planned, and executed in the physical realm to contribute to the degradation of the enemy’s mental and moral state. This is accomplished through the targeted use of information to: 1) directly influence enemy decision-making, 2) indirectly influence enemy decision-making through other relevant target audiences, or 3) both methods simultaneously. Both physical and information power can be employed to influence the decision-maker.

Planners can also seek to leverage information through denial and deception. Denying the enemy information required for effective C2, while protecting our own plans and C2, affects his decision making process and protects ours respectively. Finally, we employ deception to convince the enemy we are going to do something other than what we are really going to do, or to increase the ambiguity in his operational picture by acting in such a way that the enemy does not know what to expect. Both activities make it possible to achieve the element of surprise. Consequently, it is the IO officer’s responsibility to integrate, synchronize, and coordinate all available information related capabilities with other MAGTF capabilities in order to create effects in the information environment’s physical dimension, information dimension (corresponding to the mental dimension of MCDP-1), and the cognitive dimension (corresponding to the moral dimension of MCDP-1).

b. Definitions

On 25 Jan 2011 the SECDEF changed the definition of Information Operations as follows:

Information Operations: The integrated employment, during military operations, of information-related capabilities in concert with other lines of operation to influence, disrupt, corrupt, or usurp the decision-making of adversaries and potential adversaries while protecting our own. Also called IO. (JP 3-13)

- The previous definition of IO led to excessive focus on the capabilities used to conduct IO. This emphasis confused the distinction between them and IO as an integrating staff function. As an integrating function, successful IO requires the identification of the information-related capabilities (IRC) most likely to achieve desired effects and not simply the employment of a capability in isolation. This new definition also corrects the notion that information-related capabilities must be overseen by one entity.
- It is important to realize that IO, although it leverages the use of non-lethal fires to generate IE effects, cannot be viewed as merely the integration of non-lethal fires. The Marine Corps’ definition of the term “battlespace,” identifies the information environment as maneuver space similar to the air, land, and sea domain components of the battlespace. IO is a line of operations (LOO) within the IE that is coordinated with all other MAGTF LOO(s).

NOTE: LOOs have become the primary framework for relating force activities to one another and promoting unity of effort toward a common purpose. MCWP 5-10 (ex-MCWP 5-1), *Marine Corps Planning Process* (08-2010)

Information-Related Capability (IRC): A tool, technique, or activity employed within a dimension of the information environment that can be used to create effects and operationally desirable conditions. Also called IRC. (JP 3-13)

- Information-related capabilities are the tools, techniques, or activities using data, information, or knowledge to create effects and operationally desirable conditions within the physical, informational, and cognitive dimensions of the information environment. They are used to gain operational advantages in the IE just as more traditional military technologies are used to gain advantages in air, land, and sea components of the battlespace.
- As stated above in the discussion of IO, employing an IRC (Electronic Warfare, MISO, Engagement, CA, PA) does not imply or require ownership. Each IRC stands on its own with specific DoD policy, doctrine, funding, and authority separate from those of IO.

Information Environment: The aggregate of individuals, organizations, and systems that collect, process, disseminate, or act on information. Also called IE (JP 3-13)

Information Operations focus on creating effects in the information environment. This environment (IE), and identified component of the Marine Corps battlespace, is also described as consisting of three interrelated dimensions which continuously interact with individuals, organizations, and systems within the IE. These dimensions are the physical, informational, and cognitive.

- The physical dimension is composed of command and control (C2) systems, key decision makers, and supporting infrastructure that enable individuals and organizations to create effects. It is the dimension where physical platforms and the communications networks that connect them reside.

- The informational dimension encompasses where and how information is collected, processed, stored, disseminated, and protected. It is the dimension where the C2 of military forces is exercised and where the commander's intent is conveyed. Actions in this dimension affect the content and flow of information.
- The cognitive dimension encompasses the minds of those who transmit, receive, and respond to or act on information. It refers to individuals' or groups' information processing, perception, judgment, and decision making. These elements are influenced by many factors, to include individual and cultural beliefs, norms, vulnerabilities, motivations, emotions, experiences, morals, education, mental health, identities, and ideologies.

Battlespace: The environment, factors, and conditions that must be understood to successfully apply combat power, protect the force, or complete the mission. This includes the air, land, sea, space, and the included enemy and friendly forces; facilities; weather; terrain; the electromagnetic spectrum; and the information environment within the operational areas, areas of interest, and areas of influence. IRC integration does not necessitate ownership. (MCRP 1-10.2 [ex-MCRP 5-12C] *Marine Corps Supplement to DoD Dictionary* 08-2013)

The MAGTF battlespace consists of four physical components (air, land, sea, and space), the electromagnetic spectrum, and the information environment. Maneuvering and creating effects within each battlespace component requires specific training, equipment/capability, and intelligence. Planning and executing Information Operations is no different. To create IE operational advantage for the commander trained IO planners develop an IO concept of support that leverages intelligence to identify relevant targets (physical and non-physical) for engagement (lethal and non-lethal), information conduits, and the desired IE effects. The IO planners then integrate all IRCs available to the commander to create and assess those effects.

c. DoD IO Policy

Department of Defense (DOD) and Chairman of the Joint Chiefs of Staff (CJCS) directives delegate authorities to DOD components. Among these directives, Department of Defense (DoD) Directive 3600.01, Information Operations, is the principal IO policy document. Key provisions of this document are as follows:

- IO will be the principal mechanism used during military operations to integrate, synchronize, employ, and assess a wide variety of information-related capabilities (IRC) in concert with other lines of operations to effect adversaries' or potential adversaries' decision-making while protecting our own.
- IRC(s) constitute tools, techniques, or activities employed within a dimension of the information environment (IE) that can be used to achieve a specific end at a specific time and place. IRCs can include, but are not be limited to, a variety of technical and non-technical activities that intersect the traditional areas of electronic warfare, cyberspace operations, military information support operations (MISO), military deception (MILDEC), influence activities, operations security (OPSEC), and intelligence.
- The development and management of individual IRC(s) will be the responsibility of various DoD Components and will be brought together at a specific time and in a coherent and integrated fashion for use against adversaries and potential adversaries in support of military operations.
- DoD IO will be synchronized with information and influence activities of other U.S. Government (USG) organizations to ensure consistency across USG activities in the IE.
- DoD IO will be coordinated and, as practicable, integrated with related activities conducted by allied nations and coalition partners.
- Consistent with existing statutory requirements and manpower polices, Service and joint IO forces must be an appropriate and cost effective total force mix of active and reserve military personnel, government civilian personnel, and contracted support.
- IO will be included across Active and Reserve Components, and government civilian professional education curriculums to foster an understanding of IO and IRCs across all ranks and positions within DoD.
- IO tactics, techniques, and procedures (TTPs); technologies; and lessons learned will be shared among DoD Components and, as practicable, with allied nations and coalition partners to fully facilitate the synchronization, integration, and effectiveness of IO while reducing redundancies in capabilities across the DoD.
- IO will be integrated into joint exercises and joint training, security cooperation guidance for theater planning, communication strategy, and deliberate and contingency planning.
- DoD IO programs and activities will incorporate an explicit means of assessing the results of operations in relation to expectations.
- DoD IO activities will not be directed at or intended to manipulate audiences, public actions, or opinions in the United States and will be conducted in accordance with all applicable U.S. statutes, codes, and laws.

Basic Considerations:

- Establish the Information Operation Working Group (IOWG): Is a manned and trained Information IOWG in place? Are the required and recommended staff elements and capability providers in attendance? (G2, GS, G3, G5, EW, MISO, MILDEC, OPSEC, Cyberspace Ops, STO, Fires, CI, CA, PA, Legal).
- Information Operations Intelligence Integration: Is there dedicated intelligence support to the IO cell? Has an adequate analysis of the information environment (in accordance with Annex B, Appendix 6) been completed? Are the intelligence requirements supporting information related capabilities available to the MAGTF Electronic Warfare (EW), Military Deception (MILDEC), Military Information Support Operations (MISO) representatives? Are RFI(s) submitted that fill the intelligence gaps? Have we identified the enemy's information environment scheme of maneuver and tactics, techniques, and procedures (TTP)?
- Coordination with higher headquarters: What IO activities require approval from theater (or higher) authorities? Does the MAGTF have the Joint Force IO Plan? Does the MAGTF IO concept of support conflict with the Joint Force IO plan? Has the MEF IO cell

Staff Planning Factors and Considerations

coordinated IO with the Joint Force IO Cell? Have we considered how to employ all available assets able to create and/or sustain their desired information environment effects? Have we coordinated with, and submitted our allocation requests for joint air assets in a timely manner (i.e. 24-30 hours prior to execution of the ATO)? (These include MISTF, JSOTF, JFACC assets, EC-130H Commando Solo, Leaflet drops, EW and deception elements.)? Does the IO cell have full time intelligence support?

- **MEF IO Planning:** Are all IO activities integrated into a single coherent IO plan that supports the MEF commander's intent (e.g., concept of decisive action)? Has the MEF requested expertise from relevant supporting commands (e.g. MCIOC, JIOWC, JWAC, NIOC, 1st IOC) to assist in IO planning? Are nodal analysis tools available/employed for IO planning? Are IO objectives and concepts of support developed for each phase of the operation? Is the IO target list ready for submission to the targeting board?
- **Branches/Sequels:** Has a means for branch/sequel planning and tasking of relevant IO assets been identified?
- **MEF IO Execution:** Has the MEF established IO representation in Current Operations with procedures that ensure receipt of critical information? Has the MEF IO cell identified the Measure of Effect (MOE) indicators to be monitored?
- **MEF IO Assessment:** Have information operations assessment requirements been entered into the overall assessment plan? Have information operation assessment requirements been submitted the G2 for inclusion in collection plans? Is the process for monitoring, collecting, and analyzing focused information environment data for IO assessment identified? Are assessment results being evaluated in the IOWG? Are improve, sustain, or cease recommendations (related to current IO activities and actions) provided to the MEF commander?

d. Military Deception (MILDEC)

Military Deception (MILDEC) is intended to deceive a target into taking actions that facilitate accomplishment of friendly force objectives and/or defeat the target's efforts to accomplish its own objectives. In combat situations MILDEC typically seeks achieve its objective by misleading a target as to the strength, readiness, locations, and intended missions of friendly forces. In noncombat situations, the commander seeks to create conditions that avoid conflict, minimize risk and lead to an early and favorable conclusion. (JP 3-13.4)

Key components of MILDEC are:

- The MILDEC Goal which is the commander's statement of the purpose of the MILDEC as it contributes to the successful accomplishment of the assigned mission.
- The MILDEC Objective which is a concise statement of what the MILDEC will cause the adversary to do or not do.
- The Deception Target which is the adversary decision maker with the authority to make the decision that will achieve the deception objective.
- The MILDEC Conduits which are information or intelligence gateways to the deception target. Conduits may be used to control flows of information to a deception target.
- The Deception Story is a scenario that outlines the friendly actions that will be portrayed to cause the deception target to adopt the desired perception. It is a succinct statement or narrative of exactly what the MILDEC planner wants the target to believe to be the true situation, then decide and act on that basis.

Functions of MILDEC include:

- Causing ambiguity, confusion, or misunderstanding in adversary perceptions of friendly critical information.
- Causing the adversary to misallocate personnel, fiscal, and material resources in ways that are advantageous to the friendly force.
- Causing the adversary to reveal strengths, dispositions, and future intentions.
- Conditioning the adversary to particular patterns of friendly behavior to induce adversary perceptions that a joint force can exploit.
- Causing the adversary to waste combat power with inappropriate or delayed actions.

Six principles of MILDEC provide guidance for planning and executing MILDEC operations:

- **Focus.** The deception must target the adversary decision maker capable of causing the desired action(s) or inaction(s)
- **Objective.** To cause an adversary to take (or not to take) specific actions, not just to believe certain things
- **Centralized Planning and Control.** MILDEC operations should be centrally planned and directed
- **Security.** Deny knowledge of a force's intent to deceive and the execution of that intent to adversaries
- **Timeliness.** A deception operation requires careful timing
- **Integration.** Fully integrate each MILDEC with the operation that it is supporting

e. Military Information Support Operations (or MISO - formerly Psychological Operations)

Military information support operations (MISO) develop and convey messages and devise actions to influence select foreign groups and promote themes to change those groups' attitudes and behaviors. MISO can also degrade the enemy's combat power, reduce civilian interference, minimize collateral damage, and increase the population's support for operations.

Target audiences (TAs) are individuals or groups selected for influence, and may include enemy, adversary, friendly and neutral groups or populations. MISO requires significant planning before execution is authorized. These include an approved program, execution authorities, and deployment authorities. An approved MISO program is not an execution authority. The actual execution is initiated by an execute order (EXORD), deployment order (DEPORD), or program approval.

A MISO program consists of the following minimum elements:

- Proposed psychological objectives
- Themes to stress and avoid
- Proposed dissemination means
- General concept of operations (including planned attribution methods)
- Concept of assessment (CJCSI 3110.05E)

Intelligence to support MISO consists of the following types of information:

- Comprehensive information about the social structures of a country or region so that potential TAs can be determined.
- Evaluated facts about conditions in the country or region of operation.
- Exploitable vulnerabilities.
- Messages and media that can be transmitted, received, and understood.
- Accurate data about the effectiveness of MISO.
- Observable and measurable data that indicates the effectiveness of MISO messages and actions.

MISO forces require continuous and timely intelligence to monitor and assess the results of their actions, thus providing feedback. Specific information and intelligence requirements include the following:

- Evaluation of threat capabilities, vulnerabilities, and probable COA(s).
- Potential adversary messages and actions.
- Cognitive aspects (attitudes, values, and beliefs).
- TA accessibility.
- TA effectiveness in accomplishing desired actions.
- Population motivations and current behaviors.
- Indicators of effectiveness.
- Popular reactions to friendly, hostile, and neutral force actions and messages.

Every Marine has the potential to provide useful information and contribute to situational understanding through observing and interacting with local populations and exposure to events occurring in the Operating Environment. Marines should report their observations through their unit intelligence section. These reports increase the depth of, and provide context to other information collected for MISO. (JP 3-13.2)

f. Electronic Warfare (EW)

EW consists of three main functional areas: electronic attack (EA), electronic warfare support (ES), and Electronic Protection (EP).

- **Electronic Attack (EA):** actions involving the use of EM (electro-magnetic) energy, DE, or antiradiation weapons to attack personnel, facilities, or equipment. The intent is to degrade, neutralize, or destroy enemy combat capabilities. It is considered a form of fires.
- **Electronic Warfare Support (ES):** actions tasked by, or under direct control of, an operational commander to search for, intercept, identify, and locate or localize sources of intentional and unintentional radiated EM energy for the purpose of immediate threat recognition, targeting, planning, and conduct of future operations.
- **Electronic Protection (EP):** actions taken to protect personnel, facilities, and equipment from any effects of friendly, neutral, or enemy use of the EMS (electro-magnetic spectrum), as well as naturally occurring phenomena that degrade, neutralize, or destroy friendly combat capability.

EW can be applied from all physical domains by manned and unmanned systems. EW may adversely affect friendly forces when not properly integrated and coordinated.

EW is employed to create decisive, standalone effects, or to support military operations by generating various levels of control, detection, denial, deception, disruption, degradation, exploitation, protection, and destruction.

- During the shape and deter phases, ES assets contribute to the overall understanding of the OE (operating environment).
- When used in support of a deterrence activity or operation EW can support the shaping of adversaries' perceptions and morale, as well as unit cohesion. EW applied toward deterrence objectives can sever lines of communications, logistics, C2, and other key functions while simultaneously protecting friendly capabilities.
- The MEF may use EW to set the conditions for combat when imminent and prosecute the attack once combat is under way.
- EW may also employ destructive EM fires, decisive for achieving campaign objectives during the seize initiative and dominate phases.
- From the stabilize to enable civil authority phase, EW can foster restorative operations by offering nonlethal options such as force protection through ES; EP for ensuring communications capabilities continue to function; EA to counter radio-controlled improvised explosive devices; or broadcasting selected themes and messages, to include civil defense messages, to assist civil authorities.

