Prepared for
Chief of Naval Operations (N44)
Range Planning Office

Department of the Navy Range Needs Assessment

Air-to-Ground Ranges

September 2000

PREFACE

The effort to prepare this *Department of the Navy (DoN) Air-to-Ground Range Needs Assessment* began in October 1997. It was initiated to address issues facing the continued use and future availability of DoN air-to-ground ranges to accommodate test and training activities essential to maintaining the readiness of the Navy and Marine Corps. Since that time, DoN air-to-ground range activities have been the subject of increased scrutiny both inside and outside DoN.

AFWTF Inner Range (Vieques, Puerto Rico)

The April 1999 range mishap that occurred on the Inner Range at AFWTF immediately placed DoN range activities in the public eye and triggered a comprehensive review by the Secretary of the Navy. This review culminated in the July 1999 release of *The National Security Need for Vieques* (Commander US Second Fleet and Commander US Marine Corps Forces Atlantic). This report concluded that: "the Inner Range Complex at Vieques is the critically important cornerstone of combat training and readiness for Atlantic Naval forces" and is a "unique and irreplaceable asset." The report also recommended that the Inner Range be retained for future DoN training. In October 1999, the Special Panel on Military Operations on Vieques released their *Report to the Secretary of Defense.* This Panel concluded that "there is a valid requirement" for the Navy to conduct live fire exercises at the Inner Range, but recommended that all training activities cease within five years and that DoN immediately reduce the use of live ordnance and the availability of the impact area. A further directive from the President (issued January 31, 2000) presented two alternatives on the future of the Inner Range, to be determined by referendum: (1) DoN shall cease all training no later than May 1, 2003; and (2) Continued training to include live fire on terms proposed by DoN. Full implementation of this directive is contingent on the government of Puerto Rico authorizing and supporting the referendum. Given the importance of the Inner Range to maintaining Navy and Marine Corps combat readiness, and because a firm decision on the future use of the Inner Range is still pending, this assessment assumes that live fire capability will continue to be available.

Hicacal Range (Guantanamo Bay, Cuba)

Another range issue that has recently emerged is a proposal for revalidation of the existing Hicacal Range in Cuba for air-to-ground deliveries of practice and inert general purpose bombs up to MK-82, rockets, and strafing. The range is also being investigated as a potential location for support of Naval Surface Fire Support (NSFS) and aircrew and Forward Air Controller (FAC) training. This range has not been included in this assessment.

Other Evaluations of Range Encroachment

Recognition of the seriousness of encroachments on the ability to train and retain range assets has led to several initiatives within DoN. Chief of Naval Operations and the Atlantic and Pacific Fleets have launched range environmental vulnerability studies, addressing both environmental compliance and other encroachments. Ultimately these studies should, in conjunction with this assessment, become tools for use in making future decision about DoN ranges.

DoN Surface and Subsurface Ranges, Operating Areas, and Other Land Ranges

Training conducted on air-to-ground ranges is only one facet of the Naval combat mission. Readiness training also is conducted in DoN surface and subsurface ranges and operating areas and other land ranges. These ranges and operating areas should be the focus of companion future assessments.

EXECUTIVE SUMMARY

Overview

The intent of the *Department of the Navy (DoN) Air-to-Ground Range Needs Assessment* is to document resources available at each DoN air-to-ground range and provide an evaluation of the capabilities of these assets to support existing and projected operational (basic and intermediate level) training demands. Ranges studied include Fleet tactical training ranges, Test and Evaluation (T&E) ranges operated by the Naval Air Systems Command (NAVAIR), and ranges operated by Chief of Naval Education and Training (CNET).

Military ranges are invaluable assets of the Department of Defense (DoD). Throughout US history, ranges have served instrumental roles in preparing US forces for confrontation with any military force they might reasonably be expected to oppose. As force size, weapons types, and military doctrine have evolved over time, concurrent changes have occurred in both the number and size of DoD range assets. However, the basic roles served by the range infrastructure have remained unchanged. Ranges continue to provide appropriate locations where the US Armed Forces can achieve and maintain their state of readiness to defend the US against potential threats by:

- Obtaining operational training before deployment;
- Maintaining combat readiness;
- Conducting RDT&E activities for new or improved weapons systems; and
- Undertaking instructional activities for new trainees.

Training with equipment -- aircraft, vehicles, weapons, and logistic support -- must be intensive and realistic, replicating the realities and stresses imposed under actual combat conditions. Joint and combined operations require an additional level of proficiency training. For Naval forces, intensive and realistic training can best be accomplished at established DoN ranges where sailors and aviators can train-as-they-fight and their performance (i.e., state of readiness) can be assessed.

In addition to maintaining operational readiness, the concurrent need exists to develop and test technologically superior weapons and weapons systems for use on the battlefield of the future. While some training and RDT&E related to weapons platforms and/or systems deployment can be acquired through the use of simulators, actual proof of suitability and/or readiness can be measured only through operational exercises conducted in a range environment

Some of the critical issues affecting DoN range use include, but are not limited to:

- Quantifying the amount of land and/or airspace required to support advances in weapon system technology and changes in warfighting doctrine;

- Competing for scarce land and airspace resources;
- Dealing with encroachment of range lands and/or airspace;
- Complying with environmental laws and regulations; and
- Developing working relationships with Native American Tribes and governmental agencies such as the local and state agencies and federal agencies such as the Bureau of Land Management, Fish and Wildlife Service, National Marine Fisheries Service, and Federal Aviation Administration.

The *DoN Air-to-Ground Range Needs Assessment* has been accomplished in four phases with information/data derived in each subsequent phase progressively building upon that identified in previous phases. The four phases are:

Phase I **Range Evaluation and Capability** - Current capabilities of DoN ranges have been documented and are available for review on the CNO N44 Range Planning Office's Internet Website. This secure site includes information on range extents, associated airspace, military training routes, target descriptions and locations, ordnance allowed by target, emitters, electronic warfare ranking, operations and administration facilities, tower locations, users, environmental issues, and infrastructure issues. In addition, appropriately formatted maps are available for download for HAZARD weapons impact analysis.

Phase II **Range Utilization and Scheduling** - Utilization and scheduling of DoN air-to-ground ranges was documented and evaluated using two years of data where available. However, utilization was found to be more of an indicator, rather than a driver, of funding or environmental or encroachment issues at any particular range.

Phase III **Training Demands** - Basic level and intermediate level training demand was quantified for both fixed- and rotary-wing crews for air-to-ground facilities and associated Special Use Airspace (SUA).

Phase IV **Range Assessment Summary and Recommendations -** The results of this analysis are described in the remainder of this Executive Summary.

Air-to-Ground Range Training Support Capabilities

One of key objectives of the *DoN Air-to-Ground Range Needs Assessment* was to provide a complete picture of the state of Navy and Marine Corps' air-to-ground range facilities, as well as

the demand for those facilities. The capability of a range to provide training support can be assessed on the basis of several properties, including range area, SUA, infrastructure, ordnance authorized for expenditure, and hours of operation. However, while a study of range properties is a good indicator of what training can be accommodated at a range, the real measure of the range's capabilities is the extent to which it can support documented aircrew training demand.

Navy and Marine Corps fixed- and rotary- wing aircrew training progresses logically from basic to intermediate level training before participation is possible in advanced-level coordination or battle group training. Basic and intermediate level training is structured and can be readily quantified and predicted through review and analysis of Training and Readiness (T&R) matrices and other relevant training manuals. Battle group training, on the other hand, has a stated goal, but the Fleet Commander is provided flexibility in how that stated goal is to be accomplished. Consequently, advanced level training is variable and not addressed in this assessment.

Navy and Marine Corps T&R instructions and manuals were used to develop a set of evaluation criteria for determining essential air-to-ground training support at the basic and intermediate training levels. These instructions and manuals were supplemented by the first-hand experience of operators and users of the air-to-ground facilities knowledgeable about existing and emerging air-to-ground tactics. These evaluation criteria or "training elements" are listed in Table ES-1. Six of these training elements (denoted in bold type) have also been identified as being critical to air-to-ground training since a lack of training support in any of these elements could potentially limit or prevent the development of Navy and Marine Corps aircrew skills in real-world tactics, thereby significantly impacting aircrew combat readiness.

Table ES-1

Primary Training Elements[1]

Electronic Warfare (EW I, II, **III, IV)**	Precision-Guided Munitions Expenditure
Live Ordnance Expenditure[2]	Air-to-Air Missiles Expenditure
Chaff Expenditure	Laser-Safe Range
Flares Expenditure	Range Scoring
High-Altitude Airspace	Cluster Weapons Expenditure
TACTS	Air-to-Ground Rockets Expenditure
Air-to-Ground Guns Expenditure	Practice Bomb Expenditure
Air-to-Air Guns Expenditure	General Purpose Bomb Expenditure
Stand-off Weapons Expenditure[3]	**Overland Supersonic Flight**[4]
Air-to-Ground Missiles Expenditure	**Night-time Operations**

Notes:
1. Bold face denotes a critical training element.
2. Live Ordnance refers to heavy and light, fired or dropped ordnance (e.g., general-purpose bombs, GBUs, etc.), but not gun ammunition.
3. Delivery requires real or simulated weapon release at a range of 15 NM or greater from the target and at an altitude of at least 20,000 ft AGL.
4. Overland TACTS ranges associated with air-to-ground training.

The capabilities of each DoN air-to-ground range were then compared with the demand for specific training elements. The most significant conclusions of this analysis were:

- There is no single DoN air-to-ground range that supports every required aircrew training element. In fact, the DoN air-to-ground range infrastructure (targets, facilities, range area, and SUA) available on the West Coast is significantly better and more capable of supporting basic and intermediate level air-to-ground training demand than is the DoN air-to-ground infrastructure available on the East Coast.

- Existing infrastructure at East Coast air-to-ground ranges is insufficient to support all required air-to-ground training requirements for East Coast squadrons. The most significant shortfall is in the ability to support the high-altitude operations, stand-off weapons expenditure, and overland supersonic flight training elements. East Coast squadrons compensate for the existing East Coast range shortfalls through the use of training detachments to West Coast range facilities. This practice to achieve documented and necessary training is detrimental to the quality of life of DoN personnel by contributing to excessive family separations.

- With respect to DoN air-to-ground range infrastructure on the West Coast, all required air-to-ground training requirements for West Coast squadrons are supported. In fact, seven West Coast ranges support high-altitude operations and five support the expenditure of stand-off weapons, although in both cases, T&E ranges are represented.

- The disparity between East and West coast range support capabilities can impact advanced level training exercises, where it is essential that all participating assets of the Carrier Battle Group (CVBG) be in the same place, exercising and honing warfighting skills from “magazine-to-target.” Simply shifting East Coast aircrew training to the West Coast would be counter to achieving this vital training need as Atlantic-based CVBGs would not be available to provide for concurrent training.

- While NAVAIR’s T&E ranges were found capable of supporting many of the training elements, these ranges are operated as Navy Working Capital Facility (NWCF) sites. Thus, Fleet operating units are not guaranteed use of these facilities on a regularly scheduled basis given the variability in T&E requirements.

- The use of live weapons during training is essential to combat readiness. It provides end-to-end experience with the procedures for managing, storing, handling, and employing live weapons and instills the confidence necessary to succeed in combat (Commander US Second Fleet and Commander US Marine

Corps Forces Atlantic, July 15, 1999). Moreover, training with live ordnance permits full systems verification and validation by all levels of the operational chain. Although range manuals indicate that 69 percent of DoN ranges support the expenditure of live general purpose bombs, this capability is severely limited at East Coast ranges.

- DoN ranges have limited capability to support the expenditure of stand-off weapons and 40 percent of this capability is concentrated at the T&E ranges.

- Population densities on the East Coast are higher than on the West Coast. As a result, East Coast ranges are experiencing greater encroachment by civilian land uses. This is more of a concern at the VACAPES, Cherry Point, and Camp Lejeune complexes, where seasonal and retirement community development has substantially increased in the past decade. Seasonal residents and retirees are not especially tolerant of aircraft noise disturbances.

Training Demand For Air-To-Ground Range Facilities

Using the same primary training elements previously introduced in Table ES-1, a predictive analytical tool was developed for quantifying basic through intermediate level training demand for air-to-ground range facilities and associated SUA for Navy and Marine Corps fixed- and rotary-wing aircrews. This tool can be used in future planning efforts. The demand for air-to-ground ranges and SUA as documented herein should be considered valid through the end of FY 2001 (unless new or modified Navy/Marine Corps aircraft, weapons, and tactics beyond those analyzed for this assessment are introduced to the DoN inventory).

Several key variables drive the type and tempo of basic through intermediate level training demand including Primary Mission Areas (PMAs), which account for expected threat environments, aircrew training cycles, and aircrew manning. Collected training demand data were further defined and standardized by adherence to a detailed series of assumptions.

The results of the analysis indicate a demand for air-to-ground facilities and SUA to support Navy and Marine Corps aircrew basic and intermediate training that may be quantified over a 12-month period for all squadrons of any type platform. The typical 18-month Inter-Deployment Training Cycle (IDTC) has been normalized to capture an annual summary. For example, a summary of the 12-month demand for air-to-ground range facilities and associated SUA generated by a typical deployable Navy Carrier Air Wing would be approximately 6,100 hours. Note that a single airwing deployment to the Fallon Range Training Complex averages 3,440 flight hours.

Recommendations

A series of recommendations were made in the *DoN Air-to-Ground Range Needs Assessment* concerning existing and future range capabilities. A flexible approach was adopted in developing and identifying these recommendations, recognizing that future conditions with respect to basing, range infrastructure, and training requirements may be significantly different from those in effect today. Key recommendations are:

- DoN should develop necessary strategies (fiscal and political) to sustain capabilities, meet new requirements, and ensure efficient use of resources.

- DoN should adopt a goal of establishing at least one range on each coast capable of supporting (at a minimum) the six critical training elements identified in this assessment. The West Coast DoN range infrastructure already satisfies this goal, with three ranges (China Lake, Twentynine Palms, and Yuma) capable of satisfying all six training elements. Adopting and implementing this recommendation on the East Coast will be far more difficult, due to land and SUA limitations associated with all existing DoN East Coast ranges. In spite of these difficulties, it is reasonable to assume that the goal of this recommendation could be realized through one of three alternative approaches:

  - ***Alternative Approach 1 - New Range*** - DoN would identify and acquire the necessary range area and SUA for development of a new East Coast range with capabilities similar to the West Coast ranges mentioned above. The greatest potential difficulty with this alternative is the requirement for an area that will support overland live ordnance expenditure and overland supersonic operations.

  - ***Alternative Approach 2 - Joint Service Initiative*** - DoN would: (1) identify and develop a new range infrastructure for a backyard range and/or for advanced level or CVBG training in partnership with the US Army and/or US Air Force, or (2) begin steps, under a joint service initiative, for the acquisition of additional land and SUA at an existing DoD range. Preliminary research indicates two existing DoD ranges (Fort Bragg and Fort Knox) may be candidates for expansion, principally because they both have the existing capability of supporting the use of live ordnance and appear to offer opportunity for expansion of both range land area and airspace. Fort Bragg is a potential candidate for a backyard training range and both Fort Bragg and Fort Knox are viable candidates for intermediate level squadron and CVW training. In addition, although Victor Airways do exist within the general vicinity of these range complexes, these airways do not appear to present insurmountable obstacles.

- ***Alternative 3 - Expand Existing DoN Range*** - DoN would select an existing East Coast range and expand its range area and SUA or enhance other capabilities (e.g., obtain authorization for live ordnance expenditure). The Cherry Point Complex and Townsend Range would be good candidates under this scenario.

- For the near-term East Coast squadrons should continue to supplement basic and intermediate level training support available at East Coast DoN air-to-ground ranges by maximizing opportunities available while on detachments at West Coast DoN air-to-ground range facilities.

- In order to maximize use of range assets at the El Centro Complex, DoN should consider securing additional SUA to connect the existing SUA now associated with the El Centro Complex and the R-2507 Chocolate Mountain Range (Yuma Complex).

- DoN should continue existing and encourage future efforts for joint use of existing DoD service ranges (US Army and US Air Force) to supplement training, particularly on the East Coast, for those critical elements not otherwise available at existing DoN ranges. Furthermore, DoN should pursue the possibility of combining certain range operations with the US Air Force. One obvious example is combining and enhancing the SUA of the Navy and Air Force Dare County ranges that would provide sufficient airspace for stand-off weapons training. In addition, some operational scenarios may merit further quantitative analysis, such as combining certain range operations of the Marine Corps and US Air Force that are associated with the Barry M. Goldwater Range (R-2301E and W) or participating in the proposed Southwest Defense Complex (a private and local government consortium).

- The capability to expend Chaff on the East Coast needs to be expanded. Potential additional ranges for Chaff expenditure include Camp Lejeune and Pinecastle (Jacksonville Complex). Even though Chaff may not fall within the bounds of the respective range areas for various reasons (weather, aircraft tactics, etc.), the environmental impacts of such releases would not be significant, as confirmed by several recent studies on Chaff releases by the US Air Force (1997), General Accounting Office (1998) and the Naval Research Laboratory (1999). Released chaff is perceived by some individuals as litter, however.