All EW activities conducted in joint operations should be coordinated through EWCC (Electronic Warfare Coordination Cell). In addition, they should participate in, and coordinate with, the IO cell, to align objective priorities and help synchronize EW employment with information-related capabilities and operations. (JP 3-13.1)

Staff Planning Factors and Considerations

g. Physical Destruction

The purpose of information operations is to create an advantage for the MAGTF by shaping information content and flow in the operational area and impacting adversary use of the information environment. The exact type of advantage varies by mission, but is typically associated with influencing adversary actions and populace behavior. Fires related to information operations can be lethal, nonlethal, or both. Lethal fires can involve attacks on leadership or command and control nodes, while nonlethal fires can include MISO leaflets or broadcasts and attacks on computer networks. Information operations planners must be an integral part of the entire targeting process to provide the MAGTF commander with expanded means and methods that include both lethal and nonlethal options. IO targets should be presented at the Targeting Boards to be integrated with the plan for fires

h. Operations Security

OPSEC is an analytic process that identifies and controls critical information, indicators of friendly force actions attendant to military operations, and incorporates countermeasures to reduce the risk of an adversary discovering and exploiting friendly vulnerabilities.

Planners must consider the key information adversaries will probably try to collect regarding our intentions, capabilities, and activities. Obtaining such information will be critical to their own operational effectiveness. The answers can potentially lead the compromise of CI (critical information) about friendly forces. (JP 3-13.3)

STEP ONE: IDENTIFY CRITICAL INFORMATION: Critical information is defined as information about friendly (U.S., allied, and/or coalition) activities, intentions, capabilities, or limitations an adversary seeks in order to gain a military, political, diplomatic, economic, or technological advantage. Such information, if revealed to an adversary prematurely, may prevent or complicate mission accomplishment, reduce mission effectiveness, damage friendly resources, or cause loss of life.

STEP TWO: THREAT ASSESSMENT: The threat assessment (TA) includes identifying potential adversaries and their associated capabilities, limitations, and intentions to collect, analyze, and use knowledge of our CI against us.

- Who is the adversary? (Who has the intent and capability to take action against the planned operation?)
- What are the adversary's goals? (What does the adversary want to accomplish?)
- What are the adversary's possible courses of action for opposing the planned operation?
- What CI does the adversary already have about the operations? (What information is it too late or too costly, in terms of money or resources, to protect?)
- What are the adversary's intelligence collection capabilities?

STEP THREE: VULNERABILITY ANALYSIS: The vulnerability analysis identifies operation or mission vulnerabilities. An operational or mission-related vulnerability exists when the adversary has the capability to collect indicators, correctly analyze them, and take timely action. Work with the operations, intelligence, and counterintelligence staffs, to answer the following questions:

- What CI indicators (friendly actions and open-source intelligence (OSINT)) will the planned operation generate through friendly activities?
- What indicators can the adversary actually collect?
- What indicators can the adversary use to the disadvantage of friendly forces? (Can the adversary analyze the information, make a decision, and take appropriate action in time to interfere with the planned operation?)

OPSEC indicators are those friendly actions and open sources of information that adversary intelligence systems can potentially detect or obtain and then interpret to derive friendly critical information.

STEP FOUR: RISK ASSESSMENT: Risk assessments estimate an adversary's capability to exploit a vulnerability, the potential effects such exploitation will have on operations, and provide a cost-benefit analysis of possible methods to control the availability of CI to the adversary.

Work with other planners and with the intelligence and counterintelligence organizations to complete the risk assessments. The Risk Assessment has two components.

- Analyze the OPSEC vulnerabilities identified in the vulnerability analysis and identify possible OPSEC countermeasures for each.
- Select OPSEC countermeasures for execution based on a risk assessment for presentation to the commanding officer and staffs.

STEP FIVE: MEASURES/COUNTERMEASURES: More than one countermeasure may be identified for each vulnerability. Conversely, a single countermeasure may be used for several different vulnerabilities. The most desirable OPSEC countermeasures combine the highest possible protection with the least impact on operational effectiveness. Commanders will decide whether or not and when to employ the OPSEC measures.

Typical questions that might be asked during analysis include:

- What is the potential risk to effectiveness if a particular OPSEC countermeasure is implemented?
- What is the potential risk to a mission's success if an OPSEC countermeasure is not implemented?
- What is the potential risk to a mission's success if an OPSEC countermeasure fails?

i. Special Technical Operations (STO)

Information Operations need to be deconflicted and synchronized with STO. Detailed information related to STO and its contribution to IO can be obtained from the STO planners at CCMD or Service component headquarters. IO and STO are separate, but have potential crossover, and for this reason an STO planner is a valuable member of the IO cell.

Considerations: Does the MEF have a means to coordinate with and employ national capabilities to ensure its success? Are these activities coordinated with the IO concept of support and the MEF plan?

j. Civil Affairs

Civil Affairs (CA) personnel support and contribute to functions normally provided by the local, regional, or national government, placing them into direct contact with civilian populations. This level of interaction results in CMO having a significant effect on the perceptions of the local populace. Since this populace may include potential adversaries, their perceptions are of great interest to the IO community. For this reason, CA representation in the IO cell can assist in identifying TAs (target audiences); synchronizing communications media, assets, and messages; and providing news and information to the local population. CA personnel contribute to missions by synchronizing and building synergy between multiple entities such as intergovernmental organization (IGO), nongovernmental organization (NGO) activities with joint force operations. They can also help disseminate relevant messages and themes to local leaders and population; and so provide feedback to information operations (IO) as the assessments reveal sentiments of targeted HN populations or organizations. (JP 3-57)

Considerations: Is the MEF Civil Affairs Officer or representative engaged in IO planning? Are Civil Affairs actions coordinated with the IO concept of support?

k. Public Affairs

Information in the public domain affects the OE and influences operations. Commanders should carefully evaluate how various friendly, enemy, adversary, and neutral actions, images, and words impact planned and ongoing operations. By conveying the facts about joint force activities in a proactive manner, PA helps the commander to impact the information environment, particularly as it relates to public support. The force must coordinate all of its messages; further, it must integrate those messages with its partner nations' message as part of the ongoing alignment to maintain unity of effort and stand out in a saturated information environment. (JP 3-61)

Tenets of PA include:

- Tell the truth.
- Provide timely information.
- Practice security at the source.
- Provide consistent information at all levels.
- Tell the Department of Defense (DOD) story.

Perceptions Can Become Reality: A first impression on the perceptions and attitudes of decision makers, leaders, and other individuals cannot be underestimated. First impressions influence perceptions and judgments, which bias how individuals process subsequent information. Additionally, information that contradicts first impressions may be dismissed altogether. Enemies take advantage of this and often communicate lies or misleading information before we can verify details and communicate the truth. The first side that presents information often sets the context and frames the public debate.

Timeliness and Repetition: Timeliness is a key component of newsworthy information. Providing accurate and useful information in a timely manner increases credibility and relevancy. Continuous public engagement throughout an operation provides the best chance of success in supporting strategic narratives and themes and in achieving operational objectives.

Cultural Considerations: The staff and PA must understand who they are communicating with to enhance reception and understanding of the message. News is produced by people who adhere to the values and cultural system of the society they serve. News media coverage does not always reflect reality, but frames reality by choosing what events to cover and how to present them. Examine culture to predict how the presentation of news and information affects publics' perceptions. Attempts to mitigate the impact of joint force or adversary actions on public opinion after the fact are often ineffective.

Impact of Propaganda: Propaganda is compelling as it often uses elements that make information newsworthy. Many people are drawn to conflict or violence. Adversaries use conflict and violence reports to influence public opinion to further their objectives and minimize our effectiveness. Anticipating events that adversaries may exploit with propaganda can allow us to mitigate the value of that propaganda through the preemptive release of information. When operations do not allow for preemptive release of information, being prepared to respond quickly with accurate information to counter adversary propaganda is critical.

Media Landscape Complexity: The ability of groups to influence audiences has increased dramatically with the proliferation of media platforms tailored to specific points of view. This more fragmented media environment has allowed the coexistence of multiple, conflicting narratives, making the "defeat" of unfavorable narratives or "memes" difficult, if not impossible. The ability of an organization to influence audiences in this environment has become complicated, and traditional assumptions are often no longer valid. Outlandish accusations, which PA practitioners have conventionally ignored rather than helped sustain with a public response, can now often provide their own oxygen and must be addressed.

Other Considerations: Is the MEF Public Affairs Officer or representative engaged in IO planning? Are Public Affairs actions coordinated with IO activities? Are Public Affairs and related considerations factored into the overall IO plan?

Staff Planning Factors and Considerations

I. Key Leader Engagement (KLE)

KLEs are deliberate, planned engagements between US military leaders and the leaders of foreign audiences that have defined objectives. These engagements can be used to shape and influence foreign leaders at the strategic, operational, and tactical levels, and may also be directed toward specific groups such as religious leaders, academic leaders, and tribal leaders; e.g., to solidify trust and confidence in US forces.

KLEs may be applicable to a wide range of operations such as stability operations, counterinsurgency operations, noncombatant evacuation operations, security cooperation activities, and humanitarian operations. When fully integrated with other IRCs into operations, KLEs can effectively shape and influence the leaders of foreign audiences.

m. Legal Considerations

The authority to employ IRCs is rooted foremost in Title 10, United States Code (USC). While Title 10, USC, does not specify IO separately, it does provide the legal basis for the roles, missions, and organization of DOD and the Services. Title 10, USC, Section 164, gives command authority over assigned forces to the Combatant Commander (CCDR), which provides that individual with the authority to organize and employ commands and forces, assign tasks, designate objectives, and provide authoritative direction over all aspects of military operations.

General considerations for legal advice:

- “Could the execution of a particular IRC be considered a hostile act by an adversary or potential adversary?” (jus ad bellum issues under the United Nations Charter).
- “Do any non-US laws concerning national security, privacy, or information exchange, criminal and/or civil issues apply? (foreign domestic law, or host nation or coalition partner bilateral agreements)
- “What are the international treaties, agreements, or customary laws recognized by an adversary or potential adversary that apply to IRCs?” (international law)
- “How is the joint force interacting with or being supported by US intelligence organizations and other interagency entities?” (domestic law, including intelligence and national security law)
- Is it “directed at or intended to manipulate audiences, public actions, or opinions in the United States?” (2013 DoDD 3600.01, para. 3.k. requirement)
- Is there appropriate legal expertise available at the MEF to resolve any of the various legal consequences of the IO concept of support?

n. Information Operations Intelligence Integration

The intelligence staff should not perform IPB (intelligence preparation of the battlespace) in a vacuum. Staff officers from all sections bring their own areas of expertise to IPB. The IO Officer is responsible for assisting the G-2/S-2 in characterizing the Information Environment by identifying the relevant individuals, organizations, and systems that collect, process, disseminate, or act on information. Included in this analysis are the associated physical resources, information content and flow, and cognitive processes of relevant actors and audiences with an ability to impact MAGTF operations positively or negatively.

Specifically, the information operations (IO) officer (G-7/S-7) assists the G-2/S-2 in identifying—

- Threat/Adversary information-related operations, capabilities, and vulnerabilities.
- Status of threat/adversary information-related operations, assets, types, and locations.
- Threat/Adversary denial and deception doctrine and plans.
- Developed IO assessments and analyses that support and enable the IPB process.
- Friendly vulnerabilities to adversary IO or propaganda.
- Status of friendly IO capabilities—both offensive and defensive.
- HVTs, HPTs, TAIs, and DPs that can be targeted by friendly IO or by friendly IO capabilities or systems (lethal and nonlethal) to achieve an effect.
- Completing Annex B Intelligence - Appendix 6 / Information Operations Intelligence Integration.

o. Language Preparation

The MAGTF and/or Joint Force must identify the languages spoken in the AO as soon as possible so language training, procurement of translators, and preparation of communication aids such as phrase cards can begin. Competent and reliable translators (proficient in English as well as in the target language) are crucial for collecting intelligence, interacting with local citizens and community leaders, and developing products for information operations.

Part V

Key Terms and Graphics

5001. Command Relationships

The authority vested in a commander must be commensurate with the responsibility assigned. The US armed forces recognize seven different authority levels with which commanders (and certain others) may be vested. The first four are the command relationships. The other three are administrative and coordinating relationships. Table 5-1 summarizes all seven of these relationships. A list of their JCS definitions follows.

Command Authority	Authority	How & Where Exercised	Restrictions	Remarks
COCOM	(1) Organize & employ forces (2) Assign tasks (3) Designate objective (4) Operations (5) Joint training (6) Issue logistics directives	Normally through subordinate joint force, Service and/or functional component commanders	Combatant commanders only: Cannot be delegated	Established by 10 USC 164; OPCON & TACON are inherent
OPCON	(1) Organize & employ forces (2) Assign tasks (3) Designate objectives (4) Direct accomplishment or assigned mission (5) Direct operations & joint training (6) May be delegated	At any echelon at or below a combatant command. Normally through subordinate commanders	Does not include administration, logistics, discipline, internal organization or unit training	OPCON is inherent within COCOM. TACON is inherent within OPCON
TACON	Tactical command authority over assigned or attached forces or commands, or military capability or forces made available for tasking. May be delegated.	At any echelon equal to or below a combatant command	No organizational or ADCON authority	TACON is inherent within OPCON
SUPPORT	Aid, protect, complement or sustain another force as directed by a higher command for a specified mission	Under a directive issued from a higher command	As prescribed by the higher command	This is a command relationship
ADCON	(1) Organization of service forces (2) Control of resources/equipment (3) Personnel Management (4) Unit & individual training plus readiness (5) Mobilization & demobilization (6) Discipline	Normally by service or component commanders directly over subordinate or other formations.	Does not include any matters relating to operational missions	May be modified or restricted by COCOM authority
Coordinating Authority	Coordinates specific functions or activities involving forces from two or more services and/or joint force components or two or more elements from the same service. The appointing authority may require the parties to consult each other	Normally used in connection with planning rather than operations	Has no authority to compel agreement; if no agreement is reached, must refer to appointing authority	Establishes a consulting relationship, not command authority
DIRLAUTH	Authority granted by a commander (any level) to a subordinate to directly consult or coordinate with a command or agency outside the granting command	Normally used in connection with planning rather than operations	Granting commander must be kept informed	A coordination, but not a command relationship

Table 5-1. Command Relationships (JP 1-02 and MCWP 7-10 [ex-MCWP 3-40.8] 02-2009)

a. Combatant Command (Command authority) (COCOM)

Nontransferable command authority established by Title 10 (“Armed Forces”), United States Code, Section 164. Combatant command (command authority) or COCOM is exercised only by commanders of unified or specified combatant commands unless otherwise directed by the President or the Secretary of Defense. COCOM cannot be delegated and empowers a combatant commander to perform those command functions over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned to the command. COCOM should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. COCOM provides full authority to organize and employ commands and forces as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in COCOM. (JP 1-02)

b. Operational Control (OPCON)

Commanders at any echelon at or below the level of combatant command may exercise Operational Control (OPCON). OPCON is inherent in combatant command (command authority) and may be delegated within the command. When forces are transferred between combatant commands, the command relationship the gaining commander will exercise (and the losing commander will relinquish) over these forces must be specified by the Secretary of Defense. OPCON is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning

Key Terms and Graphics

tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. OPCON includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. OPCON should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. OPCON normally provides full authority to organize commands and forces and to employ those forces as the commander in OPCON considers necessary to accomplish assigned missions; it does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. (JP 1-02)

c. Tactical Control (TACON)