- The capability to train with stand-off weapons (actual and simulated release) at the Fallon Range Training Complex should be secured by adding range area and SUA, thus allowing DoN to control where and when this training occurs. Navy and Marine Corps squadrons currently operating from the Fallon Range Training

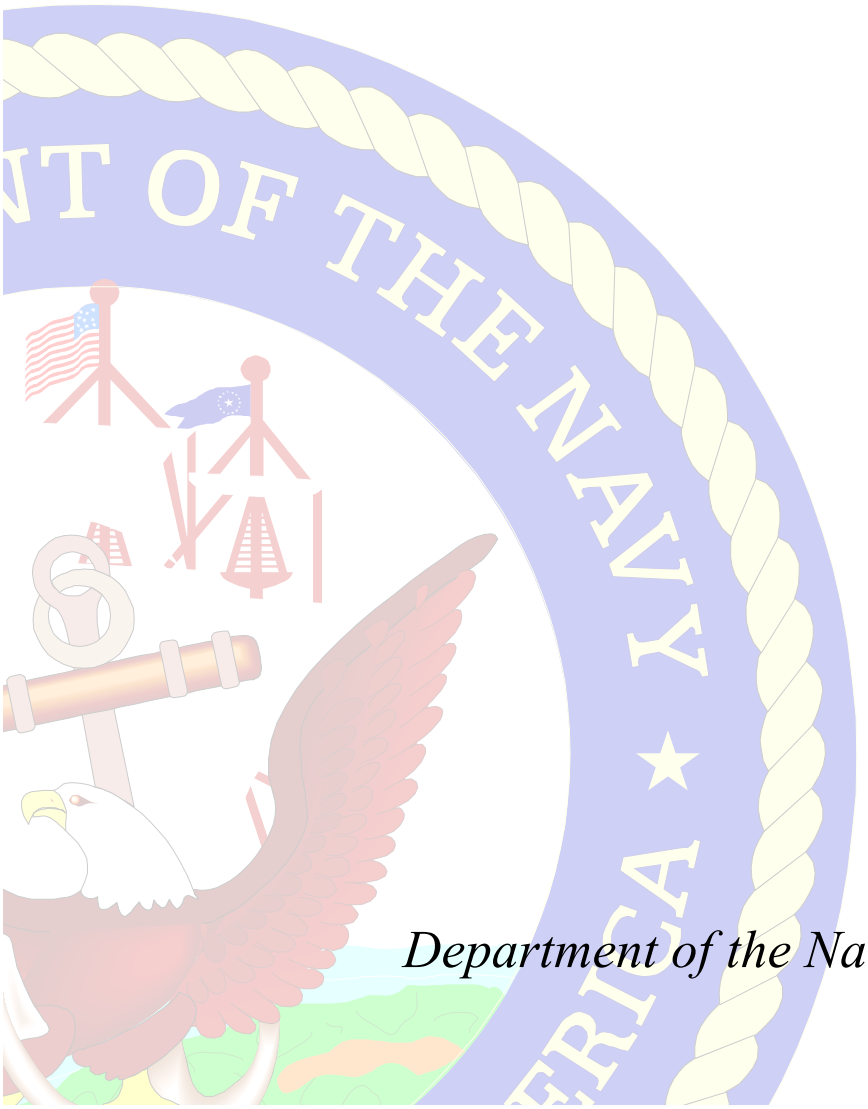
Complex conduct this training at the China Lake Complex or at the US Air Force's Utah Test and Training Range (both ranges are MRTFB T&E ranges).

- The DoN should continue efforts to play a proactive role in addressing encroachment issues at ranges. These issues have serious potential consequences to range operational capabilities and ultimately, force readiness. The DoN RAICUZ program can provide guidance and policy in these efforts.

- T&E ranges should be required to publish range scheduling information for Fleet benefit and/or guarantee certain reasonable scheduling times for Fleet use of the T&E ranges.

- The system for using and reimbursing T&E ranges by Fleet training units needs to be addressed by both senior Navy leadership and the Office of the Secretary of Defense.

Table of Contents



Department of the Navy Range Needs Assessment:
Air-to-Ground Ranges

TABLE OF CONTENTS

Number Title Page

1 INTRODUCTION AND BACKGROUND 1-1

1.1 Introduction 1-1
1.2 Background 1-3
1.3 DoN Range Assets....1-5
1.4 What is an Air-to-Ground Range? 1-5
1.5 DoN Air-to-Ground Ranges....1-8
1.6 Challenges to Continued and Future Use of DoN Air-to-Ground Ranges....1-12
1.6.1 Future Weapons Systems and Tactics....1-13
1.6.1.1 New Generation of Weapons Systems 1-13
1.6.1.2 Combined and Joint Operations....1-15
1.6.1.3 Electronic Warfare Training 1-16
1.6.1.4 Tactical Training Instrumentation....1-17
1.6.2 Airspace Utilization....1-17
1.6.3 Encroachments on DoN Ranges 1-18
1.6.3.1 Physical and Land Use Encroachment of Range Lands 1-19
1.6.3.2 Encroachment by Environmental Conservation Issues and Regulatory Programs 1-21
1.7 Summary 1-24

---

2 RANGE EVALUATION AND CAPABILITY 2-1

2.1 Project Meetings 2-1
2.2 Range Database 2-2
2.2.1 Range Data Collection Effort....2-2
2.2.2 Range Database Organization 2-3
2.3 Development of Internet Website....2-5
2.3.1 The Maps 2-6
2.3.2 Viewing or Editing Data....2-8

TABLE OF CONTENTS

Number Title Page

3 RANGE UTILIZATION AND SCHEDULING 3-1

3.1 Range Utilization Data 3-2

3.1.1 Sources of Utilization Data 3-2

3.1.2 Types of Data Collected on Range Utilization 3-3

3.1.3 Comparability of Collected Range Utilization Data 3-5

3.2 Range Utilization Metrics 3-7

3.3 Applying the Metrics to Available Range Utilization Data 3-8

3.3.1 Analysis of Range Utilization Rates 3-9

3.3.1.1 FY 97 Data 3-9

3.3.1.2 FY 98 Data 3-12

---

4 AIR-TO-GROUND RANGE TRAINING SUPPORT CAPABILITIES 4-1

4.1 Air-to-Ground Range Characteristics that Affect Quality of Training Support 4-2

4.2 Operational Training Elements 4-4

4.3 Analysis of DoN Air-to-Ground Range Training Support Capabilities 4-5

4.3.1 Range Capabilities to Support Primary Training Elements 4-5

4.3.2 Capabilities of East and West Coast Ranges in Supporting the Critical Training Elements 4-11

4.3.3 Accessibility of DoN Air-to-Ground Ranges 4-18

4.3.4 Other Issues Affecting DoN Air-to-Ground Training Support Capabilities 4-24

4.3.5 Joint Use Strategies 4-24

---

5 TRAINING DEMAND FOR AIR-TO-GROUND RANGE FACILITIES 5-1

5.1 Overview of Analytical Methodology 5-1

TABLE OF CONTENTS

Number Title Page

5.2 Key Variables Influencing Training Demand 5-2

5.2.1 Primary Mission Areas 5-2

5.2.2 Aircrew Training Cycles 5-3

5.2.3 Aircrew Manning 5-4

5.3 Analytical Assumptions 5-6

5.4 Training Demand Database 5-9

5.5 Demand for Air-to-Ground Range Facilities and SUA 5-9

5.5.1 Critical Training Elements and Demand for Air-to-Ground Ranges 5-13

5.5.2 Air Wing Training Demand 5-17

5.6 Summary 5-17

---

6 CONCLUSIONS AND RECOMMENDATIONS 6-1

6.1 Conclusions 6-1

6.1.1 Data Collection/Internet Website 6-1

6.1.2 Range Utilization 6-1

6.1.3 Range Capabilities 6-2

6.1.3.1 General Conclusions 6-2

6.1.3.2 East Coast Range Conclusions 6-4

6.1.3.3 West Coast Range Conclusions 6-5

6.1.4 Training Demand 6-6

6.1.5 Decision-Maker's Planning Tool 6-7

6.2 Recommendations 6-7

6.2.1 Data Collection/Internet Website 6-7

6.2.2 Range Utilization 6-8

6.2.3 Range Capabilities 6-8

6.2.4 Training Demand 6-12

TABLE OF CONTENTS

Number	Title	Page
7	**ACRONYMS AND ABBREVIATIONS**	7-1
8	**GLOSSARY**	8-1
9	**REFERENCES**	9-1
10	**LIST OF PREPARERS**	10-1

APPENDICES

Appendix A - Range Data Collection Form A-1
Appendix B - Air-to-Ground Ordnance B-1
Appendix C - DoN Range Website Overview C-1
Appendix D - DoN Range Capability and Issue Summaries D-1
Appendix E - DoN TACTS Range Capabilities E-1
Appendix F - Range Utilization F-1
Appendix G - Decision-Maker's Planning Tool G-1
Appendix H - Air-to-Ground Training Database by Aircraft Platform H-1
Appendix I - Straightline Distance Between DoN Airfields and DOD Ranges I-1

LIST OF FIGURES

Number	Title	Following Page
1-1	Locations of DoN Air-to-Ground Ranges	1-8
1-2	Locations of Navy and Marine Corps Air Stations	1-8
1-3	DoN Controlled or Extensively Used SUA	1-18
1-4	Existing Land Use Within and Adjacent to the Barry M. Goldwater Range	1-20
1-5	Mining Districts at the Fallon Range Training Center	1-20
2-1	USA Map for Range Selection on Internet Website	2-6
2-2	Map of Cherry Point Complex Available on Internet Website	2-6
2-3	View Range Data	2-6
2-4	Editing the Website Database	2-6
4-1	Air-to-Ground Ranges Used by the US Air Force	4-28
5-1	Example of Overlapping Training Phases	5-8
5-2	Methodology Used for Populating Database Elements	5-12

LIST OF PHOTOGRAPHS

Number	Title	Following Page
1-1	Searay Multipurpose Target Range Area (Meridian Complex)	1-6
1-2	Spotting Tower at McMullen Range Yankee Target (Gulf of Mexico Complex)	1-6
1-3	Spotting Tower at B-127 (Fallon Range Training Complex	1-6
1-4	Army Complex Tactical Target at B-17 (Fallon Range Training Complex)	1-6
1-5	Bullseye Target at B-17 (Fallon Range Training Complex)	1-6
1-6	Strafe Target (Fallon Range Training Complex	1-6

LIST OF TABLES

Number	Title	Page
1-1	Definitions of Special Use Airspace and Airspace for Special Military Use	1-7
1-2	Department of the Navy Air-to-Ground Ranges	1-9
2-1	Electronic Warfare Levels and Descriptions	2-4
3-1	Comparison of Available Utilization Data	3-4
3-2	FY 97 and 98 DoN Range Utilization Calculations by Metric	3-10
3-3	Use of DoN Ranges by General User Category (%)	3-13
4-1	Training Elements	4-6
4-2	Range Complex Training Support Capabilities	4-9
4-3	Number of East and West Coast Ranges Supporting Primary Training Demand	4-12
4-4	DoN Air-to-Ground Ranges Capable of Supporting Critical Training Demand	4-13
4-5	Summary of Distance to Fly to “Find” Critical Training Elements	4-20
4-6	Summary of Operational Considerations and Issues at DoN Ranges	4-25
5-1	Navy and Marine Corps Pilot Manning Levels per Squadron	5-5
5-2	SNA and IUT Training Load	5-5
5-3	Description of Database Elements	5-10
5-4	Summary of Range Facility Demands	5-12
5-5	Air-to-Ground Range Facility Demands for Non-Critical Training Elements	5-14
5-6	Generic CVW Range Facility Demands	5-18
6-1	Joint Service Initiative Candidates: Fort Bragg and Fort Knox	6-10
6-2	DoN Range Expansion Candidates	6-10

Chapter 1

Introduction and Background

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

In December 1996, the Chief of Naval Operations (CNO) (N44) Range Planning Office was established. The purpose of the Range Planning Office is to furnish the Department of the Navy (DoN) with the information and tools necessary to address critical issues facing the continued use and future availability of sea, land, and air ranges. Some of the critical issues affecting DoN range use include, but are not limited to:

- Quantifying the amount of land and/or airspace required to support advances in weapon system technology and changes in warfighting doctrine;
- Competing for scarce land and airspace resources;
- Dealing with encroachment of range lands and airspace;
- Complying with environmental laws and regulations; and
- Developing working relationships with Native American Tribes and local, state, and federal governmental agencies, including but not limited to the Bureau of Land Management, Fish and Wildlife Service, National Marine Fisheries Service, and Federal Aviation Administration.

Given the multi-dimensional capabilities of DoN range assets, the first effort undertaken by the CNO (N44) Range Planning Office was an assessment of air-to-ground ranges. The intent of this effort was to document resources available at each air-to-ground range and provide an evaluation of the capabilities of these assets to support existing and projected operational training and Research, Development, Test, and Evaluation (RDT&E) demands. Ranges studied include Fleet tactical training ranges, Test and Evaluation (T&E) ranges operated by the Naval Air Systems Command (NAVAIR), and ranges operated by Chief of Naval Education and Training (CNET).

Begun in October 1997, the *DoN Air-to-Ground Range Needs Assessment* was accomplished in four phases, with information/data derived in each subsequent phase progressively building upon that identified in previous phases. The four phases are:

I Range Evaluation and Capability;
II Range Utilization and Scheduling;
III Training Demands and RDT&E Programs; and
IV Range Assessment Summary and Recommendations.

Working papers have already been published for Phases I and II, and the efforts undertaken in each of these phases are summarized in Chapters 2 and 3 of this assessment, respectively. Those data, in turn, form the basis for Chapter 4, which provides a summary and assessment of the capabilities of existing DoN air-to-ground ranges to meet existing training demand. Also factored into the Chapter 4 analysis is an assessment of land use development patterns surrounding the ranges and environmental compliance issues facing range managers. Both these issues have the potential to impede full utilization of DoN ranges or result in the degradation of their capabilities.

Chapter 5 traces the results of Phase III and describes an analytical tool for quantifying basic and intermediate training demand by Navy and Marine Corps fixed- and rotary-wing aircrews for air-to-ground range facilities and associated Special Use Airspace. The focus of this effort was on unit and intermediate level training because this training is achieved through adherence to the Training and Readiness matrices, allowing demand to be readily quantified and predicted. This structured approach to unit and intermediate level training is in contrast to the flexibility allowed Fleet Commanders in achieving advanced level and Carrier Battle Group training.

Documented in Chapter 6 are a series of conclusions and recommendations regarding the capability of existing DoN ranges to meet existing and projected training and RDT&E demands. The recommendations also address the potential for expanding existing ranges, developing new ranges, and using T&E ranges or other service ranges to supplement existing training range capabilities. An acronym list and a glossary of training and airspace terms are included as Chapters 7 and 8, respectively. In addition, a decision-maker's range planning tool is introduced in Appendix G, with step-by-step guidance on how to use those data provided in this assessment in future range planning efforts.

Principal sources of information used in preparing this assessment include (see Chapter 10 for a complete bibliography):

- Results of interviews, data calls, and meetings with DoN range managers and staff; and

- Approved publications, including range manuals and supplementary or supporting environmental documentation (environmental assessments and impact statements and range management plans). Of these, some of the most important were:

  - *Tactical Training Range Roadmap* prepared by Chief of Naval Operations (N889) (July 1995);

  - *Fleet Training Area/Range Directory* prepared by Naval Warfare Assessment Division (March 17, 1997);

- *Draft Joint Commander, Air Forces, U.S. Atlantic Fleet (CNAL)/Commander, Air Forces, U.S. Pacific Fleet (CNAP) Squadron Training and Readiness (T&R) Instruction* (Fall 1999); and

- Volumes I and II of the *Marine Corps T&R Manual* (March 1999).

1.2 Background

Military ranges are invaluable assets of the Department of Defense (DoD). Throughout US history, ranges have served instrumental roles in preparing US forces for confrontation with any military force they might reasonably be expected to oppose. As force size, weapons types, and military doctrine have evolved over time, concurrent changes have occurred in both the number and size of DoD range assets. However, the basic roles served by that range infrastructure have remained unchanged. Ranges continue to provide appropriate locations where the US Armed Forces can achieve and maintain their state of readiness to defend the US against potential threats by:

- Obtaining operational training before deployment;
- Maintaining combat readiness;
- Conducting RDT&E activities for new or improved weapons systems; and
- Undertaking instructional activities for new trainees.

The importance of these roles in ensuring readiness is recognized and upheld by the *National Military Strategy.* As expressed in the *1999 Secretary of Defense's Annual Report to the President* (Secretary of Defense, 1999), the *National Military Strategy* requires that:

> …US forces, both active and reserve, must be multi-mission capable, proficient in their core warfighting competencies, and able to transition from peacetime activities and operations to enhanced deterrence in crisis to war.

The *National Military Strategy* is designed to meet the ever-uncertain post-Cold War global threats to US security, threats that principally involve disruptions in the security and stability of regions abroad. Such regional disruptions have been shown to be variable in terms of timing and location and have taken the form of civil wars, territorial disputes, terrorism, the proliferation of advanced weapons and technologies, natural disasters, and other emergencies. In the last decade, for example, the US has committed its military forces in response to disruptions in Kosovo, Kuwait, Somalia, Bosnia and Herzegovina, Korea, Rwanda, Southwest Asia, Haiti, Grenada, Cuba, Peru, and Ecuador. Missions have ranged from full-scale engagement in regional conflicts, such as occurred in Kosovo and Operation Desert Storm, to assisting with natural disaster relief. Most of these missions have been conducted as joint operations, either multi-service and/or multi-nation. The successful outcome in dealing with these threats reflects the high-level of military skills honed by aircrews during training at air-to-ground ranges.

The US has played a significant, if not dominant role, in resolving these disruptions and conflicts because the international community perceives the US as the only nation capable of unilaterally conducting large-scale, effective military operations far beyond its borders. Thus, the *National Military Strategy* is predicated on the US' remaining similarly politically and militarily engaged in the world over the next 15 to 20 years, and that military superiority over current and potential rivals will be maintained. In order to support this "imperative of engagement," US military forces must be the "best trained, best equipped, and best prepared military forces in the world" (Secretary of Defense, 1999). Accordingly, maintaining the readiness and sustainability of US Armed Forces is DoD's "number one priority," a commitment that is reflected in DoD's Fiscal Year (FY) 2000 budget and plans for future years.

Proficiency in any skill requires frequent and repetitive practice. Simplistically, the training of the armed forces for combat can be compared to athletic training. However, in the case of military forces, mastering complicated equipment, particularly current high technology operating and weapons systems, is more than mere repetition of a series of exercises. Training with that equipment -- aircraft, vehicles, weapons, and logistic support -- must be intensive and realistic, replicating the realities and stresses imposed under actual combat conditions. Joint and combined operations require an additional level of proficiency training. For Naval forces, intensive and realistic training can best be accomplished at established DoN ranges where sailors and aviators can train-as-they-fight and their performance (i.e., state of readiness) can be assessed.

In addition to maintaining operational readiness, the concurrent need exists to develop and test technologically superior weapons and weapons systems for use on the battlefield of the future. DoD's budget planning, beginning with the *Fiscal Year 1996-2001 Future Years Defense Program* (FYDP), provides for the modernization and recapitalization of aging US military equipment, focusing on "true force multipliers" -- multi-mission weapons platforms (aircraft, ships, etc.) and weapons capable of meeting a broad variety of mission requirements. These future acquisition programs will also involve the development of high technology systems such as advanced sensors, computers, and communications (Secretary of Defense, 1996). These aviation weapons platforms and systems must be comprehensively evaluated on T&E ranges to assure their operational effectiveness, suitability, and survivability.

The argument has been made that with advances in computer technology -- specifically models, simulation, and even virtual reality -- actual time-on-range for training and RDT&E activities could be significantly curtailed or even eliminated. Computer technologies do provide excellent tools and are, in fact, essential to a successful, integrated training or RDT&E program, reducing the risk and expense typically associated with military training. However, they are inadequate substitutes for actual ordnance delivery and maneuver. In other words, while some training and RDT&E related to weapons platforms and/or systems deployment can be acquired through the use of simulators, actual proof of suitability and/or readiness can be measured only through operational exercises conducted in a range environment (Naval Command, Control, and Ocean Surveillance Center et al., July 1994).

Furthermore, use of live weapons is essential to combat readiness. It provides end-to-end experience with the procedures for managing, storing, handling, and employing live weapons. Training with live ordnance permits full systems verification and validation by all levels of the operational chain of command and instills the confidence necessary to succeed in combat (Commander US Second Fleet and Commander US Marine Corps Forces Atlantic, July 15, 1999).

1.3 DoN Range Assets

The sea, land, and air range assets administered and operated by DoN have a broad geographic distribution. As a result, they offer a wide variety of topographic features and climatic conditions representative of those that may be encountered during actual missions. Some of the ranges can also accommodate joint force exercises -- exercises where air and surface combat, combat support units, and at times amphibious units can train as an integrated force in order to ensure their combined effectiveness when deployed.

Given this variation in range purposes and capabilities, the initial focus of the range assessment effort (and this assessment) was necessarily narrowed by the CNO (N44) Range Planning Office to the air-to-ground ranges (i.e., ranges that are capable of supporting air-to-ground delivery of weapons and electronic warfare). There were several reasons for narrowing the focus:

- The air-to-ground range segment represents a majority of DoN ranges, most of which are located in the US; and

- Air-to-ground ranges have, in recent years, been subject to intense public scrutiny (e.g., Fallon Range Training Complex in Nevada, the Pinecastle Range in Ocala, Florida, and more recently, the Inner Range at the Atlantic Fleet Weapons Training Facility in Puerto Rico).

Thus, it was considered timely to evaluate these ranges first. In the future, the CNO (N44) Range Planning Office intends to direct resources to evaluating sea (surface and subsurface) and other land-based DoN ranges that support other training and RDT&E activities in air-to-air, amphibious, and surface and underwater warfare.

1.4 What is an Air-to-Ground Range?

An air-to-ground range is a military training facility that supports realistic simulation of air-to-air maneuvers, air-to-ground delivery of weapons, and electronic warfare (EW). Live or inert weapons may be safely and securely released or fired on these ranges. The basic components of an air-to-ground range are:

- Range area;
- Infrastructure (targets, instrumentation, etc.); and
- Special Use Airspace (SUA).

All of these range components are equally important in determining the utility of a range to provide adequate training. However, the relationship among them is not one-for-one (i.e., more overlying airspace is needed when compared to the land or water range area required to accommodate range ground facilities and weapons impacts).

The range area comprises all of the land or water area needed to conduct required air-to-ground training or RDT&E events. An aerial view of the range area at the Searay Multipurpose Target (Meridian Complex) is shown in Photograph 1-1. To insure public safety, the areal extent of the range area must be sufficient to accommodate the weapons safety footprint of any live or inert weapons that are authorized for release. Also, public access to the range land area may be limited or outright prohibited depending on the nature of the training or RDT&E activities that are conducted on the range.

Range infrastructure includes, but is not limited to, operations/administration buildings, instrumentation (tracking and scoring), targets and visual cueing devices, electronic threat emitters, towers, roadways, and perimeter fencing. Photographs 1-2 through 1-6 show examples of range infrastructure. Infrastructure in good repair enhances the quality of training.

Special Use Airspace is important to conducting the military mission at a range in that it provides access to the range, segregation from unauthorized aircraft activities (specifically civil aircraft operations), and maneuvering space for performing various ordnance delivery tactics. Simply put, SUA can exist with or without the presence of a defined air-to-ground range. By contrast, an air-to-ground range cannot exist without the presence of SUA. The Federal Aviation Administration (FAA) defines SUA as:

> …airspace of defined dimensions wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of those activities, or both.

About 75 percent of the airspace in the continental US is dedicated to the use of civilian aviation. The remaining 25 percent is designated as SUA for DoD military operational readiness training and RDT&E activities, although when not in use for military activities, the airspace is returned on a real-time basis to the Federal Aviation Administration (FAA) for use by civilian aviation. The types of designated airspace essential to effective operation and use of DoN air-to-ground ranges are restricted areas, warning areas, military operations areas, military training routes, air traffic control assigned airspace, altitude reservations, and controlled firing areas. Each of these is defined in Table 1-1.

Table 1-1

Definitions of Special Use Airspace and Airspace for Special Military Use

Airspace Designation	Definition
Air Traffic Control Assigned Airspace (ATCAA)	Airspace above Flight Level (FL) 180 (normally associated with underlying MOA), established by letter of agreement with the Air Traffic Control facility having responsibility for the airspace. Nonparticipating aircraft are separated from the military activity being conducted within the airspace.
Altitude Reservation (ALTRV)	Temporary airspace (fixed or moving) that is established by "approval request." Nonparticipating IFR aircraft are separated from ALTRV activity
Controlled Firing Area	Airspace that contain activities which, if not conducted in a controlled environment, could be hazardous to nonparticipating aircraft. The distinguishing feature of a Controlled Firing Area is that its activities are suspended immediately when spotter aircraft, radar, or ground lookout positions indicate an aircraft might be approaching the area.
Military Operations Area (MOA)	Airspace established for the purpose of separating certain military training activities (which necessitate acrobatic or abrupt flight maneuvers) from Instrument Flight Rules (IFR) air traffic and to identify for Visual Flight Rules (VFR) traffic where these activities are conducted
Military Training Route (MTR)	Low-level, high-speed IFR or VFR navigation and tactical training routes below 10,000 ft MSL and used at airspeeds of more than 250 knots. The routes above 1,500 ft above ground level (AGL) are developed to be flown, to the maximum extent possible, under IFR. The routes at 1,500 ft AGL and below are generally developed to be flown under VFR.
Prohibited Area	Airspace within which the flight of aircraft is prohibited. Such areas are established for security and other reasons associated with the national welfare.
Restricted Area	Airspace within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants.
Warning Area	Airspace over territorial and international waters extending from three nautical miles (NM) outward from the coast of the US, that contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning areas is to warn nonparticipating pilots of the potential danger.
Source: Federal Aviation Administration, *Aeronautical Information Manual*, February 24, 2000.	

1.5 DoN Air-to-Ground Ranges

The domestic DoN air-to-ground ranges are listed in Table 1-2; general locations are shown on Figure 1-1 (Locations of DoN Air-to-Ground Ranges). As can be seen, most of the DoN ranges are concentrated on the East or West coasts near existing or former Navy and Marine Corps Air Stations (Figure 1-2, Locations of Navy and Marine Corps Air Stations). Few ranges are situated within the central portion of the nation. The ranges also vary considerably in size. The smallest, Bloodsworth Island Shore Bombardment and Bombing Range (Maryland), has an areal extent of about 9.4 square miles. The China Lake Complex in the California desert is the largest land range at 1.1 million acres. All of the air-to-ground ranges on the East Coast are significantly smaller in land area than those on the West Coast.

There are 15 DoN range complexes and four individual ranges. The range complexes are comprised of one or more ranges (also referred to as targets) that are controlled and scheduled in groups by a central scheduling authority (e.g., the Fallon Range Training Complex has four ranges -- B-16, B-17, B-19, and B-20). Such range complexes can typically support more than one air-to-ground range user during the same timeframe, with each air-to-ground range user assigned to a separate air-to-ground range or target. In contrast, the four individual DoN ranges are scheduled and controlled as an individual range under a single scheduling authority (e.g., Townsend). For simplicity in this assessment, the term range is used interchangeably to denote both an individual range and a range complex (unless otherwise noted).

Some DoN ranges are operated by service organizations other than their administering organizations. For example, Townsend Range is a Marine Corps training range with scheduling authority delegated to the Georgia Air National Guard by Commander, Marine Corps Bases East (COMCABEAST). Whatever the governing structure, DoN ranges are equipped with the resources needed to support a broad variety of defined tasks.

The DoN air-to-ground ranges may be further categorized by function. There are 15 Fleet tactical training air-to-ground ranges. The Navy administers eight of these ranges (AFWTF Inner Range, Bloodsworth Island, El Centro, Fallon Range Training Complex, Jacksonville, NWSTF Boardman, SCORE, and VACAPES), and seven are administered by the Marine Corps (Camp Lejeune, Camp Pendleton, Cherry Point, Quantico, Townsend, Twentynine Palms, and Yuma). Two of the non-tactical ranges are T&E air-to-ground ranges administered by NAVAIR (China Lake and Patuxent River). Finally, two air-to-ground ranges are administered by CNET (Meridian Complex [Searay Multipurpose Target] and Gulf of Mexico Complex [McMullen County Range]). Fixed-wing (jet and propeller-driven) and rotary-wing aircraft may be employed on all DoN air-to-ground ranges.

Table 1-2

Department of the Navy Air-to-Ground Ranges

State	Range Complex/Range (Target)
Navy/Marine Corps Fleet Tactical Training Ranges	
Arizona	Yuma Complex R-2301W - Barry M. Goldwater Range Cactus West Target Urban Close Air Support R-2507 - Chocolate Mountain Range North Impact Area South Impact Area
California	Camp Pendleton (R-2503) Complex Door Gunner #1 Door Gunner #2 TOW Missile Range 212 Whiskey Impact Area (Aircraft Bombing and Strafing Range 220) Zulu Impact Area (Range 440)
	El Centro Complex R-2510 Loom Lobby Target Shade Tree Target R-2512 Inkey Barley Target Kitty Baggage Target
	Southern California Offshore Range Complex San Clemente Island Shore Bombardment Area (SHOBA)
	Twentynine Palms Complex (R-2501) North Range South Range East Range West Range
Florida	Jacksonville Complex Lake George Range Pinecastle Range Rodman Range
Georgia	Townsend Range
Maryland	Bloodsworth Island Shore Bombardment and Bombing Range
Nevada	Fallon Range Training Complex B-16 Range B-17 Range B-19 Range B-20 Range
North Carolina	Camp Lejeune Complex BT-3/N-1 Impact Areas G-10 Impact Area K-2 Impact Area
	Cherry Point Complex BT-9 Target BT-11 Range

Table 1-2

Department of the Navy Air-to-Ground Ranges

State	Range Complex/Range (Target)
North Carolina (continued)	VACAPES Complex Navy Dare County Range Palmetto Point Range Stumpy Point Range
Oregon	NWSTF Boardman Range
Puerto Rico	AFWTF Complex Inner Range
Virginia	Quantico Complex Range 7 Range 15
Naval Air Systems Command Test and Evaluation Ranges	
California	China Lake Complex R-2505 Airport Lake Range Baker Range Charlie Range Coles Flats Range Coso Range George Range Wild Horse Mesa Range R-2524 Superior Valley Range[1] Mojave B North Range Mojave B South Range
Maryland	Patuxent River Complex (Chesapeake Test Range) R-4005 Hooper Target Hannibal Targets R-6609 Tangier Island Target
Chief of Naval Education and Training Ranges	
Mississippi	Meridian Complex Searay Multipurpose Target
Texas	Gulf of Mexico Complex McMullen County Range Dixie Target Yankee Target

Notes:

1. The R-2524 Superior Valley Range is a Fleet asset paid for by Commander, Naval Air Forces Pacific (CNAP).

The Navy and Marine Corps tactical training ranges provide operational training for Naval aviators whose missions are to attack enemy targets ashore. These range resources are used to increase an aircrew's combat skills and to provide the Fleet commanders with a means of assessing performance (i.e., measuring a unit's readiness for combat). Tactical training ranges can accommodate different levels of training:

- Basic level (e.g., Navy squadron or one to two aircraft);
- Intermediate level (e.g., airwing, mix of aircraft, interface with surface ships at sea); and
- Advanced level (e.g., Joint Task Force Exercises).

The readiness of Navy and Marine Corps aviators is achieved by adherence to a building block concept. Entry level and technical skill training is the responsibility of the "school houses," which include the Fleet Readiness Squadrons (FRS). Basic combat skills are learned and integrated into the team at the basic level -- inside the envelope -- and are the responsibility of the squadron officer. Intermediate training is where the operating squadron acquires the skills needed to function as part of a fighting force. This level of training is the responsibility of the wing or squadron commander, and directed by the Type Commanders (TYCOMS) through the Training and Readiness matrices. Advanced training, where the fighting force coalesces into a ready battle unit, is the responsibility of the Carrier Battle Group and the numbered Fleet Commander. Each of the elements, from schoolhouse to the battle group, relies on an aviator's use of training ranges to complete training and certify for the next level of competency.

The primary mission at the NAVAIR ranges is to conduct RDT&E activities in support of the aviation weapons system acquisition process. China Lake is a land range and Patuxent River overlies both land and water. These two ranges are also components of the DoD Major Range and Test Facility Base (MRTFB) as identified in the January 26, 1998 DoD Directive 3200.11 (*Major Range and Test Facility Base*). As such, the two Navy MRTFB range assets are operated as Navy Working Capital Fund (NWCF) sites.

An NWCF site offers customer-provider relationships between military operating units (e.g., Fleet units) and providers of goods and services (in this case, the use of range facilities that have been established to support RDT&E activities primarily) on a cost reimbursable basis. An NWCF site receives its initial working capital to finance the costs of products and services through an appropriation or other transfer of resources. The initial working capital expenses are replenished by the acceptance of customer orders that in turn permits continuing operations of the NWCF site (i.e., the NWCF site operates with revolving funds). The overall goal of the revolving fund concept is for the provider (or the MRTFB range, in this case) to break even (i.e., not make a profit) over the long-term. To use an MRTFB range, Fleet operating units have to reimburse that range for the cost of using the range's facilities.

Financial considerations aside, the NAVAIR T&E ranges could accommodate Fleet air-to-ground training exercises. However, the regularly scheduled use of these ranges for tactical training is not guaranteed. This is because the conduct of RDT&E activities always takes precedent over training exercises (i.e., training exercises can only be conducted on the NAVAIR ranges when such training does not interfere with the RDT&E activities).

The primary mission of the two ranges operated by CNET's Naval Air Training Command is for basic and intermediate aviation training. These ranges, Gulf of Mexico Complex (McMullen County Range) and Meridian Complex (Searay Multipurpose Target), lie in proximity to NAS Whiting Field, NAS Pensacola, NAS Meridian, NAS Kingsville, and NAS Corpus Christi. McMullen County Range (Gulf of Mexico Complex) consists of two targets -- Yankee and Dixie. The Yankee Target is controlled and scheduled by the Texas Air National Guard.

1.6 Challenges to Continued and Future Use of DoN Air-to-Ground Ranges

Since the establishment of the DoN air-to-ground ranges, many of which date back to World War II or the Korean War, the dynamics of air combat have changed dramatically in terms of speed, missions, weaponry, and the sophistication of enemy air defense systems. For example:

- World War II aircraft flew at maximum airspeeds of 220 to 375 knots. In contrast, today's modern jet fighters are capable of supersonic speeds of more than Mach 2 (more than 1,400 knots), with typical subsonic air combat maneuvering speeds from 260 to 608 knots.

- Missions in the 1940s and 1950s usually were limited to one or two different types of aircraft. Today's multi-force strike missions may involve most of the combat aircraft in the DoN inventory, from fixed-wing to rotary-wing to unmanned aerial vehicles (UAVs).

- The invention of radar in the 1940s allowed the spotting of incoming aircraft at distances of little more than 100 miles. Today's potential adversaries employ air defense systems that use advanced computational and signal processing techniques, some of which have detection ranges greater than 2,000 miles.

These and other advances in weapons systems, coupled with the need for aircrews to "train the way they will fight," is driving a need for air-to-ground range areas that are significantly larger than those established during World War II. Expanding civilian residential, recreational, and business interests are clamoring for access to and competing for use of the same finite land, sea, and airspace resources -- a trend that is likely to worsen in future years. A further complicating factor affecting range management is the need for compliance with increasingly stringent environmental regulatory programs. The real challenge facing future use (and possible

expansion) of DoN air-to-ground ranges is the development of strategies that balance the need to maintain force readiness within the constraints of potential encroachment and environmental compliance.

1.6.1 Future Weapons Systems and Tactics

Of all the factors that will affect future use of DoN air-to-ground ranges, future weapons systems and tactics will have the greatest impact. The National Defense Panel (1997) projected that the goals and objectives of the *National Military Strategy* can be met by the US military of 2010-2020 if greater emphasis is placed on certain warfighting capabilities: systems architecture; information management; mobility; stealth; speed; increased operational and strike ranges; and precision strike. In general, increased emphasis on these warfighting capabilities would have a two-fold benefit:

- Ensuring the safety of US forces by keeping aircraft out of reach of an enemy's air defense system; and
- Limiting collateral damage associated with strikes on enemy territory.

From the perspective of Naval aviation, this means that aircraft of the future will most likely be faster and/or stealthier, delivering a substantial percentage of "smarter" weapons at greater distances laterally and vertically from the target. Moreover, Naval aviators will be increasingly engaged in joint or multi-dimensional operations (i.e., operations involving integrated ground, sea, and air forces) and, even multi-national operations, at close and extended ranges.

1.6.1.1 New Generation of Weapons Systems

New generations of weapons systems are being developed or are in production that have the capability to precisely deliver the payload to the target. These weapons, known as precision-guided munitions (PGMs), can be bombs or air-to-ground missiles. They use advanced guidance systems: laser, infrared (IR), television imaging, global positioning system (GPS), or a combination thereof, with or without man-in-the-loop.

The current generation of PGMs that employ laser guidance include the Hellfire Missile (AGM-114), Maverick Guided Missile (AGM-65E), and laser-guided bombs (GBU-10, -12, and -24). These laser-guided weapons require a laser source to illuminate (or designate) the target, a laser seeker on the weapon that "homes" on the laser energy from the designator that is being reflected by the target, and a clear line of sight between the bomb's laser seeker and reflected laser energy. The laser designator may be mounted on an aircraft (only a limited number of Navy and Marine Corps platforms have this capability) or it may be employed by ground-based personnel (such as forward-deployed Special Operations Forces). The effectiveness of laser-guided weapons to

destroy a designated target has been demonstrated except where a clear line of sight is not possible due to adverse weather conditions (e.g., rain, clouds, dust, etc.).

To overcome the constraints associated with laser-guided PGMs, alternative guidance systems are under development including IR, GPS, and improved television imaging. Weapons systems employing these guidance systems provide accuracies comparable to laser-guided weapons and generally can be released at higher altitudes and/or longer ranges from the target (for example, the Joint Direct Attack Munition [JDAM]).

The tactical employment of PGMs as stand-off weapons is a critical component of emergent air-to-ground warfighting doctrine. Stand-off weapons delivery requires the employing aircraft to release (or simulate release) of the PGM at a range of 15 NM or greater from the target and at an altitude of at least 20,000 ft AGL. Examples of stand-off weapons systems under development or in initial production include the High-Speed Anti-Radiation Missile (HARM) (AGM-88), Joint Stand-Off Weapon (JSOW), HARPOON/Stand-off Land Attack Missile (AGM-84), Stand-Off Land Attack Missile-Expanded Response (SLAM-ER), and Penguin (AGM-119).