Command authority over assigned or attached forces or commands, or military capability or forces made available for tasking, that is limited to the detailed direction and control of movements or maneuvers within the operational area necessary to accomplish missions or tasks assigned. Tactical control (TACON) is inherent in operational control. TACON may be delegated to, and exercised at any level at or below the level of combatant command. When forces are transferred between combatant commands, the command relationship the gaining commander will exercise (and the losing commander will relinquish) over these forces must be specified by the Secretary of Defense. TACON provides sufficient authority for controlling and directing the application of force or tactical use of combat support assets within the assigned mission or task. (JP 1-02)



d. Support

Support is a command authority. A support relationship is established by a superior commander between subordinate commanders when one organization should aid, protect, complement, or sustain another force. (JP 1-02) Categories of support include—

- **General Support.** That support which is given to the supported force as a whole and not to any particular subdivision thereof. (JP 1-02)
- **Mutual Support.** That support which units render each other against an enemy, because of their assigned tasks, their position relative to each other and to the enemy, and their inherent capabilities. (JP 1-02)
- **Direct Support.** A mission requiring a force to support another specific force and authorizing it to answer directly the supported force's request for assistance. (JP 1-02)
- **Close Support.** That action of the supporting force against targets or objectives which are sufficiently near the supported force as to require detailed integration or coordination of the supporting action with the fire, movement, or other actions of the supported force. (JP 1-02)

e. Other Authorities

Other authorities outside the command relations delineated above include:

- **Administrative Control (ADCON):** Direction or exercise of authority over subordinate or other organizations in respect to administration and support, including organization of Service forces, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, discipline, and other matters not included in the operational missions of the subordinate or other organizations. (JP 1-02)
- **Coordinating Authority:** A responsibility assigned to a commander or individual for coordinating specific functions or activities involving forces of two or more Military Departments, two or more joint force components, or two or more forces of the same Service. The commander or individual has the authority to require consultation between the agencies involved, but does not have the authority to compel agreement. In the event that essential agreement cannot be obtained, the matter shall be referred to the appointing authority. Coordinating authority is a consultation relationship, not an authority through which command may be exercised. Coordinating authority is more applicable to planning and similar activities than to operations. (JP 1-02)
- **Direct Liaison Authorized:** That authority granted by a commander (any level) to a subordinate to directly consult or coordinate an action with a command or agency within or outside of the granting command. Direct liaison authorized is more applicable to planning than operations and always carries with it the requirement of keeping the granting commander informed. Direct liaison authorized is a coordination relationship, not an authority through which command may be exercised. (JP 1-02)

5002. Possible Command Relationships for MAGTF Units

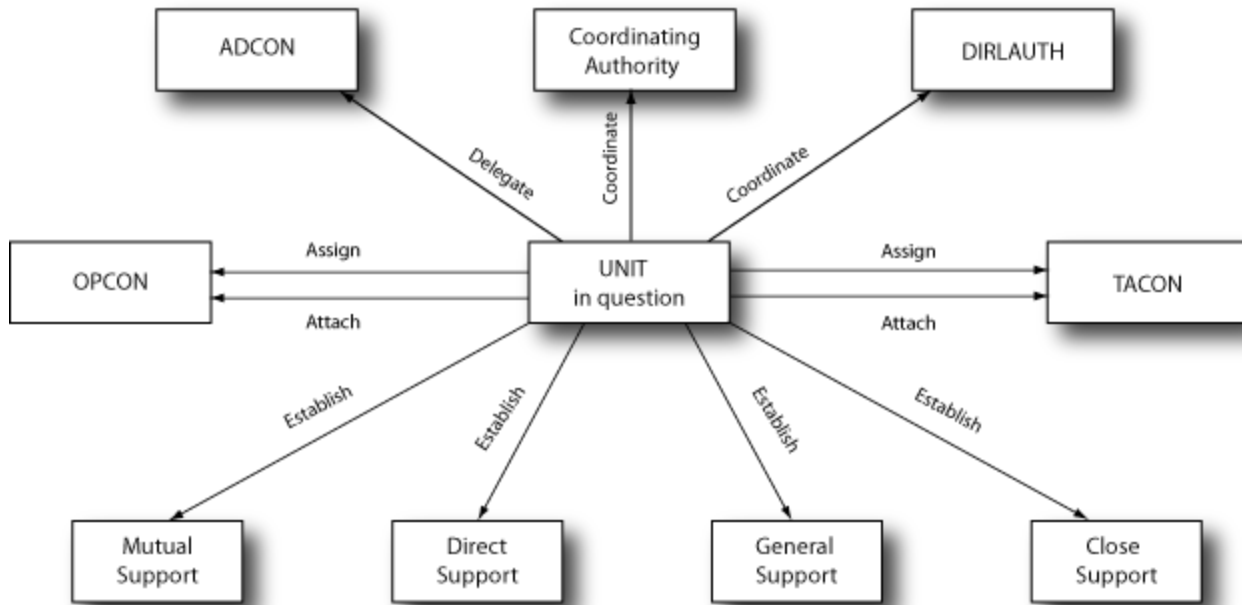


Figure 5-1. Command Relationships for MAGTF units

5003. Tactical Tasks Definitions

The following are commonly assigned MAGTF tactical tasks that may be specified, implied, or essential tasks. These tactical tasks define the actions that commanders may take to accomplish their mission. See MCRP 5-12A, Operational Terms and Graphics, for more information. Examples of enemy oriented tactical tasks include—

- **Ambush:** A surprise attack by fire from concealed positions on a moving or temporarily halted enemy.
- **Attack by Fire:** Fires (direct and indirect) to destroy the enemy from a distance, normally used when the mission does not require or support occupation of the objective. This task is usually given to the supporting effort during offensive operations and as a counterattack option for the reserve during defensive operations. The assigning commander must specify the intent of fire—destroy, fix, neutralize, or suppress. [A clear purpose must accompany the assignment of the task attack.]
- **Block:** To deny the enemy access to a given area or to prevent enemy advance in a given direction or on an avenue of approach. It may be for a specified time. Units assigned this task may have to retain terrain. [A force assigned the task of “block” should be assigned the degree of success to be achieved (the size of force to be blocked) and/or a specified time frame in support of its purpose.]
- **Breach:** To break through or secure a passage through a natural or enemy obstacle. [A force assigned the task of “breach” should know what size force is to be passed through the breach.]
- **Bypass:** To maneuver around an obstacle, position, or enemy force to maintain the momentum of advance. Previously unreported obstacles and bypassed enemy forces are reported to higher headquarters. [A unit assigned the task “bypass” should also be given *bypass criteria*. Bypass criteria are measures used during the conduct of an offensive operation. Higher headquarters establishes them by specifying the circumstances under which friendly units may avoid enemy contact.]
- **Canalize:** The use of existing or reinforcing obstacles or fires to restrict enemy operations to a narrow zone. [The tasked unit should be given the physical limits of the narrow zone, the size of the force to be canalized, and desired duration of the task.]
- **Contain:** To stop, hold, or surround enemy forces, or to keep the enemy in a given area and prevent his withdrawing any part of his forces for use elsewhere.
- **Cover:** Offensive or defensive actions to protect the force.

Key Terms and Graphics

- **Defeat:** To disrupt or nullify the enemy commander's plan and overcome his will to fight, thus making him unwilling or unable to pursue his adopted course of action and yield to the friendly commander's will. [When assigning the task of defeat, a statement that describes end state conditions should be used to define task completion ("By defeat I mean ...").]
- **Destroy:** Physically rendering an enemy force combat-ineffective unless it is reconstituted. [The degree of destruction should be specified in terms of observable enemy capabilities and not simply in terms of numbers and percentages. Destroy as an interdiction objective (attack effect) calls for ruining the structure, organic existence, or condition of an enemy target that is essential to an enemy capability (DoD no longer defines this term in JP 1-02). Destroy as a fires effect requires that a target physically be rendered combat ineffective or so damaged that it cannot function unless restored, reconstituted, or rebuilt. Setting automated fire support default values for destruction such as 30% does not guarantee the achievement of the commander's intent. The surviving 70% may still influence the operation. Destruction missions are expensive in terms of time and material. Consider whether neutralization or suppression may be more efficient.]
- **Disrupt:** To integrate fires and obstacles to break apart an enemy's formation and tempo, interrupt his timetable, or cause premature commitment or the piecemealing of his forces. [A force assigned the task "disrupt" should normally be assigned the degree of success to be achieved and/or the duration of the "disruption" in relationship to its purpose. In targeting, we disrupt enemy plans by precluding effective interaction or the cohesion of enemy combat and combat support systems. In Air Force interdiction doctrine, disrupt forces the enemy into less efficient and more vulnerable dispositions.]
- **Exploit:** Take full advantage of success in battle and follow up initial gains. Offensive actions that usually follow a successful attack, designed to disorganize the enemy in depth. [A force assigned the task of "exploit" should normally be assigned the degree of success to be achieved and/or the duration of the "exploitation" in relationship to its purpose.]
- **Feint:** An offensive action involving contact with the enemy to deceive him about the location or time of the actual main offensive action.
- **Fix:** To prevent the enemy from moving any part of his forces either from a specific location or for a specific period of time by holding or surrounding them to prevent their withdrawal for use elsewhere. [The size of the force to be fixed, the duration of the task, and where to fix the enemy should be specified.]
- **Guard:** To protect the main force by fighting to gain time, while also observing and reporting information. [A force is assigned the task to "guard" as one of the tasks in security force operations. Before assigning a unit the task of "guard", planners should ensure that they specify the scope of the task in terms of time and terrain. A guard force normally operates within the range of the main body's indirect fire weapons.]
- **Interdict:** An action to divert, disrupt, delay, or destroy the enemy's surface military potential before it can be used effectively against friendly forces. [A force assigned the task of "interdict" should normally be assigned the degree of success to be achieved (i.e., the effect desired relative to enemy capabilities) and/or the duration of the "interdiction" in relationship to its purpose.]
- **Neutralize:** To render the enemy or his resources ineffective or unusable. [A force assigned the task of "neutralize" will normally be assigned a specific time frame or degree of neutralization to be achieved in relationship to its purpose. Neutralization effects should be described in terms of observable enemy activity. Planners should avoid articulating neutralization effects in terms of numbers or percentages whenever possible. Neutralization fire results in enemy personnel or material becoming incapable of interfering with an operation or COA. Key questions planners must ask are when and how long does the commander want the target to be neutralized. Most planned fire missions are neutralization fires.]
- **Penetrate:** To break through the enemy's defense and disrupt his defensive system.
- **Protect:** To prevent observation, engagement, or interference with a force or location. [A force assigned the task "protect" should be assigned the degree of success to be achieved and/or the duration of the "protection" in relationship to its purpose.]
- **Reconnoiter:** To obtain, by visual observation or other methods, information about the activities and resources of an enemy or potential enemy.
- **Rupture:** To create a gap in enemy defensive positions quickly.

- **Screen:** To observe, identify, and report information, and only fight in self-protection. [A unit assigned the task “screen” may be required to maintain surveillance; provide early warning to the main body; or impede, destroy, and harass enemy reconnaissance within its capability without becoming decisively engaged. The scope of task should be articulated in terms of time and terrain.]
- **Support by Fire:** Where a force engages the enemy by direct fire to support a maneuvering force using overwatch or by establishing a base of fire. The supporting force does not capture enemy forces or terrain.

Examples of terrain oriented tactical tasks include—

- **Clear:** The removal of enemy forces and elimination of organized resistance in an assigned zone, area, or location by destroying, capturing, or forcing the withdrawal of enemy forces that could interfere with the unit's ability to accomplish its mission. [The degree of success to be achieved should be specified by describing what is meant by “organized resistance” (see bypass criteria above).]
- **Control:** To maintain physical influence by occupation or range of weapon systems over the activities or access in a defined area. [The area to be controlled and duration of the task should be specified.]
- **Occupy:** To move onto an objective, key terrain, or other man-made or natural terrain area without opposition, and control the entire area. [A unit assigned the task “occupy” should be assigned the duration of the “occupation” in relationship to its purpose.]
- **Reconnoiter:** To secure data about the meteorological, hydrographic, or geographic characteristics of a particular area.
- **Retain:** To occupy and hold a terrain feature to ensure it is free of enemy occupation or use. [A unit assigned the task of “retain” should be given a specific timeframe in relationship to its purpose.]
- **Secure:** To gain possession of a position or terrain feature, with or without force, and to prevent its destruction or loss by enemy action. The attacking force may or may not have to physically occupy the area. [The attacking force may or may not have to physically occupy the area. Conditions should be established that define when a position or terrain feature is “secured.” Usually, conditions can be expressed in terms of observable enemy activity.]
- **Seize:** To clear a designated area and gain control of it. [A unit assigned the task of “seize” will usually have to gain physical possession of a terrain feature from an enemy force. Note that the task “clear” is imbedded within the definition of the task “seize.” See the definition of “clear” for specific planning considerations.]

Examples of friendly force oriented tactical tasks include—

- **Breach:** To break through or secure a passage through a natural or friendly obstacle. [A unit assigned the task of “breach” should know what size force is to be passed through the breach.]
- **Disengage:** To break contact with the enemy and move to a point where the enemy cannot observe nor engage the unit by direct fire.
- **Displace:** To leave one position and take another. Forces may be displaced laterally to concentrate combat power in threatened areas.
- **Exfiltrate:** The removal of personnel or units from areas under enemy control.
- **Follow:** The order of movement of combat or combat support, and combat service support forces in a given combat operation. In special circumstances, the above tasks may be modified to meet the requirements of METT-TC. The commander must clearly state that he is departing from the standard meaning of these tasks. One way this can be done is by prefacing the modified task with the statement, “What I mean by [modified task] is...”

Tactical tasks are assigned based on capabilities. The ground combat element has the inherent capability to execute all MAGTF tactical tasks. The combat service support element can execute all tactical tasks essential to providing sustainment to a MAGTF. The aviation combat element can execute many of the MAGTF's tactical tasks (all those requiring/involving aviation). However, it cannot secure, seize, retain, or occupy terrain without augmentation from the ground combat element. Weather and task duration may significantly affect the aviation combat element's ability to execute assigned tactical tasks. (See MCDP 1-0.)

5004. Selected Key Map Symbology

MIL STD 2525D, *Joint Military Symbology*, establishes the procedures for the Army and Marine Corps in the use of land-based warfighting symbology. The manual describes the use of symbols for maneuver command and control. The intent of this section is to provide the user a ready reference for the use of routine and commonly used symbols. It is not intended to be a replacement for, or as complete as the aforementioned manual.

Key Terms and Graphics

Size Indicator	Meaning
—	Installation
∅	Team / Crew
•	Squad
••	Section
•••	Platoon / Detachment
I	Company / Battery / Troop
II	Battalion / Squadron
III	Regiment / Group
X	Brigade
XX	Division
XXX	Corps / Force
XXXX	Army
XXXXX	Army Group / Front
XXXXXX	Region

Table 5-2. Unit Size and Installation Indicators

a. Unit Symbol Modifiers

The following unit symbols are for use on situation maps, overlays, and annotated aerial photographs. A symbol is composed of three components: a frame (geometric border), a fill, and an icon. Frames are geometric shapes used to display affiliation. Affiliation refers to whether the warfighting object being represented is a threat. The basic affiliation categories are friendly, unknown, neutral, and enemy. The unknown frame shape is normally used only for aircraft and ships.
















	Friendly Ground Units	Friendly Sea/Air Units	Unknown Sea/Air Units	Neutral Units	Enemy Units
Surface					
Sub-surface					
In-flight					

Figure 5-2. Unit, Installation and Site Symbol Frames

Fill refers to the area within the frame. If color is used in a symbol, it shall indicate affiliation. Generally, black is used for the frame, icon, and modifiers when symbols are displayed on a light background. White is used for these elements when displayed on a dark background. A color fill can be used if an icon is displayed within the area of the frame. The icon is a “role indicator” that shows the warfighting function the unit performs either on the ground, in the air, or at sea. An example is the crossed rifles which represent an infantry unit.