While the expenditure of most conventional ordnance (e.g., gun ammunition, rockets, practice bombs, general purpose bombs, etc.) is authorized at nearly all DoN air-to-ground ranges, the authorized expenditure of PGMs has limitations. From the perspective of the range facility, several conditions must be met before PGMs can be employed in operational training exercises.

First, there must be sufficient range area and/or associated airspace to contain the entire flight envelope of the weapon, from launch/release (actual or simulated) to impact. If the extended release point causes the aircraft to be positioned outside designated SUA, additional restricted airspace would be needed per FAA regulations.

Next, the impact area for fired or released live or inert standoff weapons must fall within the identified weapons safety footprint on DoN range land or a DoN-controlled hazard area. A weapons safety footprint describes the land area needed to accommodate the impact of ordnance used in training. The shape and size of the footprint is tactic-driven, its shape determined by such factors as aircraft type, ordnance type, run-in headings, release altitude, target type, etc. The weapons safety footprint for conventional ordnance is relatively modest. For example, a MK-76 practice bomb released by an F/A-18 could have a weapons safety footprint covering an area approximately 2.2 by 0.4 miles. In contrast, the weapons safety footprint for the newly-developed JDAM would encompass an area approximately 27 by 26 miles (US Air Force, March 1999).

Should the weapons safety footprint for a particular weapon exceed the land area administered or otherwise controlled by DoN, several immediate strategies could be implemented to remedy the situation, such as modifying run-in lines to a target or even relocating a target. If these strategies fail to allow accommodation of the weapons safety footprint, DoN would seek to expand the area

of control either through lease or easement, or by purchasing or initiating land withdrawal (if public lands are involved).

In the case of laser-guided weapons, the laser system employed must be authorized at the range where it is to be operated. Authorization takes into account the strength of the laser system (i.e., its hazard potential) as well as range size and topography, target size and location, and mission and tactics to be employed. This evaluation must be conducted for each laser system or class of laser systems. Not all ranges are authorized for all laser systems.

The expenditure of some type of PGMs is authorized at nearly all the DoN air-to-ground ranges. Most ranges are authorized for laser use, principally laser-guided bombs, but fewer (four) are authorized for the Hellfire Missile (AGM-114) (a Hellfire Missile Training Program and High Altitude Weapons Delivery Program has been approved at the Fallon Range Training Complex). Similarly, only three air-to-ground ranges are authorization for expenditure of stand-off weapons.

The optimum size and features of existing and future range facilities will also be affected by the capabilities designed into new generation weapons platforms. Two of these platforms are the F/A-18E/F and the Joint Strike Fighter (JSF). Both aircraft are multi-role and supersonic aircraft with significantly longer ranges, enhanced performance with respect to acceleration and maneuverability, and increased survivability. Exercising the full capabilities of these high performance aircraft during training or RDT&E activities will require range areas of significant size with state-of-the-art instrumentation and expansive airspace.

1.6.1.2 Combined and Joint Operations

The “full spectrum force” that the *National Military Strategy* envisions as being responsible for defending US sovereign interests in the future will be one where the separate services (Navy, Marine Corps, Army, Air Force, and Coast Guard) will participate in combined or joint operations. Operations involving combined and/or joint forces have several tactical advantages:

- **Flexibility** - the commanders can tailor the force to meet specific national objectives given specific circumstances; and

- **Capabilities** - a force with a broad array of capabilities is difficult for an enemy to defend against.

Combined and joint training exercises require ranges and/or training areas with large land, sea, and airspace in order to deploy a combination of forces and weapons systems. The range battlespace would need to be large enough to accommodate both defending and opposing forces. Carrier Battle Group combat readiness is described in a study prepared for the Secretary of the Navy on *The National Security Need for Vieques* (Commander US Second Fleet and Commander US Marine Corps Forces Atlantic, July 15, 1999). This assessment describes the training

associated with Carrier Battle Group combat readiness as requiring a full integration of sea, air, and land assets including live fire training.

With a few exceptions (AFWTF, SCORE, and the Fallon Range Training Complex), the DoN air-to-ground ranges do not have sufficient size or instrumentation to individually accommodate large-scale air wing training or even joint training exercises. This has led to the development of CINCLANTFLT and CINCPACFLT requirements for the formation of two training complexes for the purpose of supporting large-scale littoral warfare scenarios (e.g., scenarios that replicate combat conditions in shallow, coastal environments where most regional disruptions have occurred in recent years). The combination of assets necessary to form these training complexes would be used for major Fleet exercises, with each individual range retaining its autonomy and purpose for individual and unit-level training (Chief of Naval Operations [N889], July 1995). On the East Coast, the Littoral Warfare Training Complex is envisioned as comprising the combined assets of the VACAPES, Cherry Point, and Camp Lejeune range complexes. The West Coast's littoral warfare complex, known as the Expeditionary Force Training Complex, would encompass the range assets at SCORE, Camp Pendleton, Yuma, El Centro, and Twentynine Palms.

1.6.1.3 Electronic Warfare Training

Electronic warfare is the process of denying, disrupting, degrading, deceiving, or exploiting enemy use of the full electromagnetic spectrum while ensuring its use by friendly or joint forces (DoD Defense Research and Engineering, 1997). There are three principal elements of EW:

- **Electronic Attack** - defensive or offensive protection of US forces and platforms against hostile weapons, sensors, and Command, Control, and Communications (C^3). In other words, electronic attack involves suppression, electromagnetic jamming, and electromagnetic deception of enemy systems.

- **Electronic Protection** - design features and techniques that maintain accurate offensive and defensive electronic sensors and systems in spite of an environment that includes hostile jamming, deception activity, and enemy weapon targeting.

- **Electronic Support** - gathering, consolidating, and using information from hostile or potentially hostile electronic sensors and C^3 systems to intercept, identify, and locate sources of intentionally and unintentionally radiated electromagnetic energy threats or warnings.

Electronic warfare range components allow aircrews to detect and respond to simulated threats while completing mission objectives. Realism is injected into the exercise when emitters are placed in shielded terrain such as between mountain ranges and/or at greater distances from the training ranges so that aircrews are forced to fly through simulated defended terrain for longer periods. It is also important that a range have the capability of varying the number and location

of electronic emitters to create different threat scenarios and prevent aircrews from memorizing threat locations. In order to accommodate such realistic EW training objectives, sizable range lands and associated airspace are needed.

1.6.1.4 Tactical Training Instrumentation

Tactical training instrumentation is an important measurement tool that provides feedback to the aircrew undergoing training and can also be used by an observer to monitor the effectiveness of the training activity. The Tactical Aircrew Training System (TACTS) is one such instrumentation system that is in use at six locations: Beaufort, South Carolina; Cherry Point, North Carolina; Fallon Range Training Complex, Nevada; Key West, Florida; Oceana, Virginia; and Yuma, Arizona. TACTS provides a measure of realism to tactical training exercises and allows for the monitoring and extensive debrief of the position and actions of up to 36 TACTS-instrumented participants operating in the TACTS area (Chief of Naval Operations [N889], July 1995). The system, although not a replacement for actual live fire, can also evaluate simulated air-to-air and air-to-ground weapons employments for most DoN tactical aircraft and weapons.

The next generation of tactical training instrumentation systems is the Joint Tactical Combat Training System (JTCTS). This system, which is expected to become the single baseline tactical training system for the Navy, will incorporate extensive state-of-the-art technologies to provide for simultaneous tracking and data collection for up to 100 aircraft, 24 surface combatants, and 6 submarine participants (Chief of Naval Operations [N889], July 1995). This system will be capable of extensive scenario generation and control and simulation/stimulation. Moreover, it will be able to operate free of land-based instrumentation, providing a realistic threat environment in any area to which the instrumented participants are deployed. However, the airspace associated with the JTCTS must be sufficiently sized to accommodate the maximum number of participants. Installation of the JTCTS is estimated to be operational at the Fallon Range Training Complex in 2006 or beyond.

The current plan is to develop a single JTCTS design that can be configured to support air and sea combat training missions (Chief of Naval Operations [N889], July 1995). The mobile configuration would be used in support of training of forces at sea and the fixed-range configuration will be used at current Navy Fleet tactical training ranges. Locations within the DoN where JTCTS would be implemented include the existing TACTS locations (Beaufort, Cherry Point, Fallon, Key West, Oceana, and Yuma) and at SCORE.

1.6.2 Airspace Utilization

The public perception is that the recent military downsizing that has occurred since the end of the Cold War should correspond to a reduced need for airspace by the military for training and RDT&E activities. In other words, DoD (and similarly, DoN) should need far less than the airspace currently controlled (Figure 1-3, DoN Controlled or Extensively Used SUA). However,

the new generation of weapons platforms and weapons systems will require more rather than less range area and associated airspace in order to provide realistic environments for effective training and RDT&E.

A complicating factor in the drive for additional SUA is the increasingly active roles that state governments are assuming in airspace matters affecting their residents. State concerns relate to public safety, economic growth and development (including airport development), and communication coverage. Some state governments have even tried to impose sovereignty over airspace and have been pressuring Congress for more authority over its allocation and use. Airspace is a particular concern in Nevada, Florida, North Carolina, and California (where many DoN ranges and T&E facilities are located). The increasing involvement of state governments, in decision-making about airspace and/or the potential for such involvement, sets up situations where it may be difficult for military airspace users to expand existing SUA. This could have serious consequences on both coasts of the US where recent basing decisions have resulted in high densities of military tactical jet aircraft competing for existing airspace.

Another issue that could potentially affect future use of military air-to-ground ranges is the FAA's "free flight" program. This program would permit pilots operating under Instrument Flight Rules (IFR), whenever safe and practical, to select their own routes as alternatives to published routes. As anticipated by the FAA, the program will have positive benefits for commercial aviation by decreasing user costs, improving airspace flexibility, and removing flight restrictions (FAA Free Flight Internet Website, Accessed January 5, 2000). The pilot's flexibility would be restricted to ensure flight safety in situations where:

- A safe separation distance must be maintained;
- Traffic density at busy airports or in congested airspace precludes free flight; and
- Unauthorized entry into special use airspace must be prevented.

Coordination among DoD, the FAA, and users of the National Airspace System is currently being undertaken to improve civilian use of SUAs when not being utilized by DoD.

1.6.3 Encroachments on DoN Ranges

The DoN ranges are becoming increasingly subject to encroachment by individuals and/or organizations outside the military. In the context of this analysis, the term encroachment means an "impact on the ability to train." Consequently, the encroachment can take the form of:

- Physical encroachment (e.g., the construction of a television tower on a target run-in line)

- Encroachment by incompatible land uses/activities (e.g., the development of a residential subdivision on property adjacent to a range); or

- Regulatory encroachment, involving the need to comply with the environmental laws and regulations that were not specifically written for ranges but that are applicable to ranges (e.g., Endangered Species Act, Clean Water Act, etc.).

1.6.3.1 Physical and Land Use Encroachment of Range Lands

Many of the DoN air-to-ground ranges were established before and during World War II, and consequently their locations were generally in sparsely populated rural areas. The lack of a nearby resident population provided a protective buffer around the ranges, insulating not only the public from aircraft noise and other annoying and potentially dangerous military activities but also the military from unauthorized civilian or foreign entry onto range lands. However, since the end of World War II, development trends have occurred that have set in motion the potential for conflicts between civilian interests and military use of range lands. These trends include, but are not limited to:

- **Suburban Sprawl** - Civilian development patterns have increasingly sprawled away from the urban cores into suburban and rural areas. Thus, once isolated ranges are becoming surrounded by residential and commercial uses (Figure 1-4, Existing Land Use Within and Adjacent to the Barry M. Goldwater Range). The consequence of this development pattern is that range activities are coming under increasing public scrutiny, much of it negative. For example, at the Fallon Range Training Complex concerns expressed by civilian neighbors relate to (Institute for Defense Analysis, April 1999):

  - noise and vibration caused by low-altitude flights and sonic booms;
  - visual intrusion of military equipment (radars and communication facilities) in otherwise remote areas;
  - perceived intimidation by military activity conducted on the range;
  - denial of access to what would otherwise be public land;
  - potential for health impacts of electromagnetic radiation from ground-based threat emitters;
  - use of chaff; and
  - potential for other environmental impacts on plants, animals, and cultural artifacts.

- **Competition for Scarce Natural Resources** - Mineral deposits of commercial value are present on or surrounding land-based range areas, particularly in the

west. These mineral deposits include locatable minerals (e.g., gold, silver, tungsten, fluorite, copper, lead, zinc); leasable minerals (e.g., oil and gas, geothermal resources, and solid leasable minerals); and salable minerals (sand, gravel, pumice, pumicite, cinders, and clay). The China Lake, El Centro, and Yuma complexes are coping with commercial interests intent on exploring for and exploiting minerals found within and/or adjacent to range facilities. In some cases, range expansion could prove difficult and/or expensive to achieve if the land to be acquired contains deposits of exploitable minerals and valid mining claims must be purchased. Figure 1-5 (Mining Districts at the Fallon Range Training Complex) shows the overlap of "mineral commodity districts" with the range areas comprising the Fallon Range Training Complex.

- **Expanded Use of Recreational Resources** - In recent years, the remote areas surrounding DoN ranges have attracted greater numbers of recreational users. The intense public interest in these areas has led to "wilderness" designations and other protective land use controls for areas near established ranges, such as is occurring near China Lake and Fallon Training Range complexes. In fact, in the land area underlying the airspace comprising the Fallon Range Training Complex, there are four wilderness study areas designated by the Bureau of Land Management, and managed as if they were wilderness areas pending official designation by Congress (a circumstance recommended by the Bureau of Land Management).

The problem of civilian encroachment on or near DoN air-to-ground ranges is a serious concern because of the potential for impacts to range operational capabilities and, ultimately, force readiness. Incompatible development may impair the ability of the ranges to fulfill their mission. For example, artificial constraints (e.g., programmed routes and run-in lines to targets) may be imposed on aircrews to avoid noise impacts to or overflights of residential areas or natural resources. Such constraints have the potential to undermine the value of the training being undertaken. Thus, it is crucial that all precautions are taken to prevent development of incompatible land uses and to preserve undeveloped land surrounding air-to-ground ranges.

Similarly, civilian encroachment that is occurring in land areas underlying established SUA (including restricted airspace, MOAs, MTRs) could also lead to restrictions in the way a range is utilized. Furthermore, where general aviation or commercial airports or airways are located beneath or near SUA boundaries, conflicts may occur with possible spill-outs of aircraft from the SUA and spill-ins by civil aircraft.

Public concern regarding air-to-ground range activities is not limited to inland ranges. Air-to-ground ranges situated on the coast and/or overflying or otherwise using coastal waters are also becoming subject to encroachment. In fact, it has been found that half of the nearly 269 million people living in the US live in coastal counties, which in turn represent about ten percent of the continental US (National Safety Council, Environmental Health Center, February 1998). Not

only are there permanent increases in coastal population densities, there are also significant seasonal populations (vacationers) present in the coastal areas during the summer months. Other encroachments on coastal ranges are recreational activities (e.g., boating, fishing, or swimming) and commercial activities (e.g., fishing and mineral exploration and exploitation). Conflicts occur because the civil sector generally assumes that coastal airspace and land areas and the open ocean should be available for their use on an unrestricted basis.

Another land use issue that may affect use of DoN air-to-ground ranges concerns the interest and rights of Native Americans. Military lands, including ranges, are often places of cultural significance to Native Americans, particularly those located in the western US. For example, one of the largest concentrations of Native American petroglyphs in the US is found within the boundaries of the China Lake Complex. Ongoing cultural resource surveys of the target areas could reveal additional petroglyphs that could limit the future use of the target areas.

The legal and moral rights of Native Americans to have access to and request protection of cultural resources have been affirmed by Congress (e.g., National Historic Preservation Act and Native American Graves Protection and Repatriation Act). In addition, the sovereignty of Native American tribes has been further recognized in several executive actions implemented by the President:

- **White House Memorandum for the Heads of Executive Departments and Agencies (1994)** - requires heads of executive departments and agencies to operate on a government-to-government basis with federally-recognized Tribal governments.

- **Executive Order 13007, Indian Sacred Sites** - requires managers of federal agencies of public lands, to the extent practicable and not inconsistent with agency functions, to: accommodate access to and ceremonial use by Native Americans of sacred sites; protect such sacred areas from adverse affects; hold the location of sacred sites in confidence; and notify any culturally affiliated native group(s) of actions or proposals that might affect sacred sites.

1.6.3.2 Encroachment by Environmental Conservation Issues and Regulatory Programs

Since the early 1970s, environmental conservation issues have received considerable attention from the public-at-large, Congress, and state and local legislative bodies. Comprehensive legislation has been passed to respond to a number of these issues concerning the protection of air, water, and land resources.

Military installations, including ranges, have proven successful stewards of the environment. In fact, in some areas of the country, some military installations are the only remaining unique and large tracts of undisturbed land for endangered species. As such, compliance with environmental

regulatory programs has had a direct and immediate impact on the everyday management of land and natural resources at DoN ranges, as well as on how training and RDT&E operations are conducted. In some cases, environmental compliance activities have reduced the amount of land available for range operations. For example, at the Camp Lejeune and Cherry Point complexes, training exercises must avoid red cockaded woodpecker habitat. Seasonal use limits have been imposed at SCORE's San Clemente Island Shore Bombardment Area to support management and recovery operations for the endangered San Clemente Island Loggerhead Shrike. These and other environmentally-related restrictions at DoN ranges can make it difficult for aircrews to train when needed.

The environmental regulatory programs having the most effect on range management include, but are not limited to:

- **Clean Air Act** (42 USC §§ 7401-7671q, as amended) - This act and its amendments established the core of the clean air program as it is known today. The primary objective of the Clean Air Act is to establish federal standards for air pollutants from stationary and mobile sources and to work with the states to regulate polluting emissions. The Clean Air Act Amendments of 1990 expand the scope and content of the act's conformity provisions. In November 1993, the US Environmental Protection Agency published final rules on general conformity that apply to federal actions in areas designated nonattainment for any of the criteria pollutants (40 CFR Parts 51 and 93).

- **Clean Water Act** (35 USC §§ 1251-1387, as amended) - The Federal Water Pollution Control Act, popularly known as the Clean Water Act, is aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. This act covers discharges of pollutants into navigable waters, wastewater treatment management, and protection of fish, shellfish, and wildlife. Section 402 of this act specifically requires a National Pollutant Discharge Elimination System permit for discharges into navigable waters. Section 404 includes provisions for permits to dispose of dredged and fill materials into navigable waters and applies to many wetlands.

- **Comprehensive Environmental Response, Compensation, and Liability Act** (42 USC 9601A et seq. as delegated to DOD by Executive Order 12580) - The cited provisions of this act (known as CERCLA), apply to the process for evaluating appropriate response actions on closed, transferred, and transferring military ranges and focus on environmental consequences and cleanup of unexploded ordnance (UXO).

- **Cultural Resources Acts** - The protection and preservation of historic sites and objects is assured through the Archaeological Resources Protection Act (16 USC 470aa-47011); Archaeological and Historic Preservation Act (16 USC 469-469c);

Historic Sites, Buildings and Antiquities Act (16 USC 461-464-464-467); and National Historic Preservation Act (16 USC 470-470b, 470c-470n).

- **Endangered Species Act** (16 USC 1531-1544, 87 Stat. 884, as amended) - This 1973 act provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. Key provisions of the act:

  - authorize the determination and listing of species as endangered and threatened;

  - prohibit unauthorized taking, possession, sale, and transport of endangered species, and

  - impose a requirement for federal agencies to insure that any action authorized, funded or carried our by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat (Section 7).

- **Marine Mammal Protection Act** (16 USC 1361-1407, Public Law 92-522, October 21, 1972, as amended) - This act established a federal responsibility to protect marine mammals. The Department of the Interior (Fish and Wildlife Service) is responsible for sea otter, walrus, polar bear, dugong, and manatee; the Department of Commerce (National Marine Fisheries Service) is responsible for cetaceans and pinnipeds, other than walrus. Incidental “take” of depleted marine mammals is allowed by activities other than commercial fishing, provided that such take does not result in an unmitigable impact on subsistence harvest.

- **National Environmental Policy Act (NEPA)** (42 USC 4321-4347, Public Law 91-190, as amended) - NEPA provides for the consideration of environmental issues in federal agency planning and decision-making. Procedures require that environmental impacts of human activities on the natural environment be disclosed to the decision-maker and be made available to the public before decisions are made.

- **National Wildlife Refuge System Administration Act of 1966/National Wildlife Refuge System Improvement Act of 1997** (16 USC §§ 668dd-668ee, as amended and Public Law 97-105) - This act provides for the administration and management of the national wildlife refuge system, including wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas.

- **Resource Conservation and Recovery Act (RCRA) and Federal Facility Compliance Act** (42 USC 6912, 6921-7, 6930, and 6973-4) - On February 12, 1997, the USEPA published its *Final Military Munitions Rule* (40 CFR Parts 260-266, 270) that identifies when conventional and chemical military munitions become a hazardous waste under RCRA and provide for the safe storage and transport of such waste. For the purposes of 40 CFR Part 260.10, military munitions include all ammunition products and components produced or used by or for DoD or the US Armed Services for national defense and security. However, when military munitions are used for their intended purpose (training, RDT&E, and in range clearance), they are not considered a solid waste for regulatory purposes, even if the intended purpose results in the deposit of munitions on land.

- **Safe Drinking Water Act** (42 USC 300f et seq., Public Law 93-523) - The aim of this act is to provide for the safety and protection of all water used for human consumption. Section 1424(e) of the act contains provisions for the designation and protection of aquifers that are the sole or principle source of drinking water for an area and if contaminated, would create a significant hazard to public health.

- **Wild and Scenic Rivers Act** (16 USC 1271-1287) - The act established a National Wild and Scenic Rivers System and prescribes the methods and standards through which additional rivers may be identified and added to the system. Procedures and limitations for control of lands in federally administered components of the system are described.

- **Wilderness Act** (16 USC §§ 1131-1136) - The act established the National Wilderness Preservation System. Each agency administering any wilderness area is responsible for preserving the area's wilderness character. With limited exceptions, no commercial enterprise or permanent road is allowed within a wilderness area. Temporary roads, motor vehicles, motorized equipment, landing of aircraft, structures, and installations are only allowed for administration of the area. However, the use of aircraft or motorboats may be permitted in wilderness areas where their use has already been established. Measures may be taken to control fire, insects, and disease.

1.7 Summary

In summary, there is a continuing need for DoN air-to-ground range assets. These ranges provide Navy and Marine Corps aircrews with the opportunity to train in environments that realistically replicate modern combat conditions. Thus, aircrews obtain the best possible military training capability. However, the advent of modern weapons systems, with their increased ranges, higher velocities, greater firepower, and more sophisticated guidance and tracking systems have generated a need to not only maintain existing range infrastructure, but also to consider its

expansion. Opposition from civilian interests and other forms of encroachment are presently challenging existing range use and/or expansion plans. In addition, compliance with environmental regulations will continue to challenge everyday range management.

Chapter 2

Range Evaluation and Capability

2 RANGE EVALUATION AND CAPABILITY

The intent of Phase I of the *DoN Air-to-Ground Range Needs Assessment* was to document the current capabilities of existing DoN air-to-ground ranges. Data collection and documentation efforts, summarized in this chapter, occurred between November 1997 and June 1998. These efforts involved:

- Development and distribution of a data collection package to range managers;
- Completion and return of the data collection packages by the ranges;
- Input of data collected into a database and preparation of range maps; and
- Dissemination of the database and maps to each range manager for review and validation.

Finalized maps and data were incorporated into a secure Internet website where they are available for potential users, including DoN range planners, range managers, range users, and others in DoD involved in range planning activities. The Internet website provides a quick means to review specific range capabilities and actually view a map of a specific range. In addition, surrounding land uses may be identified. Print capability enables a website user to readily prepare presentations or briefs. The capabilities of the Internet website can be expanded to include many other types of information about all DoN ranges and the database is updatable on-line by authorized range personnel.

2.1 Project Meetings

A series of project meetings was held throughout the development of the *DoN Air-to-Ground Range Needs Assessment.* Representatives from both the Navy and Marine Corps attended, including range planners, range managers, Fleet operators, and T&E operators. The first meeting focusing specifically on the Phase I effort was in October 1997. An overview of the purpose of and need for the *DoN Air-to-Ground Range Needs Assessment* was presented by the CNO (N44) Range Planning Office. Following this was a discussion of how the data collection effort under Phase I would be conducted. Many of the comments made by meeting attendees had a significant impact on the ultimate process used to collect range data. In particular, the group was vocal about the need for the project team to physically meet with Navy/Marine Corps range managers during the data call period. These visits were considered important because:

- Range representatives would be more likely to cooperate with the data call when the data call proponents were known and the purpose of the data call was explained in person.

- Project team members would become familiar with the unique operating conditions of each range.

Several other progress meetings were held over the course of the data collection effort. Presentations were made at each meeting to update the group on the progress of the *DoN Air-to-Ground Range Needs Assessment* and to discuss specific issues concerning upcoming work.

2.2 Range Database

2.2.1 Range Data Collection Effort

The first step undertaken in the data collection process was to develop a detailed data collection package (Appendix A) for distribution to DoN range managers. The data collection package requested information in the following areas:

- Scheduling control and hours of operation;
- Range location and dimensions (e.g., real estate property boundaries);
- SUA associated with a range;
- Targets and permitted ordnance;
- Low-level ingress/egress provided through military training routes (MTRs);
- Laser operations;
- Electronic warfare capability (e.g., number and type of emitters);
- Range scoring methods;
- Basic range procedures (run-in lines, pull offs, etc.);
- Surrounding land uses (parks, wildlife refuges, Native American lands);
- Infrastructure (potential issues in the management of critical range infrastructure);
- Environmental issues and concerns; and
- Generalized lists of range users.

Data collection packages were distributed to the ranges in three data calls:

- **Navy and Marine Corps Fleet Air-to-Ground Ranges** - This data call was conducted from November 1997 through March 1998;

- **CNET Ranges** - This data call was conducted in April 1998; and

- **NAVAIR T&E Ranges** - This data call was conducted in April/May 1998.

East Coast and West Coast ranges were visited during the first two weeks of December 1997. In February 1998, the project team visited the Atlantic Fleet Weapons Training Facility (AFWTF). The purpose of these visits was to talk with range managers and their staff, observe range operations (where possible), and gather data. In fact, some ranges submitted completed data collection packages and/or reviewed the data collection packages with the project team during these visits.

2.2.2 Range Database Organization

As each package was received, it was reviewed for completeness. Most completed data collection packages were accompanied by a number of reference materials, including range manuals, maps, and related items. The next step was to encode these data using a relational database. The main databases developed during this process include:

- **Range Extents** - This database identifies the scheduling authority (with phone numbers) and operating hours for each range. Operating hours are provided in local time unless otherwise noted. The lateral extent of each range (latitude/longitude) is depicted on a range map.

- **Airspace** - The airspace database contains the boundaries of all the airspace (lateral and vertical) associated with each range, including restricted and warning areas, MOAs, ATCAAs, and ALTRVs. Also identified are times of designation (i.e., operating hours that the airspace is available for DoD use) and the controlling and scheduling authorities (with phone numbers) for each airspace.

- **Military Training Routes** - This database identifies MTRs that provide access to each range along with an identification of the scheduling agency. The latitude/longitude of each turning point along a route is identified.

- **Targets/Ordnance** - The targets/ordnance database includes the location of targets and identifies target type, condition, and method of scoring. The ordnance database includes more than 90 different individual types of ordnance that may be fired or released on DoN ranges now and in the future. The general categories of ordnance are:

  - gun ammunition;
  - air-to-ground missiles;
  - cluster bombs (classified by submunition);
  - rockets;
  - practice bombs;
  - general purpose bombs;
  - laser-guided bombs;

- chaff;
- flares; and
- miscellaneous ordnance.

The complete list of ordnance included in the database is shown in Appendix B (Table B-1). The database also identifies whether the ordnance authorized for fire or release at DoN range targets can be live or inert. A master list of live and inert ordnance by range and target is included in Appendix B (Table B-3). Provided in Appendix B (Table B-2) for reference is a table showing weights of explosives for various types of ordnance.

- **Emitters** - For each range a complete list of the available emitters is included in the database.

- **EW Ranking** - EW rankings (I, II, III, and IV) as identified for ranges by Chief of Naval Operations (N889) in the *Tactical Training Range Roadmap* (July 1995) were included in the database. The assumptions underscoring each EW ranking are shown in Table 2-1.

- **Operations/Administration Facilities -** This database is a record of the locations of operations/administration facilities, if any, at a range.

Table 2-1

Electronic Warfare Levels and Descriptions

Level	Electronic Warfare Description
I	Signal recognition Limited number of emitters (1-2) Basic emitter(s) suited to weapon/sensor employed Limited signal fidelity
II	Coordinated multiple threats Accurate threat replication for sensor and countermeasures employment and targeting
III	High-density/variety of real and/or simulated/stimulated threats located throughout the exercise area Coordinated threat operations
IV	High-density simulated/stimulated threat environment Coordinated threats (all axis)
Source: Chief of Naval Operations (N889), Tactical Training Range Roadmap (July 1995).	

- **Towers/Obstructions -** This database is a record of the on-range locations of spotting towers or other tall obstructions such as antennae, if any.

- **Users -** This database includes all range users identified by the range manager.

- **Environmental Issues -** This database contains a listing of environmental or land issues of concern as identified by the DoN range managers and/or acknowledged in available environmental documentation for each range.

- **Infrastructure Issues -** This database contains a listing of infrastructure issues of concern as provided by DoN range managers.

In addition to the database, a map was prepared for each range (maps are discussed in more detail in Subchapter 2.3.1). The maps and database for the Fleet ranges were the first to be completed and paper copies of each were distributed to Fleet range representatives in March 1998 for review and validation. The maps and database were then revised at that time to conform with the results of the validation. Additional on-line data editing by representatives of the CNO (N44) Range Planning Office and range managers has since occurred.

2.3 Development of Internet Website

As the database was being populated and maps reviewed, numerous discussions were held concerning the form of the final report for the *DoN Air-to-Ground Range Needs Assessment*. As a result of these discussions, it was decided that a written report (alone) containing the database and maps would not meet the needs of either the Chief of Naval Operations (N44) Range Planning Office or range managers. The chief objection to a written report was that it would quickly become outdated and significant resources and time would be required to update its contents regularly. In contrast, the development of an Internet-accessible electronic database that included digital maps was considered to be more useful than a written report. An electronic information source, readily available to interested parties would have several advantages over a paper report:

- The database and maps could be quickly and efficiently updated;

- Data retrieval could be accomplished on a timely basis;

- Customized range maps could be made;

- Future data calls could be accomplished via the website more efficiently than through the paper route; and

- The scope of the Internet website containing the database and map could easily be expanded to include the remainder of DoN ranges, including surface and underwater ranges and other land or air ranges.

Therefore, the CNO (N44) Range Planning Office decided to develop a secure Internet website. The focus of this website is on map development using the geographic information system (GIS) software known as ArcInfo. Maps developed using ArcInfo software are considered to be "living maps," or maps that can be customized to the user's needs and linked to a database, as well. Upon accessing the website, a map of the US appears and the user selects a range that he or she wishes to examine (Figure 2-1, USA Map for Range Selection on Internet Website). The user is then linked to a customizable map of that range (Figure 2-2, Map of Cherry Point Complex Available on Internet Website). The user can create customized maps by turning on and off map layers and legends, and by zooming in to certain geographic extents. The maps can then be printed to paper or computer file. The maps also provide links to the underlying databases. For example, by clicking on a target indicator the user can obtain information about that particular target. Other features of the Internet website include:

- Security access controls requiring user ID and password (as yet, no provision has been made for public access to the website);
- Print capability; and
- Data input capability by range managers or their authorized representatives.

The user can also get to range data more directly, without querying the range map, by selecting the view data button on the map. Users with access to the website can view data on all the ranges (Figure 2-3, View Range Data). Individuals with a additional level of security can edit range data, including representatives of the CNO (N44) Range Planning Office and the range managers (Figure 2-4, Editing the Website Database).

Finally, the site includes an E-Mail function for questions and comments. While most of these range data may be edited on-line, the E-Mail function is also necessary in order to change certain types of range data (e.g., geographic coordinates) or to add on a new map element (e.g., a new target or tower).

Appendix C provides the reader with a detailed discussion of the range website and database.

2.3.1 The Maps

The range maps available for viewing on the website were developed using three broad data sets:

- **Geographic Baseline Data** (e.g., roads, water bodies, etc.) were developed using Defense Mapping Agency (DMA) Operational Navigation Chart (ONC) data at a scale of 1:1,000,000 for the initial view of each range. In some cases, these coastlines were updated using US Geological Survey (USGS) Digital Line Graph (DLG) data or 1:30,000 scale quad sheets. When viewers zoom in on the ranges to a scale of 1:100,000 or closer, all roads and water bodies are replaced with data developed using DLGs for greater accuracy.

- **Land Use Data** for the area surrounding each range includes federal, state, and Native American lands, etc. These data were compiled for the US and provided by the University of California at Santa Barbara at a scale of 1:2,000,000. Some individual parcels were updated with boundaries from DLG data. These data were used to provide uniformity in land use categories among ranges.

- **Range Data**, including hours of operation, airspace, ordnance, MTRs, etc. as described in Subchapter 2.2.2.

Those map data on the website vary in accuracy according to the accuracy of the source. Much of the data were supplied with precise ground coordinates, accurate to within a few feet on the ground. The base map for the original views and land use data, by contrast, are accurate to within a few hundred feet on the ground. These data sets are included chiefly as reference, but have been updated by more accurate sources in areas where they make these range data appear incorrect (e.g., land targets appearing to fall in the water). Those updated data and higher accuracy DLG data sets are accurate to within five feet on the ground. These map data are in Universal Transverse Mercator (UTM) coordinates, in meters. In those cases where the maps span two UTM zones, the zone containing the most range data was used.

The various map data sets were projected into UTM coordinates using ESRI's Arc/Info software, and formatted for the site in ESRI ArcInfo software. Once complete, the maps were web enabled using Enabling Technology's MOJO Map software, with some customization for this site. The result is a series of GIS maps for each range that each user can customize by zooming in to desired extents, turning layers on and off, and labeling selected features.

Also included on the website are self-extracting compressed downloadable map files for use with the HAZARD program for determining weapons impacts using the DoN weapons footprint database. These files are in AutoCAD version 12 DXF format consistent with the requirements of the HAZARD software. They include layers for hydrography, roads, range boundaries, impact areas, target locations and labels, and range building locations and labels. Those data for hydrography and roads are 1:100,000 scale DLG data. Other data were digitized or entered from maps and coordinates supplied by the individual ranges, and are considered extremely accurate. All HAZARD map data files are in the UTM meters, North American Datum (NAD) 27, as required by the HAZARD program. The mapping extends five miles past the range boundary.

2.3.2 Viewing or Editing Data

The text portion of the site offers the user the ability to view range data or edit data (if authorized) for ranges. Users with access to the site can view data for all ranges as “read only.” Where a range complex is composed of several ranges, the user is pointed to a screen where complex level or range level data choices can be made. For ranges that are not part of a complex (e.g., Boardman), the user will go directly from the range map to range data screens.

The Edit Data screens are comparable to those under View Data. However, a second level of security is presented here so that only range managers (or their authorized staff) can change these data sets. All of these data can be edited with the following exceptions:

- Unique names of range elements (e.g., the name of a target) cannot be edited because the choice of names affects data queries; and

- Most coordinates (e.g., the latitude/longitude of a tower) cannot be changed because they affect the location of that element on a map.

An individual seeking to make such changes must E-mail detailed instructions to the site's webmaster. The same holds true for adding new elements to the maps (e.g., a new target or tower). The site user can E-Mail the webmaster with the name and coordinates of the new range element. Once this information is added to the database by the webmaster, the site user can add the other information on that specific element via this website.

Chapter 3

Range Utilization and Scheduling

3 RANGE UTILIZATION AND SCHEDULING

The intent of Phase II of the *DoN Air-to-Ground Range Needs Assessment* was to collect, document, and evaluate current and historical utilization data for all DoN air-to-ground ranges. In accomplishing this task, a common range utilization metric(s) was developed that was structured such that the unique operation, mission, or other characteristic of each range could be taken into consideration. Detailed information concerning the development of the range metric(s) can be found in Appendix F.

Using the common metrics, utilization statistics were calculated for each range complex using raw data for Fiscal Years (FY) 1997 and 1998. However, the results of these calculations must be interpreted with the utmost caution for the following reasons:

- Any utilization statistics must be viewed in the "context" of the specific training opportunities being offered by the range. A reviewer needs to ask the following questions:

  - What is the purpose of the range -- backyard or more advanced training?
  - Where is the range located and how accessible is it to potential users?
  - Is the range part of a complex of ranges?
  - What is the extent of the range area and its associated SUA?