Affiliation	Hand-Drawn	Computer-Generated
Friend, Assume Friend	Blue	Cyan
Unknown, Pending	Yellow	Yellow
Neutral	Green	Green
Enemy, Suspect, Joker, Faker	Red	Red

Table 5-3. Fill Colors

b. Friendly Unit Symbols

Unit symbol modifiers are combined with basic unit function (branch) symbols to create a composite symbol that represents a unique type of unit. All modifiers are placed in either the center of the frame, upper half, or above the basic function symbol. In addition to the modifier symbols, text may be used inside the symbol frame to further clarify the symbol. The following are examples of friendly unit symbols with modifiers. (See Figure 5-3, next page, and MIL-STD-2525D, *Joint Military Symbolology*, 06-2014)


































































				
Infantry	Armor	Artillery	HIMARS	Reconnaissance
				
Chemical	Air Defense	Engineer	Airborne	Motorized
				
Supply	Service	Amphibious	Unmanned Air Vehicle	Rotary Wing
				
Fixed Wing	Maintenance	(Motor) Transportation	Mechanized Infantry	Airborne Infantry
				
Motorized Infantry	Air Defense Missile	Air Assault Infantry	ANGLICO	Anti-Armor
				
Air Defense Radar	Artillery Radar	Air Defense Gun & Missile (Avenger)	Amphibious Assault Vehicle	Wheeled Armored Reconnaissance (LAR)
				
Military Police	Force Reconnaissance	Mortar	Civil Affairs Group	MEF Headquarters Group
				
Special Operations Training Group	Communication	Radio	General Support Communications	Direct Support Communications
				
Combat Logistics Regiment	Combat Logistics Battalion	Combat Logistics Company	Personnel Service	Marine Logistics Group
				
General Support Motor Transport	Direct Support Motor Transport	Motor Transport Maintenance	General Support Maintenance	Ordnance Maintenance
				
Electronic Maintenance	Engineer Maintenance	Engineer Services	Engineer Support	Engineer Bridge
				
Ammunition Supply	Medical Supply	Ration Supply	Bulk Fuel	Landing Support
				
Beach & Terminal Operations	Landing Support Equipment	Medical	Dental	Infantry (Hostile)

Figure 5-3. Land Unit Symbols (from MIL STD 2525D)

Key Terms and Graphics

c. Tactical Mission Graphics

Tactical task graphics are for use in course of action sketches, synchronization matrixes, and maneuver sketches. They do not replace any part of the operation order or operations overlay. The graphics should be scaled to fit the map scale and size of unit for which they are being used. Where practical, the tactical mission graphic should connect with the decision graphic or unit graphic at the center of the bottom of the symbol.

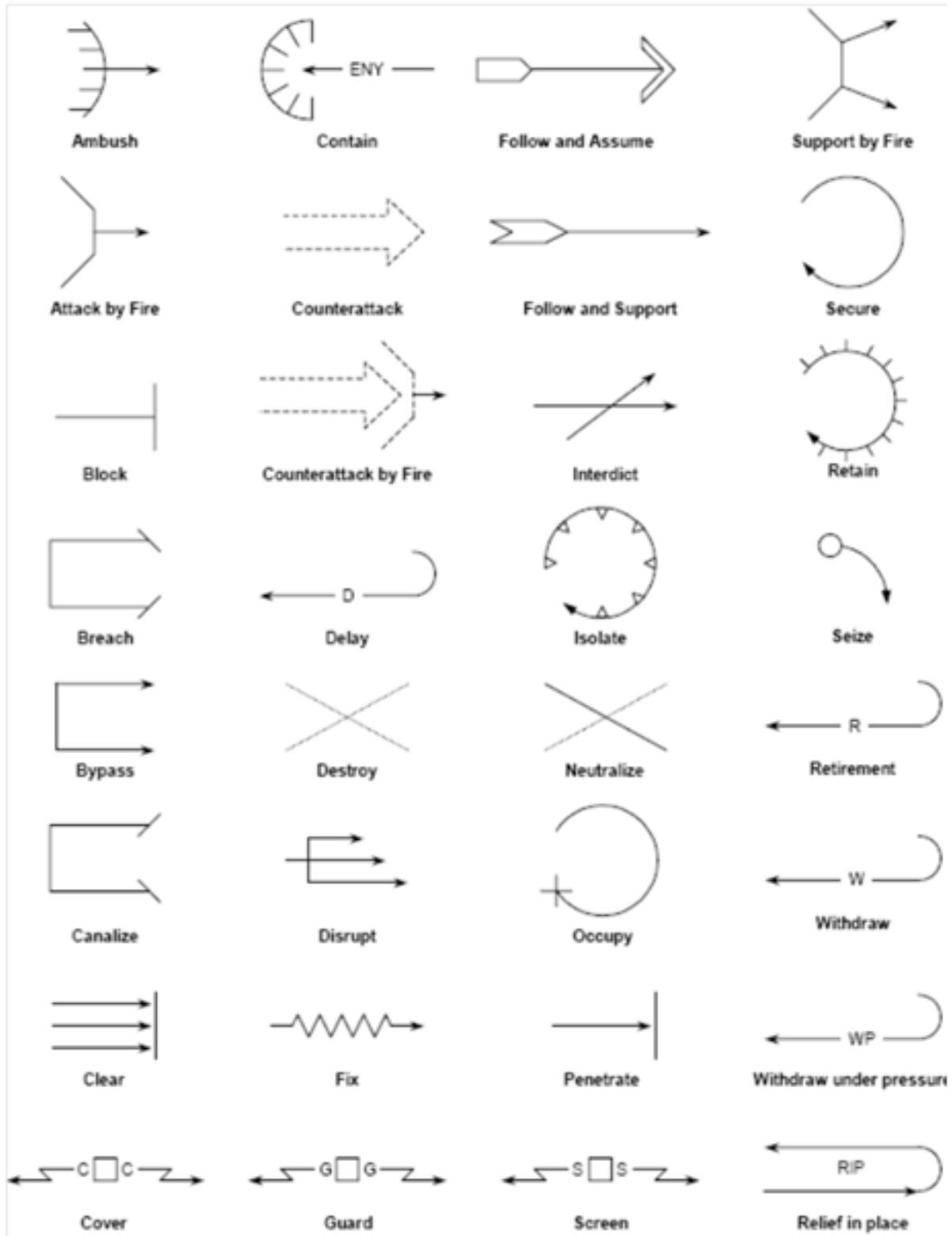


Figure 5-4. Tactical Mission Graphics

Appendix A

References

A-1. Useful Web Pages

a. Department of Defense

Secretary of Defense	http://www.defense.gov/osd/
Joint Chiefs of Staff	http://www.jcs.mil/
U. S. Marine Corps	http://www.marines.mil/
U. S. Navy	http://www.navy.mil/
U. S. Air Force	http://www.af.mil/
U. S. Army	http://www.army.mil/
USCENTCOM	http://www.centcom.mil/
USEUCOM	http://www.eucom.mil/
USPACOM	http://www.pacom.mil/
USSOUTHCOM	http://www.southcom.mil/Pages/Default.aspx
USSOCOM	http://www.socom.mil/default.aspx
USSTRATCOM (incl. former USSPACECOM)	http://www.stratcom.mil/
USTRANSCOM	http://www.transcom.mil/
Defense Logistics Agency - Energy	http://www.energy.dla.mil/Pages/default.aspx
DISA	http://www.disa.mil/
DLA	http://www.dla.mil/
DOD Terms & Dictionary	http://www.dtic.mil/doctrine/dod_dictionary/index.html
DOD Information Center	http://www.dtic.mil/dtic/

b. Doctrine

USMC Doctrine	https://www.doctrine.usmc.mil/ CAC required
MSTP	http://www.tecom.marines.mil/Units/Directorates/MSTP.aspx
Joint Doctrine (Joint Electronic Library)	http://www.dtic.mil/doctrine/
USA Doctrinal Publications	http://armypubs.army.mil/doctrine/active_fm.html CAC/AKO required
USA Training and Doctrine Command	http://www.tradoc.army.mil/index.asp
USN Doctrine	https://ndls.nwdc.navy.mil/Default.aspx CAC required
USAF Doctrine	http://www.au.af.mil/au/lemay/main.htm
Center for Army Lessons Learned (CALL)	http://usacac.army.mil/organizations/mccoe/call
USMC Center for Lessons Learned (MCCLL)	https://www.mccll.usmc.mil/index.cfm CAC required

c. Government

White House	http://www.whitehouse.gov/
DOS	http://www.state.gov/
DOT	http://www.dot.gov/
FAA	http://www.faa.gov/
FEMA	http://www.fema.gov/
FHWA	http://www.fhwa.dot.gov/
GSA	http://www.gsa.gov/portal/category/100000
Maritime Administration	http://www.marad.dot.gov/
DHS	https://www.dhs.gov/

d. Marine Corps Bases and Installations

MCLB Barstow	http://www.mclbbarstow.marines.mil/
MCAGCC	http://www.29palms.marines.mil/
MCB Camp Pendleton CA	http://www.pendleton.marines.mil/

Appendix A - References

MCRD San Diego CA	http://www.mcrdsd.marines.mil/
MCAS Miramar	http://www.miramar.marines.mil/
MCAS Yuma	http://www.mcasyma.marines.mil/
MARFORRES	http://www.marforres.marines.mil/
MCLB Albany	http://www.albany.marines.mil/
MCB Quantico	http://www.quantico.usmc.mil/
MARFORCOM (formerly MARFORLANT)	http://www.marforcom.marines.mil/
MARFORPAC	http://www.marforpac.marines.mil/
MCAS Cherry Point	http://www.cherrypoint.marines.mil/
MCAS New River	http://www.newriver.marines.mil/
MCB Camp Lejeune	http://www.lejeune.marines.mil/
MCAS Beaufort	http://www.beaufort.marines.mil/
MCRD Parris Island SC	http://www.mcrdpi.marines.mil/
MCB Hawaii	http://www.mcbhawaii.marines.mil/
MCAS Iwakini, JA	http://www.mcasiwakuni.marines.mil/
MCAS Futenma, JA	http://www.mcasfutenma.marines.mil/
Marine Corps Installations, Pacific	http://www.mcipac.marines.mil/
MCB Camp Butler, OK	http://www.mcbbutler.marines.mil/

e. Marine Corps Units

I MEF	http://www.imef.marines.mil/
II MEF	http://www.iimef.marines.mil/
III MEF	http://www.iiimef.marines.mil/
11 th MEU	http://www.11thmeu.marines.mil/
13 th MEU	http://www.13thmeu.marines.mil/
15 th MEU	http://www.15thmeu.marines.mil/
22 nd MEU	http://www.22ndmeu.marines.mil/
24 th MEU	http://www.24thmeu.marines.mil/
26 th MEU	http://www.26thmeu.marines.mil/
31 st MEU	http://www.31stmeu.marines.mil/

f. U. S. Transportation Command

USTRANSCOM (PAO)	http://www.transcom.mil/
Military Sealift Command	http://www.msc.navy.mil/
Military Surface Deployment & Distribution Comnd	https://www.sddc.army.mil/Pages/default.aspx

g. Miscellaneous

Aircraft Distance Calculator	https://airplanemanager.com/flightcalculator.aspx
Airfield Suitability	https://gdssams.maf.ustranscom.mil/gdss2web/ CAC & site acct req'd
Amphibious Ships	http://www.navy.mil/navydata/ships/amphibs/amphib.asp
Blount Island Command	http://www.bic.marines.mil/
IDE/GTN Convergence	https://www.igc.ustranscom.mil/igc/ CAC & site account required
GTN Classified	https://www.transcom.smil.mil (SIPRNET; can't test; may be outdated)
USM Preposition Ship Information Portal	https://mepic.bic.usmc.mil/iMepic/default.aspx CAC & site acct req'd
MAPS	https://maps.google.com/ or https://www.mapquest.com/
Per Diem Rates	http://www.defensetravel.dod.mil/site/perdiemCalc.cfm
TCAIMS (AMIS)	http://www.usarmyamis.army.mil/
Travel Claims	http://www.defensetravel.osd.mil/

A-2. Planning Quick Reference Matrix

Marine Corps Planning Process: Problem framing, COA Development, COA War Game, COA Comparison and Decision, Orders Development, Transition.

Actions Upon Receipt of Mission	CG and C/S consider the division of labor between the G-3 and the G-5: Time: Relative to what is being executed in current operations and what is future operation's planning horizon. Purpose: Is the purpose the same for future tasks, within the current or subsequent phases, such that G-3, Future Operations is the logical choice for planning. Major Tactical Tasks: Major tasks (Linkup, RIP, POL, JLOTS, etc.), of such complexity, that require long lead-time and coordination with forces external to the MEF. Area of Operations: Change in area of operations requiring a different set of considerations with respect to terrain and enemy. Command Relationships: Changes in command relationships requiring coordination beyond that of what is currently in place. CG's guidance to C/S, G-3, and G-5 may include decisions on the following: Assessment of division of labor between G-5 and G-3 in order to prevent duplication of effort. Where does the CG want the G-5 to focus his planning efforts? Does the CG want the G-5 to think beyond the next MEF mission? What are the CG's future concerns? What should the G-5 produce and hand off to G-3, FOPS. Planning Horizon based on Time Available: Is it better to have the G-5 coordinate and shape issues for the MEF or dedicate time to detailed planning that may be best planned by G-3 FOPS. Planning Horizon based on achieving the assigned purpose: While G-3 plans and executes towards one purpose, G-5 plans towards the next purpose.
Commander's Orientation:	The commander provides forming guidance to his staff. This can include information that the commander has received from higher headquarters and the commander's own initial thoughts about the situation. Once this orientation is complete the staff can prepare for subsequent design discussions.
Problem Framing:	Establish Time Line. In his discussions with his staff the commander considers a wide variety of factors affecting the environment and his mission. The commander provides initial guidance to his staff as he gains insight into the nature and purpose of his mission. The staff then identifies specified and implied tasks (annotate reference/page number); determines essential tasks; drafts the mission statement; determines the Area of Interest (AOI) in relation to AO; reviews restraints (cannot do) and constraints (must do) (annotate reference/ page number); and reviews significant assumptions required to continue planning. It also determines requests for information (RFI), priority intelligence requirements (PIR), recommended CCIR(s), and reviews resource shortfalls. Determine subject matter expert shortfall. Enemy and Friendly COG/CV analysis (Enemy COG prevents you from achieving your purpose). Throughout planning allow OPT members time to brief respective Commanders and staff principals. G-2 develops HVT(s).
Problem Framing Brief:	Review commander's initial guidance. Situation update, AO/AOI, Intel estimate (Terrain, weather, threat, COA[s]). HHQ Mission and Intent. Review purpose, specified, implied, and essential tasks (with references/page). Proposed mission statement. Review shortfalls. Have G2 present enemy COA models. Review Enemy and Friendly COG. Recommend CCIR(s). Issues for the commander. Once the mission statement is approved, draft and issue warning order (mission, commander's intent, task organization, earliest time of movement, etc.). Start incorporating planning products within the JOPES basic orders format. Begin staff estimates and convene the Red Cell.
COA Development:	Commander issues planning guidance with respect to COA development, and decisive (results beyond itself) and shaping actions. Review MCOO, doctrinal and situation template, and ENCOA models. Graphically array friendly and enemy forces. Develop the relative combat power assessment. Develop initial COA(s) by working backward from the PURPOSE of the operation, the ENDSTATE conditions that achieve the purpose, EN COG/CV, to decisive (ME) and shaping (SE/ Lethal and non-lethal) actions and Reserves. Consider Types of Offensive Operations and Forms of Maneuver that can lead you to a Decision. Think Time and Space at the MEF level—deep, close, rear operations. Determine which forms of maneuver best exploit the combined arms of the MAGTF across the entire battlespace. Where do you want to force, accept, or refuse battle. Develop HVT(s) into HPT(s). Review the commander's planning guidance against the COA. Ensure that the COA is Suitable (accomplishes the mission [purpose] and complies with the commander's guidance). Feasible (accomplish mission with available time, space and resources). Distinguishable (significant different from other COA(s) in forms of maneuver or attacking EN COG through CV[s]). Acceptable (accomplishes an advantage that justifies the cost in resources), Complete (accomplishes the all tasks in accordance with the commander's guidance). Brief the initial COA to the commander, ensure that reps from the Red Cell are present. Make necessary modifications. Refine graphics (boundaries, LD, phase lines, ground and air axis, assembly areas fire support measures, ME/SE/Res) and write COA narratives (write broad overview of the operation as a CONOPS (MSC – ACE, GCE, FSSG tasks) as conducted in phases or stages with end state for each. Tasks and Purpose of the ME/SE/Res). Reserves should be organized by anticipated capabilities.
COA Development Brief:	Review Commander's Planning Guidance, Intel update, Mission, Intent, Updated facts and assumptions, Relative Combat Power Assessment, COA graphics and narratives (read the narrative and have a pointer work the map), recommend additions to CCIR(s) and PIR(s). Pending Issues for the commander, Recommend war gaming analysis and evaluation criteria.
COA War Game:	Commander updates intent, CBAE, and CCIR(s) as part of the commander's war game guidance. Includes friendly and threat COA(s) to be war gamed against specific (most likely and dangerous) enemy COA(s). List of critical events (decisive action, shaping, link up, passage of lines, enemy counter attack...) that need to be war gamed, and level of the war game (one or two levels down). The commander establishes the evaluation criteria based upon principles of war (MOOSE MUSS), main effort, EN COG, Purpose of the operation.... Red Cell and OPT prepare Synchronization Matrixes for their COA(s). Review the commander's guidance and evaluation criteria with the OPT and Red Cell. Evaluate the friendly COA(s) against enemy COA(s) and not against other friendly COA(s). Review war game rules and technique—post the designated enemy COA overlay on the map, post the friendly COA overlay on the map. Determine if events are simultaneous or chronological. Determine the effects of shaping (CCDR and Enemy) on the forces. Begin the war game by establishing time of the event and weather conditions; then conduct as many moves as necessary to achieve desired results. Record the time and results of the friendly and enemy moves, and collect data to satisfy the commander's evaluation criteria. Update synchronization matrix and decision support template and matrix (event template with projected enemy positions, NAI(s), TAI(s), and DP(s)).