- One or two years of data are not sufficient to judge the effective utilization of a range as world events could skew utilization rates. For example, utilization rates for the early 1990s are higher than for later years because of the intense period of training activity associated with preparation for Operation Desert Storm. In addition, some range utilization statistics have been affected by Base Realignment and Consolidation (BRAC) decisions concerning user units during the period that this assessment was being prepared.

- Historic range utilization data are not directly comparable between ranges. This is principally due to differences among the mechanisms used to report raw utilization data. Specifically, there are differences in how certain terms are defined (e.g., hours available for scheduling) as well as in how the raw data has been interpreted by the individual field personnel compiling it.

- The demand and utilization rates calculated herein do not account for the use of ranges within a complex or targets within a range on a multi-tasking basis.

3.1 Range Utilization Data

3.1.1 Sources of Utilization Data

Readily available reported range use data were used in order to avoid duplication of effort and/or imposition of additional data collection requirements on range managers. These data sources included:

- *Commander-in Chief Pacific Fleet (CINCPACFLT) Targets and Ranges Information Management System (TRIMS) Reports* compiled by Commander, Naval Air Force Pacific Fleet (AIRPAC);

- *Commander-in-Chief Atlantic Fleet (CINCLANTFLT) Training Range Utilization Summary Reports* compiled by Commander, Naval Air Force Atlantic Fleet (AIRLANT);

- *Utilization Reports for Townsend Range* compiled by the Georgia Air National Guard (ANG); and

- *Monthly Flight Reports for McMullen Target* compiled by Naval Air Station (NAS) Kingsville.

Quarterly range utilization data for Bloodsworth Island Shore Bombardment and Bombing Range are only available for the most recent year that the range has been used (FY 95). These reports were compiled by the Naval Air Warfare Center, Aircraft Division at NAS Patuxent River and are based on airspace scheduling records for R-4002, the restricted airspace overlying Bloodsworth Island.

Utilization data for Marine Corps bases are documented in *Range Facility Management Support System (RFMSS) Reports*. These reports are considered as the best sources of utilization data for Marine Corps Air Facility (MCAF) Quantico, Marine Corps Base (MCB) Camp Lejeune, MCB Camp Pendleton, and Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms. However, to date, RFMSS reports have only been received from MCAF Quantico. Utilization of air-to-ground range assets at these installations is not addressed in this assessment because the RFMSS reports do not break out air-to-ground activities separate from either the ground activities or airspace specific activities. Thus, it is not possible to discern those specific data needed for this study.

In addition, utilization data have not been provided by NAVAIR for its T&E ranges -- Naval Air Weapons Station (NAWS) China Lake and NAS Patuxent River. However, utilization data are reported to TRIMS for Fleet use of the Superior Valley Range at the China Lake Complex.

Finally, upon inquiry, Naval Air Station (NAS) Meridian reports that it does not keep records of use for the unmanned Searay Multipurpose Target (Gardner, 1999).

3.1.2 Types of Data Collected on Range Utilization

While each of the reporting mechanisms gathers similar data elements, they are not identical. The specific data available from each of these sources are summarized below and in Table 3-1:

- **TRIMS Utilization Dat**a **-** The TRIMS reports are prepared for designated Pacific Fleet ranges as required by CINCPACFLT Instruction (CINCPACFLTINST) 3642.1F. Pacific Fleet ranges providing monthly TRIMS reports to AIRPAC are for: Yuma, El Centro, Fallon Range Training complexes, Naval Weapons Systems Training Facility (NWSTF) Boardman Range, and the Southern California Offshore Range Complex's (SCORE) San Clemente Island Shore Bombardment Area (SHOBA). Also submitting TRIMS reports to AIRPAC (on a voluntary basis since they are not in AIRPAC's chain of command) are: MCB Camp Pendleton and NAWS China Lake (NAVAIR T&E range), the latter only reporting Fleet-related activities at its Superior Valley range. MCAGCC Twentynine Palms has elected not to voluntarily submit TRIMS reports to AIRPAC. According to the contractor collating data and processing the TRIMS annual report, MCAGCC Twentynine Palms had submitted data to TRIMS up to the occurrence of Operation Desert Storm (1990), but has not submitted data since that time (Hedberg, 1999). The TRIMS monthly data can be input to AIRPAC by authorized individuals via the Internet.

- **CINCLANTFLT Range Utilization Data** - AIRLANT compiles utilization reports filed by East Coast ranges on a quarterly basis in accordance with CINCLANTFLTINST 3624.1B. The East Coast ground ranges filing utilization reports with AIRLANT include: VACAPES Complex (Navy Dare County, Palmetto Point, and Stumpy Point ranges); Jacksonville Complex (Lake George, Pinecastle, and Rodman ranges); Cherry Point Complex (BT-9 Target, BT-11 Range); and Atlantic Fleet Weapons Training Facility (AFWTF Inner Range). Not reporting range utilization data to CINCLANTFLT are MCB Camp Lejeune and MCAF Quantico, Townsend Range (see Georgia ANG reports below), and Naval Amphibious Base (NAB) Little Creek (Bloodsworth Island Shore Bombardment and Bombing Range). AIRLANT is moving toward future use of TRIMS for reporting East Coast range utilization.

- **Georgia ANG Utilization Reports for Townsend Range -** Townsend Range is a Marine Corps training range with scheduling authority delegated to the Georgia ANG by Commander, Marine Corps Bases East (COMCABEAST). The Georgia ANG is also responsible for range maintenance. Utilization records for Townsend

Table 3-1

Comparison of Available Utilization Data

Data Category	TRIMS	AIRLANT[3]	Georgia ANG	RFMSS	McMullen
Hours Utilized					
Day/Night Usage	X[1]			X	
Hours Manned	X				
Hours Scheduled	X	X		X	X
Hours Utilized	X	X	X	X	X
Hours Cancelled (Total)	X[2]	X	X	X	X
No Show (Reason Unknown)	X	X			
Fouled Range	X	X			
Instrumentation Failure	X	X			
User	X	X			
Weather	X	X	X		
Other	X	X			
Unit			X		
Range			X		
Ordnance Expended					
Type Identification	Specific	General[4]			
Amount	X	X	X[5]		
Other Data Categories					
No. and Type of Aircraft	X		X		
Sorties by Service Branch	X		X		
Unit Usage Data			X		

1. The split between day and night operations is identified for the categories of hours manned, hours available for scheduling, hours utilized, and hours cancelled.
2. Hours cancelled and reason for cancellation (no show, fouled range, instrumentation failure; weather, user cancelled, other). Note, however, that when total hours identified as “cancelled” are compared with the total of the hours cancelled by reason for cancellation, they are rarely equal. This discrepancy is apparently due to inconsistencies and omissions in the raw utilization data submitted by the ranges in their monthly TRIMS reports (Hedberg, 1999).
3. As can be seen, the reports provided did not include the same data element called “hours manned” for each range, nor hours used by each service branch, or type of aircraft.
4. Ordnance expended by general category (bombs-practice, bombs-live, rockets-inert, etc.).
5. Total quantity of ordnance deployed by major category (e.g., number bomb dummy units [BDUs] and heavy weights dropped, or number of rockets fired).

Range are compiled by the ANG and these records are relatively detailed by both block hours scheduled and cumulative hours. When compared to the TRIMS and AIRLANT database, the ANG database does not identify hours that the range is manned or provide broader categories of ordnance deployed. The ANG database does include a data category identified as "hours requested," which could presumably be used to track demand for the range.

- **McMullen Target Monthly Flight Reports** - The Gulf of Mexico Complex, which includes the McMullen County Range (Yankee and Dixie targets), is a CNET training complex. Training activities are conducted primarily at the Yankee Targets and the Texas ANG primarily uses the Dixie Targets. Range utilization data for DoN use of the McMullen County Range are compiled by NAS Kingsville on a monthly basis. Only data for FY 97 have been received. The Texas ANG is responsible for accounting for their use of the Dixie Targets. Although range utilization data has been requested from the Texas ANG, it has not been forthcoming. The McMullen Target Monthly Flight Reports collected significantly less data than the other range utilization reports examined in this assessment. In addition, non-Navy use of the Dixie Targets is absent.

- **Range Facility Management Support System (RFMSS) Reports** - The RFMSS is an automated range and training area scheduling system that provides centralized scheduling of range assets and reporting capability for MCAF Quantico, MCB Camp Lejeune, MCB Camp Pendleton, and MCAGCC Twentynine Palms. Users of RFMSS can dial in through modem access or Local Area Network (LAN) connections to request range and/or training areas. The system allows range control to maintain control of all scheduling functions, including approval/disapproval of requests. The current-day-approved requests are handled at the Firing Desk in a crucial, real-time module of RFMSS. All data are archived for future range utilization reporting.

3.1.3 Comparability of Collected Range Utilization Data

On the surface, type of utilization data provided in the TRIMS, CINCLANTFLT, Georgia ANG, and McMullen Target Monthly Flight reports appear to be relatively comparable. However, when studied in more detail, the actual degree to which these data are comparable depends on how certain terms are defined by the different reporting mechanisms and/or how individual field personnel have interpreted or compiled raw data. Of particular concern are:

- **Hours Available for Scheduling** - It could be expected that hours reported as available for scheduling would correspond to the published hours of operation identified in each range manual or as reported by range managers in the data call for the *DoN Air-to-Ground Range Needs Assessment*. However, this is not always

the case. As a result, there are several issues outstanding with respect to hours available for scheduling:

- Discrepancies exist between the hours available for scheduling reported by TRIMS, AIRLANT, etc. and what is reported in range manuals and/or the data collection packages completed by each range under Phase I of the *DoN Air-to-Ground Range Needs Assessment*. For example, the TRIMS data for MCB Camp Pendleton (R-2503) show that the range is available for scheduling 3,280 hours per year. However, when MCB Camp Pendleton range personnel were queried (Finch, 1999), it was revealed that the MCB Camp Pendleton (R-2503) range provides scheduling priority (i.e., given first choice) for air-to-ground exercises only six days per month (1,296 hours per year). Using the "hours available for scheduling" as reported in TRIMS could significantly depress range utilization calculations for this range.

- The definition of hours available for scheduling may also vary within the same reporting mechanism. For example, the AIRLANT database shows that the Navy Dare County Range is available 365 days per year, 24 hours per day for a total of 8,760 annual hours. A review of the newly published range manual (NASOCEANAINST 3710.19, Undated), shows that unless special requests are approved, the range is available for scheduling for 3,744 annual hours, less than half the hours available as reported in the AIRLANT database. These differences can significantly affect range utilization calculations.

- Hours utilized do not include details as to what activities are occurring, so that hours utilized as reported by multi-purpose ranges may not be exclusively for air-to-ground exercises. Multi-purpose ranges (e.g., SHOBA, AFWTF Inner Range, or Camp Pendleton [R-2503]) can accommodate a wide variety training activities, including air-to-ground exercises, shore bombardment or artillery practice, amphibious assaults, or a combination of these uses. In general, multi-purpose ranges appear to be available for scheduling air-to-ground activities more hours than they are actually used. For example, the total number of hours available for scheduling at AFWTF is 5,330 but only 2,207 hours are identified as actually utilized. The issue to be explored is whether the 5,330 hours are exclusively available for scheduling air-to-ground exercises or whether these hours are available to all types training activities supported by the range. Secondarily, the existence of a demand for air-to-ground training time beyond the 2,207 hours utilized is not readily apparent.

- **Hours Utilized** - There are two issues to be examined for the category of hours a range is utilized:

  - Available utilization data do not appear to accurately identify the number of hours that a range may be actually used during the period that it is unmanned. This occurs at unmanned ranges at the El Centro Complex and at the Yuma Complex. Not accounting for hours used during a period that a range is unmanned (with no verification of actual use) can depress a range's utilization statistics.

  - The hours utilized as reported by multi-purpose ranges may not be exclusively for air-to-ground exercises. Specifically, the hours utilized shown for SCORE (SHOBA) in the TRIMS data actually represent the time used to conduct a combination of air-to-ground and shore bombardment exercises (Hedberg, 1999).

3.2 Range Utilization Metrics

Two range utilization metrics are used to compare annual use of DoN air-to-ground ranges, specifically the target areas. The rationale for development and selection of these metrics is documented in Appendix F. The metrics used to evaluate range utilization in this chapter are the "Utilization" Metric and the "Demand" Metric.

The Utilization Metric calculates range utilization with credit for range controlled shutdowns. This metric is defined as follows:

$$\frac{\text{Used Blocks}}{\text{Available Blocks } \textit{Less} \text{ Planned Unavailable Blocks}}$$

Where the following definitions apply:

Used Block - Portion of time a unit is assigned to range (e.g., if one minute of a 20-minute block is assigned, the entire one block is considered used); block length may be determined by each individual range although most of the range representatives have indicated that they used 20-minute blocks.

Available Blocks - Total number of funded blocks of time that may be scheduled for a range user through Range Central Scheduling (times when the target is open).

Planned Unavailable Blocks - Blocks of time reserved by the range to accomplish maintenance/range cleanup and not available for scheduling or use.

The Demand Metric was designed to account for and avoid penalizing ranges for user cancellations and no shows. It is defined as:

$$\frac{\text{Hours Scheduled}}{\begin{array}{c}\text{Published Hours of Operation}\\ \textit{Plus}\ \text{Hours Range Used By Special Notice}\\ \textit{Less}\ \text{Range Cleanup}\\ \textit{Less}\ \text{Weather Cancellations}\\ \textit{Less}\ \text{Instrument Failures or Fouled Range}\end{array}}$$

3.3 Applying the Metrics to Available Range Utilization Data

As previously noted, readily available data on DoN range utilization on an hourly basis are found in reports prepared by AIRPAC, AIRLANT, Georgia ANG, and other range-specific sources. More accurate use data would be by scheduling "block" data. Such data would provide a better picture of how the range is actually scheduled or used and allow analysis of preferred user hours or appropriateness of block length.

However, these data were not found to be readily available for each range for use or even for review. Obtaining this level of detail would have required initiating another data call and/or round of visits to each range scheduler and extensive research of range scheduling records. Given the time and budget, neither action was undertaken. Furthermore, subsequent conversations with several range managers (VACAPES, Fallon Range Training, and Cherry Point complexes) confirmed that obtaining raw block data for each range would not be feasible, particularly historic block data. For example, historic block data (pre-FY 97) for the Fallon Range Training Complex has been archived.

Therefore, for the purposes of this assessment, range utilization was calculated for the various suggested metrics using FY 97 and 98 data only as documented in existing reports. Moreover, these data were interpreted based on the following assumptions:

- One reported hour of use was considered equivalent to one "block" of range use.

- Hours available for scheduling were considered to be "published hours of operation" as derived (in order of preference) by reference to each range manual or the original data collection packages submitted to each range to the CNO (N44) Range Planning Office under Phase I of the *DoN Air-to-Ground Range Needs Assessment* effort. Where these sources of published hours of operation were not available, the respective range utilization reports were consulted or range managers were contacted. The source of published hours of operation for each range is documented in Appendix F.

- Range managers were personally contacted to determine actual time periods that a range may be unavailable due to cleanup, maintenance, etc. A reported "day" was considered equal to eight hours and a reported "week" was considered equal to five days (see Appendix F for sources and/or methods used to calculate cleanup hours used for each range).

- Weather cancellations, fouled range, instrumentation failures, no shows, user cancellations were as reported by the respective range utilization reports.

- Unplanned unavailable hours were defined as including hours cancelled for weather, instrument failure, fouled range, user cancelled, and other cancelled, but not no shows.

- Planned unavailable hours included range cleanup periods only.

Shown in Table 3-2 are the calculated FY 97 and 98 range utilization rates for ranges and range complexes for which data are available using the formula identified for the Utilization and Demand metrics. However, when considering the results of these calculations, it is important to remember that not all utilization data are available. There are no data for NAVAIR T&E ranges other than for the China Lake Complex's Superior Valley Range and the only Marine Corps range reporting RFMSS data has been MCAF Quantico. Moreover, an examination of those data show that they are not comparable to other utilization data used in this assessment (see Table 3-1). Given this situation, utilization rates for MCB Camp Lejeune, MCAGCC Twentynine Palms, and MCAF Quantico are not evaluated at this time. Similarly, since data are not available, utilization rates were not calculated for most NAVAIR T&E ranges, the only exception being for Fleet use of the NAWS China Lake Superior Valley range.

3.3.1 Analysis of Range Utilization Rates

Using the utilization calculations shown in Table 3-2, some observations can be made for each of FY 97 and 98.

3.3.1.1 FY 97 Data

Range Utilization Rates

In FY 97, published hours of operations for the DoN ranges that accommodate air-to-ground training indicated that these ranges were available for scheduling on average for 126,318 hours or about 16 hours per day over a five-day week. However, the ranges were actually scheduled for an average of 35 percent of the FY 97 hours available. When the ratio of used to scheduled blocks is evaluated, the overall DoN range utilization rate increases to nearly 57 percent (Appendix F).

Table 3-2

FY 97 and 98 DoN Range Utilization Calculations by Metric

Range/Range Complex	Demand Metric		Utilization Metric	
	FY 97	FY 98	FY 97	FY 98
East Coast Navy Training Ranges				
AFWTF Inner Range	64	70	51	46
Bloodsworth Island Shore Bombardment and Bombing Range	Not Currently being Scheduled			
Jacksonville Complex	43	25	10	8
VACAPES Complex	46	36	25	17
East Coast Marine Corps Training Ranges				
Cherry Point Complex	13	32	16	15
Camp LeJeune Complex	NA[1]	NA	NA	NA
Townsend Range	52	54	30	28
Quantico Complex	NA	NA	NA	NA
West Coast Navy Training Ranges				
SCORE - SHOBA	95	73	75	58
Fallon Range Training Complex	38	38	28	27
NWSTF Boardman Range	4	0	3	0
El Centro Complex	35	38	17	18
West Coast Marine Corps Training Ranges				
Twentynine Palms Complex	NA	NA	NA	NA
Camp Pendleton (R-2503)	60	26	26	18
Yuma Complex	40	38	27	28
Naval Air Systems Command T&E Ranges				
Patuxent River Complex	NA	NA	NA	NA
China Lake Complex				
R-2505 Ranges	NA	NA	NA	NA
R-2524 - Mojave B North and South Ranges	NA	NA	NA	NA
R-2524 - Superior Valley Range	34	53	13	23
Chief of Naval Education and Training				
Gulf of Mexico Complex - McMullen Co. Range	14	14	14	3
Meridan Complex - Searay Multipurpose Target	Utilization Records Not Currently Kept			

Notes:
1. NA=Data not available.
2. DoN use only.