Appendix A - References

COA War Game: (continued)	Identify and record, time, critical events, decision points, branches, and sequels. Validate HPT(s). Identify resource shortfalls, and additional RFI, PIR(s), and CCIR(s). Identify and develop measures of effectiveness for assessment. Validate Assessment Criteria's and MOE(s) for Tasks. Brief respective staff sections to develop and refine staff estimates.
COA War Game Brief:	Mission, Intent, Cdr's evaluation criteria, war gamed COA, narrative and task organization, war gamed significant events and results (just the facts), decision points, any branches and sequels, validated assumptions, additional CCIR(s) and PIR(s), resource shortfalls, commander's issues (track the ones resolved), commander's evaluation criteria as it pertains to each COA.
COA Comparison and Decision:	The commander, principle staff, and subordinate commanders examine and evaluate the COA(s) using the commander's evaluation criteria, staff estimates, and estimates of supportability. The commander may select a COA, modify a COA, develop a new COA by combining favorable elements of all the COA(s), or discard and begin staff planning anew. Upon making a decision, the commander reviews the COA in detail (critical events and decision points) with subordinate commanders and principle staff. Issue Warning Order.
Orders Development:	The C/S coordinates the principle staff to assist the G-3 in developing the OPORDER. The mission statement (goes in para. 2 of the OPORDER), commander's intent (para. 3a), COA narrative (refined into a concept of operations [para. 3b]), CCIR(s) (para 3e), staff estimates (refined into appropriate annexes), specified and implied tasks (with a purpose assigned to subordinates in para 3c), synchronization matrix (refined into an execution matrix), and other products from the planning process become the basis of the OPORDER. Conduct an Orders Reconciliation to review the entire order to ensure that the basic order and all its annexes are properly linked and in agreement. Conduct an "orders crosswalk" to ensure that the order is also linked to higher and adjacent. Identified branches are further planned to become FRAGO(s). Decision Support Template and Matrix along with other Intelligence and IPB products are provided to subordinate commands.
Transition:	Designed to shift from planning to execution. The commander or C/S provide transition guidance. During transition, the commander conducts a transition/execution drill to envision flow of events with subordinate commanders. The commander may require the subordinate commanders to give a confirmation brief of their understanding of the mission and intent and their CONOPS. In internal transition, the plan is transitioned by future ops to current ops. The OPT reviews the detailed plan or order with all the staff section current ops reps. This brief may consist of an orientation, intelligence update, IPB, HHQ mission and intent, mission, commander's intent, CCIR(s), T/O, and concept of operations, subordinate tasks, coordinating instructions, identified branches and sequels, decision support tools, pending issues. Current Ops should conduct an execution drill.
Red Cell: Supports the CIC.	Convene the red cell as soon as possible. As the "thinking enemy," the red cell receives threat COA(s) (most dangerous/most likely) from the G-2 and prepares these COA(s) for the war game. Based on threat capabilities, the red cell should have the following representation: maneuver, fires, intelligence, and information operations (IO) trained planners and analysts. The red cell team leader is designated by the commander and does not necessarily have to be an intelligence officer. The red cell and the OPT must constantly exchange information during the planning process.
Warfighting Functions:	Maneuver, Intelligence, Logistics, Command and Control, Force Protection, Fires
Center of Gravity:	COG is a source of strength (MCDP series & 0-1) a COG may shift by phase or by COA. For example if the enemy is defending, his COG may be artillery; whereas, if the enemy is delaying, his COG maybe his counterattack force—armor. At the tactical level, if the EN COG does not prevent you from achieving your purpose, then it may not be a COG. Remain focused on the purpose , the attack of the EN COG is only important if it leads you to that purpose.
Cdr's Intent:	Purpose, Method, and End State
Cdr's Critical Information Requirement (CCIR):	An item of information required by the Cdr that directly affects his decisions and the successful execution of his operational or tactical operations. The two key elements in a CCIR are: Priority Intelligence Requirements (PIR) and Friendly Force Information Requirements (FFIR) (see JP 1-02). A CCIR should be linked to decisions, assessment criteria and branch plans. To better focus collection assets the Cdr should designate as few CCIR as possible.
On-order; Be Prepared Missions	An On-order mission is a mission to be executed , except that the exact time and place may not be known . The force assigned the mission is a committed force, it will develop plans, allocate resources, task organize, and position forces for execution. It must be mentioned in the CONOPS. A Be-prepared mission is a mission assigned that might be executed . It will be executed only if something else has or has not been successful; linked to an event . No resources are allocated for a BPT mission. In the priority of planning, it will be planned after any other assigned on-order missions.
Forms of Maneuver and Types of Operations:	Forms of Maneuver: Frontal Attack--Flank Attack – Envelopment (single/double)—Turning Movement- Penetration—Infiltration. Types of Offense: Movement to Contact, Attack (Hasty, Deliberate, Spoiling, Counterattack, Raid, Feint, Demonstration), Exploitation, Pursuit. Types of Defense: Mobile (orients on the destruction of the enemy through offensive action) and Position Defense (deny enemy access to critical terrain for a specified period of time). Forms of Defensive Maneuver: defend and retrograde. Forms of Retrograde: Delay, Withdrawal (under pressure and not under pressure), Retirement. Forms of Reconnaissance: Zone, Area, Point, Route, Recon in Force. Forms of Security: Screen (observe and report), Guard (T/O to operate apart and protect the main force), Cover (prevent surprise and deceive the enemy).
Defense Operations:	Security area (FLOT[no screening or guard forces forward of—should have a BHL for these forces]—FEBA [area where ground combat units are deployed, excluding screening and covering forces]). Main Battle Area (FEBA—Rear Boundary of forward subordinate units). Rear Area (area forward from the assigned rear boundary to the rear boundary of the main battle area). Position Defense: Denies the enemy access to terrain. Mobile Defense: Orients on the enemy force. Defend in sector or battle position. Task Organized Counterattack Force and Reserves.
Phases of an Operation	JP 3-0 September 06 with Change one (February 08) recognizes six phases in a campaign or major operation. These are shape, deter, seize the initiative, dominate, stabilize and enable civil authority.
Stability Operations:	Principles: Objective, Unity of Effort, Security, Restraint, Perseverance, and Legitimacy. Types: Arms Control, Combating Terrorism, DOD Support to Counterdrug Operations, Enforcement of Sanctions/Maritime Intercept Operations, Enforcing Exclusion Zones, Ensuring Freedom of Navigation and Overflight, Humanitarian Assistance, Military Support to Civil Authorities, Nation Assistance/Support to Counterinsurgency, NEO(s), Peace Operations (Peace Enforcement, Peace Keeping Operations, Operations in Support of Diplomatic Efforts), Protection of Shipping, Recovery Operations, Show of Force Operations.

MAGTF Planner's Reference Manual

Amphibious Operations:	Types: Assault, Demonstration, Raid, Withdrawal. Assault Forces and Assault Follow on Echelon. PERMA; Planning, Embarkation, Rehearsal, Movement, Assault. Considerations: Mission (Purpose of amphibious assault – fix, deceive, or fight in depth, are operations sequenced or simultaneous), Objectives, who is the CATF and does he have the ability to control the AOA, if established. If no AOA how and who controls the battlespace. AOA (immature theater) / AO (mature theater), Command Relations, Air Control, Supporting Ops, Boundaries, Linkup, Deception, Pre-Assault Ops, Advance Force Ops, MPF, Logistics (AFLOAT or JLOTS). What are the conditions for transfer of authority ashore. Is NAVFOR the supported or supporting commander during execution of the amphibious operation? Advance Force Operations (Organized within the ATF that precedes to prepare the obj area—recon, mines...), Pre-Assault Operations (conducted in obj area before the assault phase begins by the ATF forces), Supporting Operations (Coordinated by the CATF to shape the enemy by joint forces—deception, battlespace dominance, mines outside the AOA, MIO, special operations). SHIPS: LPD4: (700 Marines, 1 LCAC, 2 Helo spot—4 CH 46), LPD17 (700 Marines, 2 LCAC, 2 Helo spots – 4 CH-46), LSD41: (400 Marines, 4 LCAC, 2 Helo spots - 0 CH 46), LSD49: (400 Marines, 2 LCAC, 2 Helo spot—0 CH 46), LHD: (1,890 Marines, 3 LCAC, 9 Helo spot—42 CH 46), LHA: (1,900 Marines, 1 LCAC, 9 Helo spot—43 CH46), LCC-19 , Blue Ridge Command Ship (200 Marines, 1 Helo spot). 5-inch Guns: 22,000km range, HE, WP, illum.
Linkup Operations:	Conducted during an amphibious operation by forces landed by surface or aviation means, relief of an isolated unit, join other US or allied forces. May be conducted to complete an encirclement of envelopment of an enemy force, join an attacking force with a force inserted in the enemy rear. Assist in the breakout of an encircled friendly force, Forces may be moving towards each other, or may be stationary. May be part of an offensive or defensive operation. HQ directing the linkup must establish the command relationships and responsibilities of the forces involved. Liaison is established through planning and continues throughout the operation. Coordinate the scheme of maneuver and control measures. Location of primary and alternate link-up points. Fire support measures increase or decrease as the forces converge. Actions following the linkup. G2 must employ R/S assets near linkup points. Axis of advance of the moving force must intersect the security element of the stationary force. Stationary force removes obstacles, provides guides, and establishes assembly areas for the reorganization of the linkup forces. A restrictive fire line (RFL) may be required to preclude fires from the convergence of forces affecting each other. As the linkup become imminent, the RFL is moved as close to the stationary force as possible to allow maximum freedom of action for the linkup force (moving force should control fires). Both FSCC should clear fires not observed or under terminal control. Upon linkup, responsibility for fire support is transferred to the designated commander. If the linkup force is to continue operations with the stationary force, then a single commander for the overall force must be designated. FM 71-100 Div Ops
Obstacle Crossing:	Natural or Manmade. Hasty or Deliberate. Suppress, Obscure, Secure, and Reduce. Support Force to isolate the obj, Breach force creates lanes within the obstacle belt. Assault force dislodges the enemy. M-155 MICLIC: 100m x 16m. Expect 50% equipment loss for the breach force. Mechanical Reduction 10 minutes per 100m minefield.
Passage of Lines:	Must facilitate another tactical operation. Conducted to continue and attack, envelop an enemy force, pursue a fleeing enemy, or withdraw a security or main battle force area. Use multiple passage lanes. Should be rapid to minimize vulnerability. Stationary unit conducts aggressive counter recon. Engineer support from stationary unit to guide the passing force through obstacles along the FLOT. Control measure (Battle Handover Line, Axis of Advance, Rearward Assembly Areas). Passing unit FSC coordinates the fires. Stationary unit assists in CASEVAC, EPW(s), civilian control, route priority and traffic control. Higher command coordinates responsibility of control of zone or sector or mutually agreed by stationary and passing commanders. Deception and smoke are planned. Combat support is integrated into the plan to support the movement of the passing unit. Route priority is given to the passing unit. Exchange intelligence, tactical plans, SOP(s), security measure during passage, priorities of route and facilities and provisions for movement control, exchange of LNO(s), and obstacle plan.
Relief in Place	Can be conducted simultaneously over the entire sector or staggered over time. Executed from front to back or back to front, given METT-TC and the amount of forces employed along the FLOT (minimum forces along the FLOT, relief rear to front and vice versa). Time of relief, sequence of units, advance parties, fire support coordination, air defense, passage control (initially unit being relieved has TACON upon relieving unit, exchange of equipment...).
Maritime Prepositioning:	Secure area with adequate ports (drafts, overhead clearance, and throughput [roads...]), and adequate strategic airlift. One MPSRON supports a brigade size MAGTF force of approx. 18,800 Marines and sailors for 30 days. All classes of supplies except IV, VI and X. MSPRON-2 Indian Ocean (Diego Garcia), MSPRON-3 Pacific Ocean (Guam). M1A1: 58; LAV: 25; AAV: 109; HMMWV weapon carriers: 111 (48 w/TOW), TWPS: 20; ROWPU: 41; Trucks (7 ton cargo): 319, MHE: 121; 30 days sustainment. Sorties for MEF (Fwd) Fly in Echelon: CMD (CE) 12; GCE 35; CSSE 30; ACE 151. Naval Support Element (NSE) 6. Offload 7-9 days dependent on ship type. Backload 9-10 days.
Rear Operations:	Functions: Communications, Intelligence, Movement, Area Management, Security, Sustainment, Infrastructure Development, HN Support. Dedicate intelligence assets to rear area.. Today's deep fight may be tomorrow's rear area. MACE CG generally assigned as the RAC (rear area commander/coordinator). Reserve Regt assigned as the TCF. Levels: 1. (Agents, terrorists, saboteurs....) Threat can be defeated by base/base cluster self-defense. 2. (Small tactical units, unconventional forces....) Beyond base self-defense capability but can be defeated by response forces (MP) with supporting arms. 3. (Large tactical units—air/heliborne, amphibious....) Requires commitment of combined arms tactical combat forces (TCF). Active and Passive Defensive Measures. SROE and LNO to FOPS. If FSSG is the RAC than they must have assets assigned for fire coordination and security.
IPB:	Doctrinal Template: En Order of Battle. Situation Template: Enemy based on terrain and environment. Event Template: NAI with EN COA for developing a collection plan. Combined Event Template: Red and Blue Forces COA. Decision Support Template: A product of war gaming, projected EN COA with DP(s)/NAI/TAI. MCOO: Modified Combined Obstacles Overlay: mobility corridors, objectives avenues of approach, likely location of EN obstacle system, defensible terrain, likely engagement area, key terrain, built up areas & civil infrastructure, etc. HVT: Essential for the enemy to accomplish the mission. Developed by the G-2. HPT: Enemy targets, when destroyed, help us accomplish the mission. Developed by the G-3.
IO:	Integrated plans to degrade enemy decision making capabilities while protecting ones own include: Deception, Military Information Support Operations (MISO), Physical Destruction, Electronic Warfare, Operations Security, and Civil Affairs.

Appendix A - References

MOPP Conditions:	1: Wear over garment; carry other protective gear. 2: Wear boots. 3: Wear mask and hood. 4: Wear & close down gloves, liners and over garment. Joint Service Lightweight Integrated Suit Technology MOPP suit lasts 30 days and 24 hrs contaminated. Account for a factor of 1.5 longer to accomplish this under MOPP conditions. FM 3-4, NBC Protection.
Air Def Wpns Control Status:	Weapons Free: Weapons fired at any target not positively recognized as friendly. Weapons Tight: Fired at targets recognized as hostile. Weapons Hold: Fired in self-defense.
Levels of Authority:	COCOM: non-transferable command authority established by law. OPCON: transferable authority to accomplish assigned missions; does not include authority for logistics, administration, discipline, internal organization, or unit training. TACON: local direction to accomplish assigned tasks. ADCON: administrative and logistics. DS: Support another force and to answer directly to the supported force's request for assistance. GS: Support given to the supported force as a whole and not any subdivision thereof. GSR: Arty mission, support the force as whole while providing reinforcing fires for another arty unit. Attached: Temporary placement of units or personnel in an organization. Mutual Support and Close Support
LNO(s): REP(s): Augments:	Liaisons: represent the sending unit's capabilities, plans, and concerns. He must be able to understand how his commander thinks, and convey his commander's intent, mission, concept of operations, and concerns. LNO(s) should have the requisite rank, authority, clearances and communication connectivity to function properly. LNO(s) should have the depth in personnel to conduct sustained operations. REP(s): Work for the sending unit and provide short term, as required input into the planning process. They are expected to be the SME for the function they represent. Augments: Work for the receiving commander or staff and usually fill an MOS/TE shortfall requirement for the gaining unit.
Fire Support	FSCL: Established by the land or amphibious commander to coordinate fires of air, ground, or sea weapons systems. Must be coordinated with appropriate air commander (keep in mind the ATO cycle its impact to rapidly change FSCL(s)). Supporting elements may fire beyond the FSCL without coordination but should inform appropriate ground commander. Coordination required behind the line. CFL: A line beyond which conventional fire support means may fire at any time without additional coordination. RFL: Established between two converging forces, established by the next higher common commander. RFA: Fires that exceed imposed restrictions may not be delivered without approval.
Days: Hours:	C-day: deployment to commence; D-day: commencement of hostilities; R-day: redeployment; S-day: 200,000 selected reserve to active duty for 90 days; T-day: National Emergency 1,000,000 reserve call up for 24 months; W-day: hostile government may commence operations. Hours: H: commencement of operation on D-day; L: hour at which deployment commences on C-day. (ref: JP1-02, under Time)
Collaborative Planning Systems:	GCCS: Global Command and Control System. JDISS: Joint Deployable Intelligence System (fed by GCCS requires SIPRNET). JMCIS/UB: Joint Maritime Command Information System/Unified Build. IAS: Intelligence Analysis System. TCO: Tactical Combat Operations. C2PC: Command and Control Personal Computer. CTAPS: Contingency Theatre Automated Planning System. TBMCS: Theater Battle Management Core Systems (Replacing CTAPS). AFTADS: Advanced Field Artillery Tactical Systems. TMS: Target Management System. JOTS: Joint Operational Tactical System. JOTS 1 (TDBM): Track Database Manager. COP: Common Operating Picture (CCDR). CTP: Common Tactical Picture (Component and Below). DII COE: Defense Information Infrastructure Common Operating Environment.
Classes of Supply:	I Rations, II Individual Equipment, III POL, IV Construction, V Ammunition, VI Sundry Items, VII Major End Items, VIII Medical/Dental, IX Repair parts, X Materials for Non-Military Programs.
Weapons Systems:	MIAI: 300 miles (505 gal), wt: 70 tons, 120mm gun, range 3,000m, 14 per company; M2 BFV: 300 miles (175 gal) 25mm chain gun 14 per Army mech company; LAV-25 410 miles (79 gal), 25mm chain gun, 14 (+4 antitank, 2 mortar, 1 command, 3 log and 1 recovery variants) per LAR company; ITARS/TOW: 3750 m range (mounted on HMMWV or LAV), Hell-fire: 7000 m range; Longbow 20Km range; Javelin: 2,000 m range; 60mm Mortar 3,500 m range; 81mm Mortar 5,800 m range; 105mm Arty 14,000 m range; 155mm Arty 18,000 Rap 30,000; MLRS 32Km -100Km (ATACMS); Stinger missile: 15,000m; Patriot: 160 km; Hawk: 80 km; JSTARS: approx. 200miles by 200miles coverage. TLAM: 1,000 lb warhead; JDAM: Joint Direct Attack Munitions – Satellite Guided.
Army Heavy Brigade Combat Team:	M1A1 tank: 87; Bradley Fighting Vehicle M2A2: 125 (including Infantry, Recon and 13 Engineer variants); 13; IFV M7 (FIST): 7; M1160 Assault Breacher: 6; Javelin: 40; M1064 SP 120mm mortar: 18; M109A6 155-mm SP: 18; M992 armored ammunition vehicles: 18; M9 ACE: 2; M88A1 medium recovery vehicles: 13; M88A2 heavy recovery vehicles: 22; AN/TPQ-36/37 artillery radars: 2; M113 armored personnel carriers/ambulance: 53; HMEE (high mobility engineer excavator): 6; Heavy Trucks (HEMTT/PLS: all types): 391; Medium Trucks (MTV/LMTV: all types): 200; HMMWV (all types): 419
Army Stryker Brigade Combat Team:	M1126 Stryker Infantry Variant: 130; M1127 Stryker Recon: 57; M1128 Stryker MGS: 12; M1129 Stryker Mortar: 36; M1130 Stryker Command ICV: 30; M1131 Fire Supt (FIST): 13; M1132 Engineer: 12; M1133 Medical: 18; M1134 Antitank: 9; 155-mm how: 18; Javelin: 109; AN/TPQ-36/37 artillery radars: 2; DUECE (high speed tracked tractor): 4; HMEE: 6; Heavy Trucks (HEMTT/PLS): 140; Medium Trucks (MTV/LMTV): 254; HMMWV: 366; Volcano Mine Dispenser: 3
USMC Tank Battalion:	M1A1: 58 (66-72 tons). Co 14 x 4; M88A2 recovery vehicles: 12; TOW HMMWV: 26; HMMWV (all types): 119; MTVR: 38; LVSR: 13; Tank Bn = H&S co, 4 tank co; (6 tank cos in SMCR)
USMC LAR Battalion:	LAV-25: 60 (14 per LAR co); LAV-AT: 16 (4 per LAR co); LAV-Mortar: 8 (2 per LAR co); LAV-C2: 8 (1 per LAR co); LAV-L: 16 (3 per LAR co); LAV-R: 7 (6 per LAR co); HMMWV: 33; MTVR: 37; LVS: 5; LAR Bn = H&S Co, 4 LAR co
USMC AAV Battalion:	AAVP7: 213, AAVC7: 14; AAVR7: 6; HMMWV: 60; MTVR: 24; LVSR: 14; AAV Bn = H&S co, 4 AAV co. CO: 43P; 3C; 1R. CO D in 29 Palms. Combat Assault Bn in Okinawa has 1 AAV CO
Tactical Ballistic Missiles	SCUD B: Range:300K, Payload:2,200lbs, CEP: 400 to 1000m, Warhead: Conv/Chem. SCUD C: Range:500K, Payload:1,500 lbs, CEP: 400 to 1000m, Warhead: Conv/Chem. Nodong 1: Range:1000K, Payload:2,200lbs, Warhead: Conv/Chem. Nodong 2: Range:1500 - 2000K, Payload:2,200lbs, Warhead: Conv/Chem. M18: Range:1000K, Payload: 880lbs. M9: Range: 600K, Payload 1100lbs, CEP: 300m, Warhead: Conv. CSS-2/DF-3: Range: 3000K, Payload: 3000lbs, CEP: 1000m, Warhead: Conv/Nuc. Jericho 1 (Israel): Range:500K, Payload:1,100lbs, Warhead: Conv/Chem. Frog 7: Range:70K, Payload:960lbs, CEP: 400m, Warhead: Conv/Chem. Sakr-80 (Egypt): Range:80K, Payload:440lbs, Warhead: Conv. Vector (Egypt): Range: 600K, Payload:1000lbs, Warhead: Conv. BGM - 109 TOMAHAWK: Range:1300K, Payload:1000lbs, CEP: 10m, Warhead: Conv/Nuc. (Ref CGSC ST 100-3).

Air Defense	Patriot: 160 km. Patriot Radar Alt 80K, Acquisition Range 160K. Engagement Range 60K. Should be employed no more than 20K from unit. Mutual Support 15K. BN: 5 Btry; 8 Launchers per Btry; 32 Missiles per Btry. AVENGER Acquisition Range 10K; Engagement Range 5K. Mutual Support Distance 3K. 8 Missiles per vehicle. Stinger Missile: 15000m. Hawk: 80 km.
Attack Helicopters	AH1: Missiles: 8/ 20mm, Range: 480k; AH64: Missiles: 16/30mm, Range: 480k—aux tanks 800k; OH58: Missiles: 4/.50cal, Range: 413k. (Ref CGSC ST 100-3).
Utility Helicopter	UH60: Troop: 13 (20 without seats), Range: 592K, Internal: 2,600lbs, External: 8000lbs. CH47: Troop: 33 (100 without seats), Range: 717K, Internal: 20,200lbs, External: 30,000lbs. CH53E: Troop: 35 (55 with center seats), Range: 620m, refueling – Indefinite, Internal: 31,000lbs, External: 33,000lbs. CH53D: Troop: 35 (55 with center seats), Range: 690m, takeoff weight: 19,000lbs. CH46: Troop: 14 (24 combat), Range: 190K, Internal: 2,600lbs, External: 8000lbs. UH1: Troop: 9, Range: 200K, Internal: 1,500lbs. (Ref CGSC ST 100-3).
Functions of Marine Aviation	Offensive Air Support (CAS & DAS); Anti-air Warfare (Offensive AAW and Air Defense); Assault Support ; Air Reconnaissance ; Electronic Warfare ; Control of Aircraft and Missiles

A-3. Physical Network Analysis (CSS considerations) in Intelligence Preparation of the Battlespace

a. Terrain Implications

Can the terrain support CSS operations?

- Are host nation (HN) assets available for logistics operations?
- Any existing structures/built-up areas present?
- Any usable medical facilities
- Is there any overhead storage/work areas?

What are the ground avenues of approach (AA) that could interfere with CSS operations? Offensive operations could produce by-passed or stay behind enemy elements that must be recognized and averted by CSS assets to be able to maintain continuous support.

Where are the infiltration lanes that could be used by the enemy?

- Identify and locate the routes the enemy could use to move insurgents, light infantry, and/or unconventional warfare units into the CSS AOR.
- Is there any area in the CSS AOR that could provide concealed positioned to these enemy units?

Identify possible AA(s), LZ(s), DZ(s), and MSR ambush locations in the CSS AO.

b. Weather Implications

What will be the effect on the entire road network (hard surfaced and unimproved road surfaces) as a result of different types of precipitation (rain, snow, fog/mist, ice) and temperature?

- Will a rain soaked unimproved dirt road support the weight of fuel
- LVS(s) or 5K tankers? How about a HET loaded with a M1A1 weighing 135 tons?
- How will an iced over hard surface MSR effect LOGPAC operations?
- Will an unplowed, snowed over MSR affect CSS travel time?

Will the temperature have any effect on—

- Friendly forces CL II (Clothing)
- Classes of supply
- Storage of CL I and VIII
- Consumption of CL III (Bulk & Packaged) or IX (filters, tire chains, batteries, starters)?
- Production of potable water (frozen pipes, iced over ponds, creeks, etc)?

How would poor visibility/illumination affect—

- Enemy infiltration.

Appendix A - References

- Force protection.
- Driving/resupply activities (slower convoy speeds, accidents).

c. Other Implications

Security—

- Does the area offer adequate cover/concealment?
- Do we have observation/overwatch positions along possible AA(s)/LZ(s)?
- Can we disperse our assets to reduce possible collateral damage?
- Can we minimize our unit's signature?

General—

- Does the area afford good communications?
- Is the road network adequate and trafficable? Can the terrain support movement within the AO for the vehicles that will occupy it?
- Is the AO in proximity to the MSR, not on the MSR but near it? By doing so it reduces unit signature and might take the unit off an AA.
- Potable water/raw water source location (available, frozen over).
- Access to MEDEVAC LZ?
- Existing bridges capable of handling fully loaded LVS(s), 5K tankers and HET(s) evacuating M1(s)?
- What is the height clearance for overhead bridges?
- Any water/rail capability.

d. Considerations in Developing the Modified Combined Obstacle Overlay

- Does the terrain offer an area suitable for logistics operations?
- Is it away from possible AA(s) and mobility corridors?
- Is this area close to a usable road network?
- Does the MSR travel through primary or secondary engagement areas?
- Are there any obstacles that could restrict/divert CSS operations such as bridge restrictions, choke points, road surface/trafficability concerns?

A-4. Combat Service Support Considerations in Problem Framing

The questions logistics planners and operators should always be able to answer are—

- Where are we on the battlefield?
- Why are we here?
- How do we support from here?
- How do we get support from here?
- How long do we need to provide support for?
- When, to where, and in what sequence do we displace to ensure continuous operations?

The following methodology is for logistics planners at all levels. It is based on a requirement, capability, shortfall, analysis, and solution model. It can be used in logistics course of action (COA) development when the unit is developing its concept of support. This process is meant to complement the Marine Corps Planning Process.

a. Requirements

- What method is used to determine logistics requirements? [For example, personnel density, equipment density, planning factors, operating tempo, combination, etc.]
- What is the source of the requirements determination calculations? [For example, Marine Corps Orders, casualty estimator historical data, etc.]
- What units are you supporting for this mission? Will it change during the operation?
- Identify implied logistics tasks based on the tactical plan. What are the ramifications of river crossings, pauses, deep attacks, etc.?
- Is there an NBC threat?
- What do you need?
- How long will you need it?
- Where do you need it?
- What do you need to put it there? (For example, fuel bladders/bags, materiel handling equipment, etc.)
- How will you get it there?
- When do you need it there?
- How long will it take to get it there?
- How soon will it be available to move there?
- Where is it coming from?
- What do you need to do with it before moving it where you need it? (For example, does it have to be containerized, broken down, segregated, separated, disassembled, configured, or reconfigured before movement?)
 - How long will that take?
 - What are the requirements for that?
- Does it have to move again after it gets there? Who will move it from there?
- What are the competing demands for this requirement?
- What is required to offload it when it gets there?
- Does anything need to be done with it once it gets there? (For example, does it have to be unpacked, assembled, etc.?)
- What has to be done to move it once it is there?
- Does this requirement have special employment considerations? (For example, require a large, level area of land or a fresh water source; be located near an MSR; need refrigeration; require dedicated transportation; etc.)
- How often will the commodity, supply, or service be required? How often must it be replenished?
- Does the requirement have preparatory activities? [For example, engineers to make berms for fuel bags, airfield matting for forward arming and refueling points (FARP[s]), road and pad construction for a CSSA]
 - What is the expected duration of the required preparation?
 - How do you request the preparation and who approves it? (For example, engineer work has to be approved through channels.)
 - What support is required for the preparatory activities?

b. Capabilities

- What are the units available that have the capability to fulfill the requirement?
- Is more than one unit required to provide the capability?
- Will this capability be used to weight the battle logistically?