An important factor affecting utilization rates in FY 97 was "no shows." In FY 97, the ratio of "no shows" to scheduled range hours for DoN ranges was about 25 percent, meaning one out of every four range hours scheduled resulted in a "no show" service-wide. The occurrence of "no shows" varies significantly between ranges. In FY 97, the Camp Pendleton (R-2503) and the El Centro complexes appeared to experience the greatest occurrence of "no shows."

The "no show" occurrences could be due to over-scheduling practices by range users who fail to show up at a scheduled range because a better training opportunity presented itself. In addition, it would appear that the penalties of failing to meet a range appointment are few or minimal at the above ranges. At least one range (Quantico Complex) has established penalties for patterns of cancellation or "no shows." Clauses in the range manual *(Standard Operating Procedures for Ranges and Training Areas*, Base Order P3570.1) state that:

- Units which develop a pattern of cancellations (three cancellations to published Range Fire Orders within a 45-day period) will be notified in writing that the unit will be on a three-month probation period. During the probation period, the unit will have the lowest precedence in all schedule request conflicts.

- Units which do not notify Range Scheduling that they will not be training are classified as "NO SHOWS." A "NO SHOW" unit will be notified in writing that the unit will be on a three-month probation period. During the probation period, the unit will have the lowest precedence in all schedule request conflicts.

The DoN air-to-ground ranges with the lowest "no show" rates was the Inner Range at AFWTF. Although the range manual for AFWTF *(Manual for Use of the Atlantic Fleet Weapons Training Facility, Naval Station Roosevelt Roads*, AFWTFINST 3120.1L, 24 September 1999) does not specify penalties for "no shows," the range is host to many major Fleet exercises that are scheduled well in advance and generally not subject to last minute cancellation. Other ranges with low "no show" rates include the Fallon Range Training Complex and Townsend Range. In fact, among the DoN ranges as a whole, the lowest "no show" rate was experienced at the Townsend Range.

Other factors that can potentially reduce utilization rates, such as weather cancellations, fouled range, instrumentation failures, and even range cleanup do not account for a substantial number of hours. Thus, these factors have relatively minor effects on range utilization rates.

With respect to range demand, the ranges with the highest percentages shown for the Demand Metric could be considered to be those in highest demand. Those ranges in highest demand included:

- AFWTF Inner Range;
- Camp Pendleton (R-2503);
- SHOBA (SCORE);

- Townsend Range; and
- VACAPES Complex.

The lowest utilization rates were calculated for NWSTF Boardman Range (currently in caretaker status) and the McMullen Range (Gulf of Mexico Complex).

Other observations of the FY 97 utilization data shown in Table 3-2 are summarized as follows:

- Ranges with targets equipped with a Weapons Impact Scoring System (WISS) appear to have higher demand and utilization rates and fewer cancellations;

- There is no readily apparent bias towards utilization/demand for ranges that are authorized for live ordnance;

- There appears to be a relationship between the availability of electronic warfare equipment and high range demand and utilization; and

- The greater the number and variety of targets, the more demand is placed on a range and the higher the utilization (e.g., Townsend Range and the Fallon Range Training Complex). The fewer the number and variety of targets or ranges with targets in poor condition have lower the utilization rates (e.g., El Centro and Jacksonville).

Range Users in FY 97

In FY 97, the predominant user of DoN ranges (Table 3-3) was the Navy (58 percent), followed by the Marine Corps (34 percent). The remaining users included the Air Force (4 percent) and Army (1 percent) in terms of hours utilized. The Fallon Range Training Complex had the highest proportion of Navy users. The AFWTF Inner Range and the Jacksonville Complex saw significant use by US civilian contractors and foreign military services.

3.3.1.2 FY 98 Data

Range Utilization Rates

Based on published hours of operation, the DoN air-to-ground ranges are available for scheduling on average for 127,030 hours in FY 98, slightly more than in FY 97 (see Appendix F). However, only 32 percent of these available hours were actually scheduled, a decrease of three percent when compared to FY 97 conditions. One reason for this may be that NSWTF Boardman Range was in caretaker status for the whole year and the BT-9 Target (Cherry Point Complex) was not available for use for three-quarters of the year due to the installation of a WISS.

Table 3-3

Use of DoN Ranges by General User Category (%)

Ranges	Navy		Marine Corps		Air Force		Army		Other	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
Navy/Marine Corps Fleet Tactical Training Ranges										
AFWTF Inner Range	14.5	86.8	8.1	8.9	1.1	2.9	27.3	0.1	49.0	1.2
Bloodsworth Island Range	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Camp Lejeune Complex	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Camp Pendleton (R-2503)	0.4	1.6	97.2	90.0	0.0	1.1	2.4	7.4	0.0	0.0
Cherry Point Complex	33.9	23.8	39.2	54.2	25.5	20.1	0.7	1.5	0.8	0.4
El Centro Complex	56.7	55.7	41.0	42.1	0.8	0.2	0.1	0.3	1.4	1.8
Fallon Range Training Complex	93.2	95.0	5.0	3.1	1.3	1.5	0.1	0.0	0.4	0.4
Jacksonville Complex	71.4	96.9	2.3	1.7	2.3	1.3	0.0	0.0	24.1	0.2
NWSTF Boardman Range	39.5	NA	0.0	NA	60.5	NA	0.0	NA	0.0	NA
Quantico Complex	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SCORE (SHOBA)	88.8	83.4	7.9	12.5	0.0	2.7	0.0	1.0	3.4	0.4
Townsend Range	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Twentynine Palms Complex	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VACAPES Complex	67.1	67.1	2.1	3.9	21.8	25.8	8.6	0.2	0.4	3.0
Yuma Complex	15.5	16.3	78.1	76.3	6.0	4.2	0.3	0.4	0.1	2.8
NAVAIR T&E Ranges										
China Lake Superior Valley Range (R-2524)	79.1	87.4	5.2	2.4	15.2	9.6	0.0	0.0	0.6	0.6
CNET Ranges										
Gulf of Mexico Complex	100.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Navy-Wide Totals	58.2	62.9	33.9	32.2	4.3	3.3	1.2	0.3	2.4	1.4

When the ratio of used to scheduled blocks is evaluated, the overall DoN FY 98 range utilization rate is slightly more than 57 percent. This is higher than previously calculated for FY 97 and reflects a lower FY 98 “no show” rate for the ranges (about 23 percent in FY 98 compared to 25 percent in FY 97). The DoN range apparently experiencing the greatest occurrence of “no shows” in FY 98 was the El Centro Complex.

The lowest FY 98 “no show” rate among active ranges was again for the AFWTF Inner Range. As in FY 97, the Townsend Range and the Fallon Range Training Complex continued to experience low “no show” rates.

Ranges with the highest demand in FY 98 (based on the results of the Demand Metric) were the AFWTF Inner Range, Townsend Range, SCORE/SHOBA, and the China Lake Complex’s Superior Valley Range.

Range Users in FY 98

The Navy remained the predominant user (63 percent) of DoN ranges in FY 98 (Table 3-3). The Marine Corps accounted for about 32 percent of DoN range users. The Air Force and the Army used about ten and zero percent of range hours, respectively. The remaining percentage is attributable to use by civilian contractors. As in FY 97, the range complex with the highest proportion of Navy users was the Fallon Range Training Complex.

Chapter 4

Air-to-Ground Range Training Support and Capabilities

4 AIR-TO-GROUND RANGE TRAINING SUPPORT CAPABILITIES

The discussion of range utilization data, as presented in Chapter 3, provides a methodology and recommended metrics for measuring the degree to which DoN ranges are used. As previously emphasized, utilization data do not provide an adequate measure of the quality of the training afforded by each range. Nor do these utilization data provide a means of measuring the demand generated by Navy and Marine Corps fixed-wing, rotary-wing, and UAV platforms for specific types of air-to-ground training support. Therefore, the purpose of this chapter is to assess and summarize the capabilities of existing DoN air-to-ground ranges to meet training demand. Range capabilities are as presented in Chapters 1 through 3 and Appendix D.

That being said, it is cautioned that this analysis of training demand does not address the capacity of range land and SUA to accommodate identified training demand (i.e., wartime throughput capabilities). This is because airspace and range capacity is difficult to measure, despite the fact that the specific areal dimensions of a training range and its overlying volume of airspace are known and relatively fixed. In fact, range and airspace capacity measurements are complicated by a number of variables requiring consideration of numerous scenarios. The most significant of these variables relate to time and mission:

- "Time" addresses several scheduling parameters, including the total time the range or SUA is open for scheduling, scheduled block times, and whether the airspace is scheduled as concurrent or exclusive use. These scheduling parameters differ from range to range.

- "Mission" addresses the types of tactics that could be employed singly or in combination at a range or within SUA (missions are derived from the Training and Readiness [T&R] matrix). The amount of airspace and time needed to accommodate air combat maneuvering can differ significantly depending on the tactic to be employed, and the number of aircraft involved in the engagement (e.g., 1v1, 1v4, etc.).

Since accounting for these and other variables in measuring range and SUA capacity is such a very difficult task, range and SUA capacity is commonly characterized in terms of "delay." Based on the number of aircrews requiring training in a particular mission and delivery tactic, and the time required to complete the particular training events, a range and adjacent airspace may not have sufficient "capacity" to accommodate all the scheduled missions. At some point, delay will occur in the system and aircraft will be delayed in entering the airspace and/or range. Hence, for specific combinations of missions, capacity is often said to be reached when delay begins to occur.

A tool used by the Navy to "calculate" airspace and range capacity is the Navy-developed Naval Aviation Simulation Model (NASMOD). NASMOD provides airspace and range planners with the ability to analyze complex scenarios to determine if all scheduled missions can be accommodated in a particular piece of airspace or a range, based on actual mission requirements and the Interdeployment Training Cycle (IDTC). Using delay as a surrogate for capacity, the Navy can determine the capacity of airspace and ranges based on specific training requirements, aircraft type, types of ordnance, and delivery tactics. Since the *DoN Air-to-Ground Range Needs Assessment* identified the overall training requirements for each weapons platform based on the IDTC and T&R matrix, specific airspace and range capacity could be determined by using NASMOD to run various training scenarios. However, the level of effort to determine the capacity of each range was considered to be beyond the existing scope of this assessment.

4.1 Air-to-Ground Range Characteristics that Affect Quality of Training Support

To ensure quality of training support (i.e., the continued proficiency or readiness) of Navy/Marine Corps aircrews, an air-to-ground range must:

- Provide a realistic training environment that replicates potential combat threat conditions and enables real-world tactics skill development;
- Offer varied targets and instrumentation systems that provide quick and accurate feedback to a trainee;
- Offer a realistic electronic environment; and
- Be accessible.

The capability of an air-to-ground range to meet these goals may be measured in terms of the basic characteristics of its areal extent or size (over land or water), airspace, infrastructure, and operating conditions (e.g., authorized ordnance and scheduling). These characteristics can either enhance or constrain the use of the range with respect to the types and number of training operations that could be conducted at the range. The net result would be to provide a quality training experience for an aircrew (e.g., positively affect the development of real-world tactical skills) or limit the extent and quality of training. The key characteristics of a training range include:

- **Range Area** - The range area, as previously defined in Chapter 1, is the total area (land or water) available to a range. This area, in conjunction with the associated SUA and type of ordnance authorized for release (weapons footprint), is a key determinant in establishing the:

- number and types of air-to-ground tactics that can be employed at the range; and

- the number of fixed- and rotary-wing aircrews that can participate in any given training event.

As observed in the range utilization analysis (see Chapter 3), those ranges with larger range areas and available airspace appear to be more intensely used than those with smaller available airspace and range area. For example, overall utilization rates were higher for larger ranges like the AFWTF Inner Range, the Fallon Range Training Complex, and SCORE than for smaller ranges.

- **SUA** - The amount of SUA (again in combination with the available range area) is another important determinant in identifying the permissible air-to-ground tactics and the overall number of fixed- and rotary-wing aircrews that can participate in any given training event. (The types of designated airspace generally associated with range operations are defined in Chapter 1). As mentioned above, accessible ranges with extensive airspace resources appear to have higher utilization rates than those with limited airspace.

- **Range Infrastructure** - A range with varied and realistic infrastructure capabilities can enhance the quality of training provided (e.g., Fallon Range Training Complex). On the other hand, a lack of adequate range infrastructure may limit feedback provided to an aircrew, thus reducing the measure of effectiveness of any given training event provided at the range (aircraft, weapon, and tactics). This observation is borne out by the results of the utilization assessment (see Chapter 3), where accessible ranges with infrastructure of tactical value and in good repair appeared to benefit by increased use. This was particularly true for ranges like the AFWTF Inner Range and SCORE's SHOBA that offer users versatility (scoring, tactical targets, capability to conduct Fleet exercises, etc.). In summary, the range infrastructure elements or services critical to the effectiveness of training are:

  - conventional and tactical targets, including surface (ground-based), fixed and mobile, airborne towed and powered, ocean fixed and mobile, and undersea. Training on conventional targets provides little variation with easily identified targets that enable aircrews to practice basic skills under controlled conditions. In contrast, tactical targets are more difficult to locate, identify, and aim at requiring integration of previously developed skills and the refinement of tactics.

  - air-to-ground range instrumentation, including EW systems and scoring/tracking systems, such as Weapons Impact Scoring System

(WISS), strafe scoring systems, Tactical Aircrew Combat Training System (TACTS), No-drop Bomb Scoring System (NDBSS), Laser Training System (LTS), Underwater Tracking System (UTS), Large Area Tracking Range (LATR), and/or range support equipment including telemetry and radar. These types of instrumentation provide a means to track, score, and advise or feedback information to an aircrew on the effectiveness of the tactics employed to achieve a successful mission (e.g., deliver ordnance to a target).

- laser-safe targets (i.e., targets where specific weapon laser systems are authorized). This is another factor that can determine or limit the air-to-ground training that can be accommodated at a range, either in real-time or during post-mission debriefs.

- **Ordnance Authorized for Expenditure** - As shown in Appendix B, there are many types of air-to-ground ordnance that may be expended at DoN ranges, including gun ammunition, rockets, precision-guided munitions (bombs and missiles), free-fall bombs, and countermeasures (chaff and flares). Most ordnance is available in two forms, live or inert. The type and form of ordnance that may be expended determines whether a range can support specific air-to-ground training elements such as live weapons and/or high-altitude or stand-off weapons delivery profiles, and either enhances or limits training opportunities.

- **Hours of Operation** - Air-to-ground warfare is not limited to daylight hours. In fact, most current and emerging air-to-ground tactics emphasize the use of darkness as a means of surprising a potential enemy and of increasing aircrew survivability. “Night-time” is defined in this assessment as any time between sunset and sunrise. A range that is only available for daylight operations imposes significant limits on the type and number of air-to-ground training events that can be supported, and in addition, limits the realism of the training.

Other factors have the potential for interfering with or restricting the full capabilities of a range to provide air-to-ground training support. These factors, which were discussed previously in Chapter 1, relate to encroachment of civilian land uses on range land and airspace and environmental compliance.

4.2 Operational Training Elements

One of key objectives of the *DoN Air-to-Ground Range Needs Assessment* was to provide a picture of the state of Navy and Marine Corps’ air-to-ground range facilities, as well as the demand for those facilities. Aircrew training demands are described in the Navy and Marine Corps Training and Readiness (T&R) instructions and manuals. These demands evolve from

specific proficiencies that must be demonstrated in order to achieve combat readiness in one or more of the Primary Mission Areas (PMAs).

Experienced operators and users of the air-to-ground facilities were asked to articulate what they felt was absolutely essential for an air-to-ground range facility to provide. These individuals included representatives from CINCPACFLT, AIRPAC, CINCLANTFLT, AIRLANT, Naval Strike Air Warfare Center (NSAWC), and Marine Corps Headquarters (the complete list may be found in Chapter 10 of this report). Their inputs, developed within the context of their T&R requirements and their first-hand experience with existing and emerging air-to-ground tactics, helped in the development of a set of evaluation criteria for determining essential air-to-ground training support. These evaluation criteria, hereinafter referred to as "training elements," are described in Table 4-1. These training elements were also used in developing a tool to project demand for training support by fixed- and rotary-wing platforms as discussed later in Chapter 5.

Furthermore, of the 23 primary training elements identified in Table 4-1, six training elements are recommended as being critical to air-to-ground training. These training elements are considered critical because a lack of training support in these elements could potentially limit or prevent the development of Navy and Marine Corps aircrew skills in real-world tactics, thereby significantly impacting aircrew combat readiness. The training elements considered critical are:

- EW (III and IV);
- Live ordnance expenditure (other than air-to-ground guns);
- Chaff expenditure;
- Stand-off weapons employment training;
- Overland supersonic flight; and
- Night-time operations.

4.3 Analysis of DoN Air-to-Ground Range Training Support Capabilities

4.3.1 Range Capabilities to Support Primary Training Elements

The 19 DoN ranges/range complexes with capabilities to support the training elements previously identified are summarized in Table 4-2 (ranges are listed by area of responsibility). Since there are both individual ranges and range complexes, it is important to remember that an air-to-ground range complex is reported in Table 4-2 as supporting:

- Any given training element, even if only one air-to-ground range in that complex can support that training element; or

Table 4-1
Training Elements

Training Element	Description
Electronic Warfare (I, II, III, and IV)	EW training provides an aircrew with the skills to react to a threat: •EW I training (the least complex of all EW training) is designed to provide a simple stimulus to the pilot and/or platform EW sensors in order to introduce the aircrew to visual and/or cockpit indications and warnings. •EW II training, which is somewhat more complex than EW I training, requires a range that can simulate or replicate actual threat signals. •EW III training provides the aircrew with a realistic threat presentation. •EW IV training provides the aircrew with the most realistic and coordinated threat presentation.
Live Ordnance Expenditure	Live ordnance expenditure training requires the aircrew to release free-fall or forward-firing ordnance that is equipped with an arming/detonation device and explosives.
Chaff Expenditure	Chaff expenditure training requires the aircrew to release one of more of the types of chaff listed in Appendix B (Table B-1).
Flares Expenditure	Flare expenditure training requires the aircrew to release one or more of the types of flares listed in Appendix B (Table B-1).
High-Altitude Airspace	High-altitude airspace training requires the aircrew to maneuver their aircraft at altitudes above 20,000 ft above ground level (AGL).
TACTS	TACTS training requires the most capable training asset available for aircrew training. It allows real-time tracking (in three dimensions), simulated weapons employment, simulated “kill” removal, and complete event reconstruction and replay for debriefing.
Air-to-Ground Guns Expenditure	Air-to-ground guns expenditure training requires the aircrew to expend one more of the types of gun ammunition listed in Appendix B (Table B-1) against a ground target.
Air-to-Air Guns Expenditure	Air-to-air guns expenditure training requires the aircrew to expend one more of the types of gun ammunition listed in Appendix B (Table B-1) against an aerial target.
Stand-off Weapons Expenditure	Stand-off weapons expenditure training tactics require the aircrew to release or simulate the release of weapons at least 15 NM from the target and at an altitude of at least 20,000 AGL (high-altitude airspace).
Air-to-Ground Missiles (AGMs) Expenditure	AGM expenditure training requires the aircrew to expend one or more of the family of AGMs listed in Appendix B (Table B-1). Examples of these AGMs include AGM-45 Shrike, AGM-62 Walleye, AGM-65 Maverick, AGM-84 Harpoon, AGM-88 HARM, AGM-114 Hellfire, AGM-119 Penguin, AGM-122 Sidearm, AGM-154 JSOW, and the Stand-off Land Attack Missile (SLAM). Most AGM expenditure training will also require high-altitude and stand-off weapons range area and SUA.
Precision-Guided Munitions (PGM) Expenditure	PGM expenditure training requires the aircrew to expend one or more of the family of AGMs, Guided Bomb Units (GBUs), Laser-guided Training Round (LGTR), and the Joint Direct Attack Munition (JDAM). GBUs and JDAM are MK-80 series general purpose bombs fitted with precision guidance kits. All PGMs, for purposes of this report, are not capable of being expended using stand-off training tactics.