Appendix A - References

- What are the overall receipt, storage, and issue requirements for my area of support for this particular commodity, supply, or service?
- What is the total short ton (STON)/gallon/other distribution capability by mode? Line haul? Local haul? Other? What distribution planning factors were used?
- How many locations require this capability?
- Are any units with this capability already committed?
- Are any units with this capability due in? When?
- Can a unit deploy elements (sections or detachments) to place the capability where it is required?
- Does the unit have unique management/employment considerations?

c. Comparison/Shortfall

- If there is no shortfall, go to the *analysis* portion of this methodology.
- Which requirements exceed capabilities?
- For requirements that exceed capabilities, is it overall or in a particular area, region, or time?
- How much is the shortfall in terms of units of measurement (STON[s], gallons, square feet)?
- What does the shortfall equate to in terms of days of supply?
- At what point in the battle is the requirement expected to exceed the capability?
- What is the type of shortfall? Is it a supply availability shortfall, a resource [equipment, materials handling equipment (MHE), personnel, facilities, man-hours, etc.] shortfall, or a distribution shortfall?

d. Analysis

The analysis process has to occur for all support operations even if there is no shortfall. The logistic planner has to determine how to support the operation.

- What is the earliest the support operation can begin?
- What is the latest the support operation can begin?
- Is it better to be early or late?
- What is the purpose of the support? (For example, is the purpose to build stocks at GS, to sustain a force for a given period of time at DS, or to resupply a user?)
- Will support be provided from a fixed location or from a forward logistics detachment?
- What is the significance of the shortfall?
- What is the potential impact of the shortfall?
- What is the expected duration of the shortfall?
- What is the cause of the shortfall (battle loss, time-phased force deployment sequence, etc.)?
- If the shortfall is a *supply availability* shortfall, consider the following:
 - Is the shortfall only at this level or is at higher levels as well?
 - Is it a result of higher commands' efforts and support priorities?
 - Is the supply available at other echelons and, if so, where?
 - How long will it take to get here?
 - Is there an acceptable alternative, a substitute, or an alternative source of supply?
- If the shortfall is a *resource shortfall* (equipment, MHE, personnel, facilities, man-hours, etc.), consider the following:
 - Can similar resources be diverted or obtained from somewhere else?
 - Is HNS a viable alternative?
 - How specialized is the shortfall resource?

- Can a secondary military occupational specialty (MOS) be used?
- Does a sister service or coalition partner have the capability?
- If the shortfall is a *distribution shortfall*, consider the following:
 - Is the shortfall due to a lack of assets or to a time-distance problem?
 - Does the shortfall capability require special handling or any special distribution requirements?
 - Are there any alternative distribution modes?
 - Are host nation distribution assets available?
 - Are sister service/coalition assets available? Are they compatible? (For example, European and SWA host nation fuel tankers are metric and require a coupler adapter to interface fuel bags or US tankers.)
 - Are there any airfields, field landing strips, or helipads near the requirement?
- How will logistics capability be echeloned forward? Which units will be tasked to establish forward logistics bases?

e. Solutions

- Determine the most workable solutions based on analysis.
- Ensure support plan is fully integrated into concept of operations.

A-5. Combat Service Support Considerations in Course of Action Development

Focus on logistical factors that constrain the tactical operations—

- Key is to identify and eliminate any COA that is not supportable.
- Identify limitations that planners must be concerned with
- (CL IV availability for barrier plans or CL V CSR V[s] RSR)
- Identify the cost or risk in terms of resources for each COA
- Update logistics, personnel, and casualty estimates as additional information becomes available
- Key questions for the CSS planners are:
 - Will CSS support be required to relocate during the operation?
 - Are the line haul or local haul distance factors exceeded?

Specific items to focus on for COA development—

- CSSA, BSA locations
- MSR plan for resupply of the units
- Barrier plan and its effect on resupply; location of the CL IV point
- Will the CSSA need to move to support the COA?
- Are any Mobile Detachments required?

A-6. Combat Service Support Considerations in Course of Action Wargaming

Focus on ensuring critical CSS items are included on the synchronization matrix—

- Update logistics, personnel, and casualty estimates as additional information is obtained.
- The war game will validate, change, or invalidate parts of or the entire logistics, personnel, and casualty estimate.
- The logistics estimate is validated and completed as part of the COA war game process.
- Estimates applied during wargaming help to ensure COA(s) are supportable and feasible.
- Wargaming helps CSS planners synchronize tactical logistics functions to support a tactical operation.
- During the war game, the CSS planner can prepare the logistics portion by function of the synchronization matrix. This ensures all critical CSS actions are addressed.

Appendix A - References

- It determines the timeframe support must be provided to enable the combat forces to accomplish their mission.
- Wargaming helps determine specific events that are critical before the battle and provides estimates of peak consumption, times and distances supply convoys must travel, battle losses and casualties.
- Wargaming also helps to deconflict terrain.
- Determine adjustments to consumption factors based on war game results.

A-7. CSS Considerations in Course of Action Comparison/Decision

Develop meaningful and descriptive criteria for comparing COA(s)—

- Which COA has higher/lower casualty estimates and subsequent need for replacements?
- Which COA has higher/lower consumption rates of CL V?
- Which COA has higher/lower consumption rates of CL III (Bulk)?
- Which COA has higher/lower battle damage estimates requiring increased recovery and evaluation of combat/CS/CSS systems?
- Which COA has longer LOC(s) requiring possibly more transportation assets?
- Which COA has increased sustainment requirements (CL IV, Combat Health Spt)
- Which COA presents higher degree of risk in the potential loss or destruction of CSS assets and resources?

When determining decision criteria, CSS planners must—

- Provide the commander information to properly weigh all issues before making a decision.
- Ensure the commander fully understands the costs and risks that exist in a COA.

A-8. Comparison of Marine Corps Planning Process to Other Planning Processes

Marine Corps Planning Process	Military Decision Making Process	Joint Task Force	JOPES Crisis Action Planning	NATO
Problem Framing	Receipt of Mission	Mission Analysis	Situation Development	Initiation
	Mission Analysis	Planning Guidance	Crisis Assessment	Orientation
COA Development	COA Development	COA Development	COA Development	Concept Development
COA War Game	COA Analysis	COA Analysis		
COA Comparison & Decision	COA Comparison	COA Comparison	COA Selection	Plan Development
	COA Approval	COA Selection		
Orders Development	Orders Production		Execution Planning	
Transition		Execution		Plan Review

Note: Like steps of each planning process are shaded in the same manner

Figure A-1. Comparison of the Marine Corps Planning Process to other planning processes

A-9. Frequency Bands

Abbreviation	Band	Frequency Range
ELF	Extremely Low Frequency	Below 3 KHz
VLF	Very Low Frequency	3 to 30 KHz
LF	Low Frequency	30 to 300 KHz
MF	Medium Frequency	300 KHz to 3 MHz
HF	High Frequency	3 to 30 MHz
VHF	Very High Frequency	30 to 300 MHz
UHF	Ultra High Frequency	300 MHz to 3 GHz
SHF	Super High Frequency	3 to 30 GHz
EHF	Extremely High Frequency	Over 30 GHz

Notes: KHz = kilohertz (one thousand cycles per second)
 MHz = megahertz (one million cycles per second)
 GHz = gigahertz (one billion cycles per second)

Table A-1. Frequency bands

A-10. Customary Metric Conversion Factors

English System	Metric System
Linear Measure	
1 inch	= 2.54 centimeters
1 foot	= 0.3048 meters
1 yard	= 0.9144 meters
1 mile	= 1.6093 kilometers
0.3937 inches	= 1 centimeter
1.0936 yards	= 1 meter
0.6137 miles	= 1 kilometer
Liquid Measure	
1 fluid ounce	= 29.573 milliliters
1 quart	= 0.94635 liters
1 gallon	= 3.7854 liters
0.33814 fluid ounce	= 1 milliliter
0.26417 gallon	= 1 liter
Weight Measure	
1 troy pound	= 0.37324 kilograms
1 avoirdupois pound	= 0.45359 kilograms
1 short ton (0.8929 long tons)	= 907.18 kilograms (0.90718 metric tons)
1 long ton (1.12 short tons)	= 1,016.0 kilograms (1.016 metric tons)
2.2046 avoirdupois pounds	= 1 kilogram
1.1023 short tons (0.98421 long tons)	= 1 metric ton
Square Measure	
1 square foot	= 9.2903 square decimeters
1 square yard	= 0.83613 square meters
1 square mile	= 2.590 square kilometers
1.1960 square yards	= 1 square meter
0.38608 square miles	= 1 square kilometer
Cubic Measure	
1 cubic foot	0.28317 cubic meters
1 cubic yard	0.76455 cubic meters
1 cubic mile	4.16818 cubic kilometers
1.3079 cubic yards (35.315 cubic feet)	1 cubic meter
0.23990 cubic miles	1 cubic kilometer

Table A-2. Conversion factors

Appendix A - References

A-11. Glossary of Terms Used in Connection With Tactical Control and Fire Support Coordination Measures

These terms can be found in JP 1-02, *DoD Dictionary* except where noted.

Amphibious Objective Area (AOA): A geographical area of sufficient size for conducting necessary sea, air, and land operations, and within which is located the objective(s) to be secured by the amphibious force. (JP 3-02)

Area of Influence: A geographical area wherein a commander is directly capable of influencing operations by maneuver or fire support systems normally under the commander's command or control. (JP 3-0)

Area of Interest (AOI): That area of concern to the commander, including the area of influence, areas adjacent thereto, and extending into enemy territory. This area also includes areas occupied by enemy forces who could jeopardize the accomplishment of the mission. (JP 3-0)

Area of Operations (AO): An operational area defined by the joint force commander for land and maritime forces that should be large enough to accomplish their missions and protect their forces. (JP 3-0)

Area of Responsibility (AOR): The geographical area associated with a combatant command within which a geographic combatant commander has authority to plan and conduct operations. Formerly called TAOR (Tactical Area Of Resp.). (JP-1)

Attack Position: The last position occupied by the assault echelon before crossing the line of departure. (JP 3-09.3)

Axis of Advance: A line of advance assigned for purposes of control; often a road or a group of roads, or a designated series of locations, extending in the direction of the enemy. (JP 3-03)

Base Cluster: In base defense operations, a collection of bases, geographically grouped for mutual protection and ease of command and control. (JP 3-10)

Battle-space: The environment, factors, and conditions that must be understood to successfully apply combat power, protect the force, or complete the mission. This includes the air, land, sea, space, and the included enemy and friendly forces; facilities; weather; terrain; the electromagnetic spectrum; and the information environment within the operational areas, areas of interest, and areas of influence. (MCRP 1-10.2 [formerly MCRP 5-12C])

Battlefield Coordination Line (BCL): A fire support coordination measure, similar to a fire support coordination line, that facilitates the expeditious attack of targets with surface indirect fires and aviation fires between this measure and the fire support coordination line. To facilitate air delivered fires and deconflict air and surface fires, an airspace coordination area will always overlie the area between the battlefield coordination line and the fire support coordination line. (MCRP 1-10.2 [formerly MCRP 5-12C])

Boundary: A line that delineates surface areas for the purpose of facilitating coordination and de-confliction of operations between adjacent units, formations, or areas. (FM 3-90-1 & JP 3-0)

Checkpoint: A predetermined point on the ground used to control movement, tactical maneuver, and orientation. (MCRP 1-10.2 [formerly MCRP 5-12C])

Contact Point (CP): 1. In land warfare, a point on the terrain, easily identifiable, where two or more units are required to make contact. (JP 3-50) 2. In air operations, the position at which a mission leader makes radio contact with an air control agency. (JP 3-09.3)

Coordinated Fire Line (CFL): A line beyond which conventional surface-to-surface direct fire and indirect fire support means may fire at any time within the boundaries of the establishing headquarters without additional coordination. (JP 3-09)

Counterfire: Fire intended to destroy or neutralize enemy weapons. (JP 3-09)

Critical Vulnerability: 1. An aspect of a critical requirement which is deficient or vulnerable to direct or indirect attack that will create decisive or significant effects (JP 5-0). 2. An aspect of a center of gravity that, if exploited, will do the most significant damage to an adversary's ability to resist. A vulnerability cannot be critical unless it undermines a key strength. (MCRP 1-10.2 [formerly MCRP 5-12C])

Direct Support (DS): A mission requiring a force to support another specific force and authorizing it to answer directly to the supported force's request for assistance. (JP 3-09.3)

Final Coordination Line (FCL): 1. (Army) A phase line close to the enemy position used to coordinate the lifting or shifting of supporting fires with the final deployment of maneuver elements (ADRP 3-90). 2. (USMC) A line used to coordinate the ceasing and shifting of supporting fires and the final deployment of the assault echelon in preparation for launching an assault

against an enemy position (MCRP 1-10.2 [formerly MCRP 5-12C]). (not in JP 1-02)

Fire Support: 1. (Joint) Fires that directly support land, maritime, amphibious, and special operations forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives (JP 3-09). 2. (USMC only) Assistance to elements of the Marine air-ground task force engaged with the enemy rendered by other firing units, including (but not limited to) artillery, mortars, naval surface fire support, and offensive air support (MCRP 1-10.2 [formerly MCRP 5-12C]).

Fire Support Coordination Line (FSCL): A fire support coordination measure established by the land or amphibious force commander to support common objectives within an area of operation; beyond which all fires must be coordinated with affected commanders prior to engagement, and short of the line, all fires must be coordinated with the establishing commander prior to engagement (JP 3-09).

Forms of Maneuver: Distinct tactical combinations of fire and movement with a unique set of doctrinal characteristics that differ primarily in the relationship between the maneuvering force and the enemy. (ADRP 3-90 only)

Joint Target List (JTL): A consolidated list of selected targets, upon which there are no restrictions placed, considered to have military significance in the joint force commander's operational area (JP 3-60).

Kill Box: A three-dimensional permissive fire support coordination measure with an associated airspace coordinating measure used to facilitate the integration of fires (JP 3-09).

Line of Departure (LD or LOD): 1. In land warfare, a line designated to coordinate the departure of attack elements. Also called LD. (JP 3-31) 2. In amphibious operations, a suitably marked the landing of landing craft and amphibious vehicles on designated beaches at the scheduled times. Also called LOD. (JP 3-02)

Linkup Point: A point where two infiltrating elements in the same or different infiltration lanes are scheduled to meet to consolidate before proceeding with their missions (FM 3-90-1 only).

Objective: 1. The clearly defined, decisive, and attainable goal toward which every operation is directed. 2. The specific target of the action taken which is essential to the commander's plan (JP 5-0).

Phase Line (PL): A line utilized for control and coordination of military operations, usually an easily identified feature in the operational area (JP 3-09).

Restrictive Fire Area (RFA): An area in which specific restrictions are imposed and into which fires that exceed those restrictions will not be delivered without coordination with the establishing headquarters (JP 3-09).

Restrictive Fire Line (RFL): A line established between converging friendly surface forces that prohibits fires or their effects across that line (JP 3-09). Its establishment prevents interference between converging friendly forces without coordination with the affected force(s) (MCRP 1-10.2 [former MCRP 5-12C]).

Types of Defensive Operations: Operations conducted with the immediate purpose of defeating an enemy attack. Defensive operations may also achieve one or more of the following; gain time; concentrate force elsewhere; wear down the enemy forces as a prelude to offensive operations; and retain tactical, strategic; or political objectives. (Note: This definition is NOT recognized by DoD or any of the Services.)

Types of Offensive Operations: Operations which aim at destroying or defeating the enemy. Their purpose is to impose US will on the enemy and to achieve decisive victory. (Note: This definition is NOT recognized by DoD or any of the Services.)

Zone of Action: A tactical subdivision of a larger area, the responsibility for which is assigned to a tactical unit; generally applied to offensive action (JP 3-09).

This page intentionally left blank.

Appendix B

Abbreviations

B-1. National Distinguishing Letters (NATO and other allied nations)

The following letters are used in unit titles wherever it is necessary to identify an allied nation (e.g., 1 (UK) Armd Div):

- AF Afghanistan
- AS Australia
- BE Belgium
- CA Canada
- DA Denmark
- FR France
- GG Georgia
- GE Germany
- GR Greece
- IC Iceland
- IN India
- IT Italy
- JA Japan
- KS South Korea
- LU Luxembourg
- NL Netherlands
- NZ New Zealand
- NO Norway
- PK Pakistan
- PO Portugal
- RP Philippines
- SP Spain
- TI Tajikistan
- TU Turkey
- TX Turkmenistan
- UK United Kingdom
- US United States
- UZ Uzbekistan

Note: The national distinguishing letters for Canada are not used to identify Canadian Army units which have the words 'Canada' or 'Canadian' in their official titles.

B-2. Abbreviations

AAFS	amphibious assault fuel system	ADA TOC	air defense artillery tactical operations center
AAV	assault amphibious vehicle	ADAM	area denial artillery munitions
ABCCC	airborne battlefield command & control center	ADCON	administrative control
ABT	air breathing threat	ADCP	air defense command post
ACE	Aviation combat element	ADNS	automated digital network system
ACE	armored combat earthmover	ADP	automated data processing
ACP	Allied Communications Publication	AFATDS	Advanced Field Artillery Tactical Data System
ADA	air defense artillery	AIS	automated information system

Appendix B - Abbreviations

AL	administrative loss	CTAPS	contingency theater automated planning system
AM	amplitude modulation	CTIS	central tire inflation system
ANDVT	advanced narrow band digital voice terminal	CTT	commander's tactical terminal
AO	area of operations	CV	critical vulnerability
AOC	air operations center	CWAR	continuous wave acquisition radar
AOI	area of interest	DACT	data automated communications terminal
APOD	aerial port of debarkation	DAMA	demand assigned multiple access
ASC(A)	assault support coordinator (airborne)	DASC	direct air support center
ASLT	air support liaison team	DASC(A)	direct air support center (airborne)
ASOC	air support operations center	DEERS	Defense Eligibility Enrollment Reporting System
ASUW	antisurface warfare	DII	defense information infrastructure
ASW	antisubmarine warfare	DIRLAUTH	direct liaison authorized
ATARS	advanced tactical airborne recon system	DISA	Defense Information Systems Agency
ATC	air traffic control	DISN	Defense Information Systems Network
ATDL	Army tactical data link	DMS	Defense Message System
ATF	amphibious task force	DNS	Domain Name System
ATLASS	Asset Tracking Logistics and Supply System	DNVT	digital non-secure voice terminal
ATM	asynchronous transfer mode	DOCC	deep operations coordination cell
ATO	air tasking order	DOW	died of wounds
AUTODIN	Automatic Digital Network	DP	decision point
AVLB	armored vehicle launched bridge	DSCS	Defense Satellite Communications System
AWACS	airborne warning and control system	DSN	Defense Switched Network
BDA	battle damage assessment	DSVT	digital subscriber voice terminal
BDZ	base defense zone	DTC	digital technical control
BFV	Bradley fighting vehicle	DWTS	Digital Wideband Transmission System
BPSK	binary phase shift key	EAF	expeditionary airfield
BVR	beyond visual range	EEFI	essential elements of friendly information
C2W	command and control warfare	EFST	essential fire support task
CAP	combat air patrol	EFV	Expeditionary Fighting Vehicle
CAS	close air support	EMCON	emission control
CBAE	commander's battlespace area evaluation	EPLRS	enhanced position location reporting system
CBIRF	Chemical/Biological Incident Response Force	EPW	enemy prisoners of war
CCIR	commander's critical information requirements	EW/C	early warning/control
CEC	cooperative engagement capability	FAC(A)	forward air controller (airborne)
CEOI	comm-electronics operating instructions	FACP	forward air control post
CFV	cavalry fighting vehicle	FARP	forward arming and refueling point
CGS	common ground station	FASCAM	family of scatterable mines
CI	counterintelligence	FFCC	force fires coordination center
CID	combat identification	FFIR	friendly force information requirement
CIWS	close in weapons system	FH	frequency hopping
CJCSI	Chairman Joint Chiefs of Staff Instruction	FIWC	Fleet Information Warfare Center
CJCSM	Chairman of the Joint Chiefs of Staff Manual	FIE	fly in echelon
CMS	communications security material system	FIST	fire support team
COA	course of action	FLIR	forward looking infrared
COC	combat operations center	FLTSAT	fleet satellite
COCOM	combatant command	FLTSATCOM	fleet satellite communications
COE	common operating environment	FM	frequency modulation
COG	center of gravity	FMC	full mission capable
COP	common operational picture	FO	forward observer
COTS	commercial off the shelf	FSCC	fire support coordination center
CPOG	chemical protective overgarment	FSCL	fire support coordination line
CPU	central processing unit	FSE	fire support element
CRC	control and reporting center	FSK	Frequency shift key
CRE	control and reporting element	FSSG	force service support group
CSNP	causeway section non-powered	GBAD	ground based air defense
CSP	causeway section powered	GBDL	ground based data link
CSSE	combat service support element	GBS	Global Broadcast System

GCCS	Global Command and Control System	MCPP	Marine Corps planning process
GCE	ground combat element	MDMP	military decision making process
GCI	ground controlled intercept	MEF	Marine expeditionary force
GCSS	Global Combat Support System	MEWSS	mobile electronic warfare support system
GENSER	general service (message)	MIAG	modular integrated avionics group
GMF	ground mobile forces	MLG	Marine Liaison Group
GOTS	government off the shelf	MMT	Marine air traffic control mobile team
GPS	global positioning system	MOE	measures of effectiveness
GTN	Global Transportation Network	MOPP	mission-oriented protective posture
HEMTT	heavy expanded mobile tactical truck	MOS	military occupational specialty
HERS	helicopter expeditionary refueling system	MOU	memorandum of understanding
HPT	high payoff target	MP	military police
HST	helicopter support team	MPF	maritime pre-positioning force
HVT	high value target	MPF(E)	maritime pre-positioning force (enhanced)
IAS	Intelligence Analysis System	MPS	maritime pre-positioning ships
IFF	identification friend or foe	MPSRON	maritime pre-positioning squadron
IFSAS	interim fire support automated system	MRAC	Marine rear area coordinator
INMARSAT	International maritime satellite	MRACOM	Marine rear area commander
IO	information operations	MRC	mobile radio communications
IOS	Intelligence Operations System	MSC	major subordinate command
IP	internet protocol	MSCS	multiple source correlation system
IW	information warfare	MSE	mobile subscriber equipment
JANAP	Joint Army, Navy, Air Force publication	MSR	main supply route
JCATS	Joint Conflict and Tactical Simulation	MTACCS	Marine tactical command and control sections
JCCC	joint communications control center	MTBF	mean time before failure
JCS	Joint chiefs of staff	MTWS	MAGTF Tactical Warfare Simulation
JCSE	Joint Communications Support Element	MWCS	Marine wing communications squadron
JDISS	Joint Deployable Intelligence Support System	MWSG	Marine wing support group
JIC	Joint Intelligence Center	MWSS	Marine wing support squadron
JMCIS	Joint Maritime Command Information System	NAI	named area of interest
JOPEB	Joint Operation Planning and Execution System	NAVMACS	Naval Modular Automated Communications
JSTARS	Joint Surveillance Target Attack Radar System	NBI	non-battle injury
JTF	joint task force	NCC	naval component commander
JTIDS	Joint Tactical Information Distribution System	NEA	northeast Asia
JWICS	Joint Worldwide Intel Communications System	NEMSS	naval expeditionary medical support system
KIA	killed in action	NIIRS	National imagery interpretation ratings scale
LAAD	low altitude air defense	NIPRNET	Non-secure Internet Protocol Router Network
LCAC	landing craft air cushioned	NOC	network operations center
LCC	amphibious command ship	NSSMS NATO	Naval Sea Sparrow Missile System
LCM	landing craft, mechanized	OIR	other information requirements
LCU	landing craft, utility	OPCON	operational control
LHA	general purpose amphibious assault ship	OPSEC	operations security
LOS	line-of-sight	OSCC	operational systems control center
LPD	amphibious transport dock	OTH	over the horizon
LPH	amphibious assault ship	PCS	portable control station
LSD	landing ship dock	PEI	principle end item
LST	landing ship, tank	PGM	precision guided munitions
LVS	logistics vehicle system	PIR	priority information requirement
MACCS	Marine air command and control system	PLA	plain language address
MACG	Marine air control group	PLAD	plain language address directory
MAFC	MAGTF all-source fusion center	PLGR	precise lightweight GPS receiver
MAGTF	Marine air-ground task force	PLRS	Position Location Reporting System
MANPAD	man-portable air defense	PMD	pounds per man per day
MARFORAFRICA	Marine Corps Forces, Africa Command	POTS	plain old telephone system
MARFORCOM	Marine Corps Forces, Forces Command	PPDL	point to point data link
MARFORPAC	Marine Corps Forces, Pacific	PSK	phase shift key
MATCD	Marine air traffic control detachment	PTM	personnel transport module

Appendix B - Abbreviations

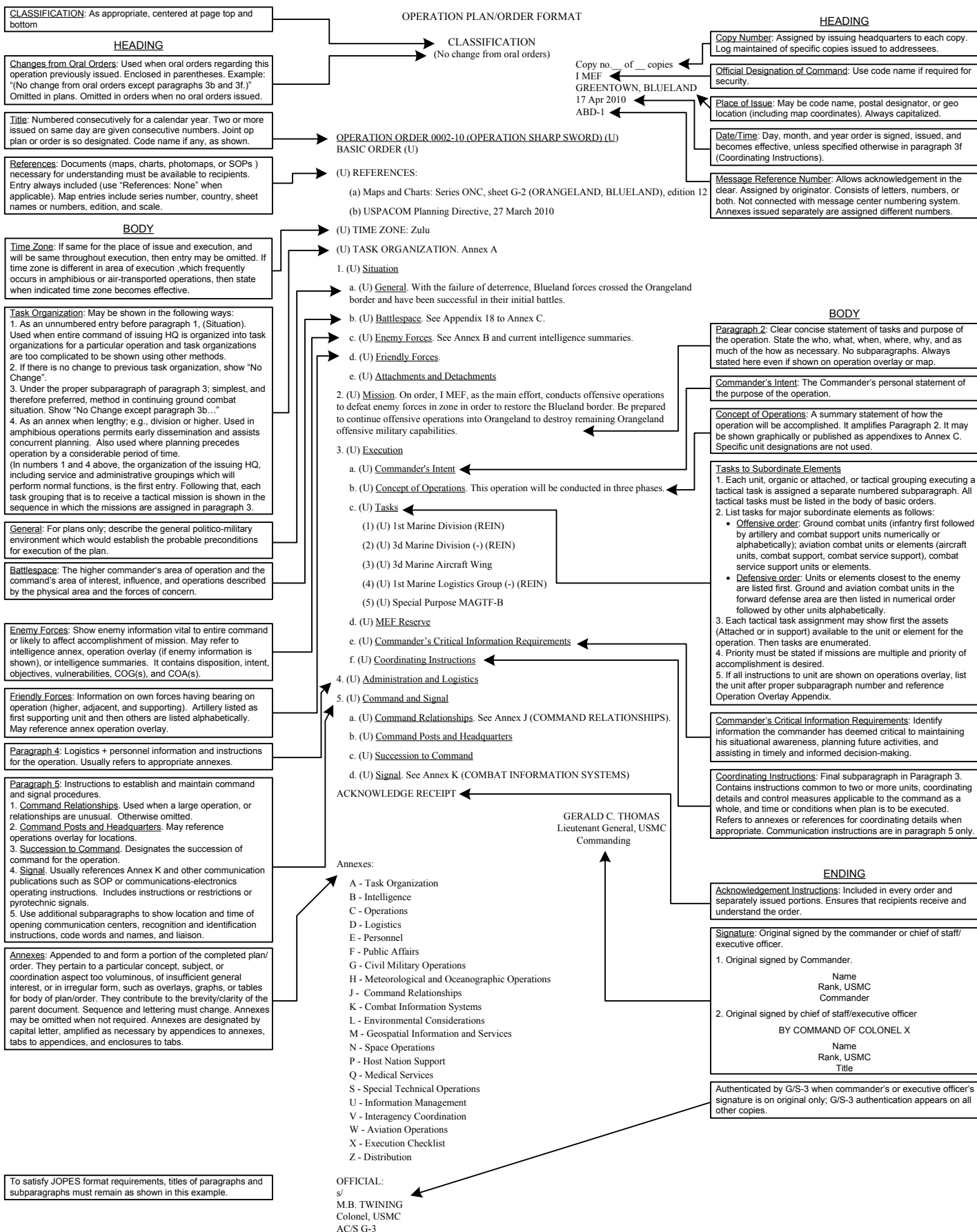
RAAMS	remote anti-armor mines system	T/O	table of organization
RCS	radar cross section	TAC(A)	tactical air coordinator (airborne)
RFI	request for information	TACC	tactical air command center
ROC	rehearsal of concept	TACON	tactical control
ROWPU	reverse osmosis water purification unit	TACP	tactical air control party
RRDF	roll-on/roll-off discharge facility	TADC	tactical air direction center
RRS	remote receive station	TADIL	tactical digital information link
RRT	radio relay team	TAFDS	tactical airfield fuel dispense system
RT	receiver-transmitter	TAI	target area of interest
RTD	returned to duty	TAOC	tactical air operations center
SAAWC	sector anti-air warfare facility	TARGET	Theater Analysis and Replanning Graphical Execution Toolkit
SAR	search and rescue	TASS	tactical automated switching system
SAR/FTI	synthetic aperture radar/fixed target indicator	TBM	theater ballistic missile
SATCOM	satellite communications	TBMCS	theater battle corps management system
SCI	sensitive compartmented information	TCO	tactical combat operations
SCR	single channel radio	TBMCS	theater battle corps management system
SIDS	secondary imagery dissemination system	TCO	tactical combat operations
SINCGARS	single-channel ground and airborne radio system	TCP	tactical control party
SIPRNET	SECRET Internet Protocol Router Network	TEG	tactical exploitation group
SLCP	ship's loading characteristics pamphlet	TERPES	Tactical Electronic Reconnaissance Processing and Evaluation System
SLRP	survey, liaison, and reconnaissance party	TTY	teletype
SLWT	side loadable warping tug	UAV	unmanned aerial vehicle
SMART-T	secure mobile anti-jam reliable tactical terminal	ULCS	unit-level circuit switch
SPIRIT	special purpose integrated remote intel terminal	URL	uniform resource locator
SPOD	seaport of debarkation	VLS	vertical launch system
SSM	surface to surface missile	WAS/MTI	wide area surveillance/moving target indicator
SWA	southwest Asia	WIA	wounded in action
SYSCON	systems control		
T/E	table of equipment		

Appendix C

Operations Orders Formats (Pull-Out Pages)

This page intentionally left blank.

MAGTF Planner's Reference Manual



Appendix C - Operations Orders Formats (Pull-Out Pages)