Table 4-1
Training Elements

Training Element	Description
Air-to-Air Missiles Expenditure	Air-to-air missile expenditure training requires the aircrew to expend one or more of the family of air-to-air missiles against an airborne target. Examples of air-to-air missiles include the AIM-9 Sidewinder, AIM-54 Phoenix, and AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM).
Laser-Safe Range	Laser-safe range training requires the aircrew to use laser spotting or designating devices in conjunction with the weapons targeting and/or expenditure of other air-to-ground weapons.
Range Scoring	Range scoring requires feedback of the results of a weapons release "run" to the aircrew using either a manual or automatic system. Manual scoring includes, for example, "hit" calls to the aircrew from a spotting tower located in the target area. Automatic scoring is provided by the family of specialized scoring equipment, such as WISS. (This analysis does not differentiate between manual or automatic scoring.)
Cluster Weapons Expenditure	Cluster weapons expenditure training requires the aircrew to expend one or more of the family of Cluster Bombs listed in Appendix B (Table B-1). Cluster Bombs are weapons that pack (or "cluster") many smaller munitions within a larger weapon shell. The larger weapon shell is designed to open at some predetermined altitude above the ground to allow the smaller munitions to be dispersed, thereby achieving a large weapon impact footprint.
Air-to-Ground Rockets Expenditure	Air-to-ground rockets expenditure training requires the aircrew to expend either the 2.75-inch or 5.0-inch air-to-ground rocket.
Practice Bombs Expenditure	Practice bombs expenditure training requires the aircrew to expend one or more of the family of practice bombs listed in Appendix B (Table B-1). Practice bombs, which are inert weapons that represent the largest family of bombs, are typically smaller than live ordnance. Some types of practice bombs are equipped with a small smoke charge that detonates upon impact with the ground in order to mark the bomb's point of impact
General Purpose Bombs Expenditure	General purpose bombs expenditure training requires the aircrew to expend one or more of the family of GP bombs listed in Appendix B (Table B-1). General purpose bombs may be "live" or inert; the "live" rounds will contain between 192 and 945 pounds of high explosive (see Appendix B, Table B-2). The inert bombs are filled with some inert material (often cement) that ensures the weight, drag, and aerodynamic flight of the bomb replicates the weight, drag and aerodynamic flight of the "live" bombs. Many general purpose bombs can be converted to PGMs by the addition of a guidance package (Laser seeker or Paveway kit, for example).
Overland Supersonic Flight	Supersonic flight training requires the aircrew to operate at speeds in excess of the speed of sound. Supersonic operations require large range complexes (range area and SUA).

Table 4-1
Training Elements

Training Element	Description
Night-time Operations	Night-time operations training requires the aircrew to exercise air-to-ground tactics during the time between sundown and sunrise. The evolution of tactics development has seen a significant increase in the use of non-daylight hours for the delivery of air-to-ground weapons. Night tactics are designed to take advantage of the family of low-light level sighting devices available to US forces. Night tactics are also employed to increase fixed- and rotary-wing platforms' survivability by minimizing the potential for engagement of these platforms by defensive forces using visually-cued weapons. An equally important advantage of night tactics is the probability of Fleet fixed- and rotary-wing platforms encountering defensive forces that are less alert than the forces that would be encountered during a daylight raid.

Table 4-2

Range Complex Training Support Capabilities

DoN Training Range Complex	Training Elements																						
	EW I	EW II[1]	EW III[1]	EW IV[1]	Live Ordnance[2]	Chaff	Flares	High-Altitude Airspace	TACTS	Air-to-Ground Guns	Air-to-Air Guns	Stand-off Weapons	Air-to-Ground Missiles	Precision-Guided Munitions	Air-to-Air Missiles	Laser-Safe Range[4]	Scored	Cluster Weapons	Air-to-Ground Rockets	Practice Bombs	General Purpose Bombs	Overland Supersonic Flight	Night-Time Operations
East Coast Ranges and Complexes																							
AFWTF Inner Range					●		●	●		⌖	●			●		●	●	⌖	⌖	●	⌖		●
Bloodsworth Island					●					⌖				⌖		⌖			●	●	⌖		
Camp Lejeune	●	●								⌖				●		●			●	●	●		●
Cherry Point	●	●			●	●	●	●	●	⌖				⌖		⌖	●		●	●	⌖		●
Jacksonville					●			●		⌖				⌖		⌖	●		⌖	●	⌖		●
Patuxent River	●	●	●			●	●	●		⌖	●	●	●	●		●	●	●	●	●	●	●	●
Quantico					●		●			⌖				⌖		⌖			●	●	⌖		●
Townsend	●									⌖				●		●	●		●	●	●		●
VACAPES	●							●	●	⌖						●	●		●	●	●		●
Gulf of Mexico (McMullen)	●									⌖							●		●	●			
Meridian (Searay)	●									⌖										●			●

Notes:

⌖ Indicates live ordnance of this type is authorized.

1. Range facilities that reported EW support greater than EW I were assumed to provide all EW levels up to and including their reported EW level.
2. Live Ordnance refers to heavy and light dropped ordnance (e.g., general purpose bombs, GBUs, etc.) and not gun ammunition.
3. With the exception of the Superior Valley Range (a Fleet asset), the China Lake Complex supports Fleet training on a not-to-interfere basis with scheduled RDT&E events; operated as a Navy Working Capital Fund site.
4. Laser operations must be authorized for the specific weapon to be employed.

Table 4-2

Range Complex Training Support Capabilities

DoN Training Range Complex	Training Elements																						
	EW I	EW II[1]	EW III[1]	EW IV[1]	Live Ordnance[2]	Chaff	Flares	High-Altitude Airspace	TACTS	Air-to-Ground Guns	Air-to-Air Guns	Stand-off Weapons	Air-to-Ground Missiles	Precision-Guided Munitions	Air-to-Air Missiles	Laser-Safe Range[4]	Scored	Cluster Weapons	Air-to-Ground Rockets	Practice Bombs	General Purpose Bombs	Overland Supersonic Flight	Night-Time Operations
West Coast Ranges and Complexes																							
Camp Pendleton	●				●	●	●	●		⌖				●		●	●		⌖	●	⌖		●
China Lake[3]	●	●	●		●	●	●	●		⌖	⌖	⌖	⌖	⌖	⌖	⌖	●	⌖	⌖	●	⌖	●	●
El Centro							●	●		⌖						●	●		●	●			●
Fallon Range Training Complex	●	●	●		●	●	●	●	●	⌖				⌖		⌖	●		⌖	●	⌖	●	●
NWSTF Boardman										⌖				●		●			⌖	●	●		●
SCORE/SHOBA	●	●	●		●	●	●	●		⌖		⌖		⌖		⌖			⌖	●	⌖	●	●
Twentynine Palms	●				●	●	●	●		⌖		⌖	⌖	⌖		⌖	●		⌖	●	⌖	●	●
Yuma	●	●	●		●	●	●	●	●	⌖	●	⌖	⌖	⌖		⌖	●	⌖	⌖	●	⌖	●	●

Notes:

⌖ Indicates live ordnance of this type is authorized.

1. Range facilities that reported EW support greater than EW I were assumed to provide all EW levels up to and including their reported EW level.
2. Live Ordnance refers to heavy and light dropped ordnance (e.g., general purpose bombs, GBUs, etc.) and not gun ammunition.
3. With the exception of the Superior Valley Range (a Fleet asset), the China Lake Complex supports Fleet training on a not-to-interfere basis with scheduled RDT&E events; operated as a Navy Working Capital Fund site.
4. Laser operations must be authorized for the specific weapon to be employed.

- An ordnance-related training element (for example, general purpose bombs or air-to-ground missiles) even if only one type of general purpose bomb or air-to-ground missile is authorized for expenditure at only one air-to-ground range (or target).

The number of East and West coast air-to-ground ranges that can support each of the identified primary training elements is shown in Table 4-3. As can be seen, all of the training elements except EW IV are supported by at least one range. However, only a limited number of ranges can support TACTS, and expenditure of air-to-air guns, air-to-air missiles, and cluster weapons. For more detailed information on the capability of each air-to-ground range to support required fixed- and rotary-wing aircrew air-to-ground training, see Appendix D (DoN Range Capability and Issue Summaries) and the DoN Range Internet Website.

4.3.2 Capabilities of East and West Coast Ranges in Supporting the Critical Training Elements

The specific ranges that can support the critical training elements are shown in Table 4-4. In general, the West Coast air-to-ground ranges offer more training support opportunities for completing the critical training elements than the East Coast ranges. East Coast air-to-ground ranges offer more training support in only one critical training element -- Night-time Operations. The capabilities of DoN air-to-ground ranges to support each of the critical training elements is summarized as follows:

- **EW -** The levels of EW training for each range complex are as defined in the *Tactical Training Range Roadmap* (Chief of Naval Operations [N889], July 1995). Both EW III and IV training equips aircrews to operate against sophisticated enemy air defense systems employing offensive tactics and defensive countermeasures. EW IV support is typically associated with large-scale training events that require a coordinated high-density simulated threat environment. A virtual EW IV capability can be achieved when the capabilities of multiple ranges are integrated to support JTFEX, and as has been proposed by CINCLANTFLT and CINCPACFLT for the East and West Coast littoral warfare complexes. The only East Coast air-to-ground range offering EW III support is the Patuxent River Complex. All but four West Coast air-to-ground ranges offer EW III support. Those ranges not supporting EW III include NWSTF Boardman and the Camp Pendleton, El Centro, and Twentynine Palms complexes. There are no individual DoN air-to-ground ranges that provide an EW IV support capability on either coast.

Table 4-3

Number of East and West Coast Ranges Supporting Primary Training Demand

Training Element[1]	No. of Capable Complexes	
	East Coast	West Coast
Electronic Warfare		
EW I	7	6
EW II	3	4
EW III	1	4
EW IV	0	0
Live Ordnance Expenditure[2]	5	6
Chaff Expenditure	2	6
Flares Expenditure	4	7
High-Altitude Airspace	5	7
TACTS[3]	2	2
Air-to-Ground Guns Expenditure	11	8
Air-to-Air Guns Expenditure	2	2
Stand-off Weapons Expenditure	1	4
Air-to-Ground Missiles Expenditure	1	3
Precision-Guided Munitions Expenditure	8	7
Air-to-Air Missiles Expenditure	0	1
Laser-Safe Range[4]	9	8
Range Scoring	7	6
Cluster Weapons Expenditure	2	2
Air-to-Ground Rockets Expenditure	10	8
Practice Bomb Expenditure	11	8
General Purpose Bomb Expenditure	9	7
Overland Supersonic Flight	1	5
Night-time Operations	9	8

Notes:

1. Bold face denotes a critical training element.
2. For the purposes of this assessment, live ordnance refers to ordnance containing explosives, chemicals, pyrotechnics, and similar stores. This definition includes general purpose bombs, GBUs, rockets, missiles, etc. but *not* gun ammunition).
3. Overland TACTS ranges associated with air-to-ground training.
4. Range laser operations must be authorized for the laser system of the weapons to be employed.

Table 4-4

DoN Air-to-Ground Ranges Capable of Supporting Critical Training Demand

Characteristic	East Coast	West Coast
EW III Training Support[1]	Patuxent River Complex	China Lake Complex Fallon Range Training Complex SCORE (SHOBA) Yuma Complex
Live Ordnance Expenditure[2]	AFWTF Inner Range Cherry Point Complex[5] Jacksonville Complex[5] Quantico Complex[5] Bloodsworth Island (currently not being scheduled)[5]	Camp Pendleton Complex China Lake Complex Fallon Range Training Complex SCORE (SHOBA) Twentynine Palms Complex Yuma Complex
Chaff Expenditure[3]	Cherry Point Complex Patuxent River Complex	Camp Pendleton Complex China Lake Complex Fallon Range Training Complex SCORE (SHOBA) Twentynine Palms Complex Yuma Complex
Stand-off Weapons Expenditure[4]	Patuxent River Complex	China Lake Complex SCORE (SHOBA) Twentynine Palms Yuma Complex
Overland Supersonic Flight	Patuxent River Complex[6]	China Lake Complex Fallon Range Training Complex SCORE (SHOBA) Twentynine Palms Complex Yuma (R-2301W Barry M. Goldwater Range)

Table 4-4

DoN Air-to-Ground Ranges Capable of Supporting Critical Training Demand

Characteristic	East Coast	West Coast
Night-time Operations	All East Coast ranges except Bloodsworth Island and Gulf of Mexico Complex (McMullen Range)	Camp Pendleton Complex China Lake Complex El Centro Complex Fallon Range Training Complex NWSTF Boardman (in caretaker status) SCORE (SHOBA) Twentynine Palms Complex Yuma Complex

Notes:

1. Range facilities that reported EW support greater than EW I were assumed to provide all EW levels up to and including their reported EW level.
2. In the past, great emphasis was placed on the need for Fleet aircrews to train with live ordnance. That emphasis has been declining of late with the emergence of smart weapons and will continue to decline due to funding constraints. Most live ordnance authorized for training expenditure is reserved for use during major CVW training exercises. These exercises normally take place at places like AFWTF Inner Range and the Fallon Range Training Complex.
3. Effective EW training is one of the most difficult single aircraft and multi-aircraft training scenarios and the proper deployment of Chaff is an essential element of aircrew training.
4. Stand-off weapons employment requires the use of airspace above 20,000 ft AGL and the ability to release or simulate weapons release at least 15 NM from the target. Stand-off weapons could, therefore, include one or more of the following PGMs: AGM-45 Shrike, AGM-62 Walleye, AGM-65 Maverick, AGM-84 Harpoon, AGM-88 HARM, AGM-114 Hellfire, AGM-119 Penguin, AGM-122 Sidearm, AGM-154 JSOW, SLAM, JDAM, GBUs, and LGTR.
5. While live ordnance use is authorized at these ranges, significant limitations exist.
6. The capabilities of the overland supersonic corridor at the Patuxent River Complex is limited.

- **Live Ordnance Expenditure -** Experience with live ordnance and exposure to live fire conditions is essential to readiness and a prerequisite to combat. Five East Coast air-to-ground ranges are documented as supporting the expenditure of live ordnance, other than air-to-ground gun ammunition -- AFWTF Inner Range, Cherry Point, Jacksonville, Quantico, and Bloodsworth Island. In reality, however, such documented authorization is severely limited at each of these ranges:

  – ***AFWTF Inner Range*** - This range has a documented capability of offering the broadest extent of authorized live ordnance (including cluster weapons). However, the range is currently closed to live ordnance training and its continued future use for live ordnance expenditure is uncertain.

  – ***Bloodsworth Island*** - Although the expenditure of live general purpose bombs (up to 100 lbs net explosive weight [NEW] or MK-81) is authorized at this range, the current and future availability of this range asset is uncertain with scheduling suspended until further notice.

  – ***Cherry Point Complex*** - BT-9 is only authorized for the expenditure of live ordnance up to 100 lbs NEW (MK-81).

  – ***Quantico Complex*** - The range at Quantico is only authorized for the expenditure of live ordnance up to 192 lbs NEW (MK-82).

  – ***Pinecastle Range*** - Pinecastle range is authorized for live ordnance expenditure up to 192 lbs NEW (MK-82) and is severely limited in what it can tactically support due to delivery restrictions and a periodic fire index moratorium.

  All but two West Coast air-to-ground ranges (El Centro and NWSTF Boardman) support the expenditure of live ordnance, other than air-to-ground gun ammunition. The China Lake Complex offers the most diverse range of ordnance authorized for expenditure. However, the China Lake Complex is a MRTFB T&E range and as such, is operated as a NWCF site (described earlier in this assessment). In addition, it is only available for Fleet use on a not-to-interfere basis with scheduled T&E events. Other West Coast ranges that offer a wide range of authorized live ordnance include Yuma, Twentynine Palms, and the Fallon Range Training Complex. Two complexes (China Lake and Yuma) authorize the expenditure of live cluster weapons.

- **Chaff Expenditure -** Chaff is a countermeasure device intended to deceive airborne and ground-based enemy search, acquisition, and guidance radars. For this countermeasure to be effective, the aircrew must employ a chaff “program”

that is effective against the specific threat radar and they must effect rapid changes in aircraft heading, altitude, or speed shortly after dispensing chaff (Institute for Defense Analysis, April 1999). The coordination of threat recognition, chaff deployment, and aircraft maneuvers is critical, otherwise the countermeasure fails to degrade the effectiveness of the threat radars. In order to refine this critical coordination skill, aircrews must practice dispensing chaff in conjunction with EW training. Only two East Coast air-to-ground ranges (Cherry Point and Patuxent River) authorize the expenditure of chaff. The Patuxent River Complex is an MRTFB T&E range that is operated as a NWCF site (recently, the Patuxent River Complex has indicated a willingness to make range time and airspace available to Fleet units to support documented training demand). By contrast, all but two West Coast air-to-ground ranges (El Centro and NWSTF Boardman) authorize the expenditure of chaff. The fact that few East Coast air-to-ground ranges authorize chaff expenditure is considered a significant adverse impact to aircrew training and aircrew and aircraft combat readiness.

- **Stand-off Weapons Expenditure -** Future warfighting doctrine is focusing on technologies and tactics that ensure the safety of US forces by keeping aircraft out of reach of an enemy's air defense system. To achieve this training element demands actual or simulated delivery of a greater percentage of stand-off weapons. Stand-off weapons training tactics support requires the ability to release weapons, or simulate the release of weapons, either live or inert, at distances greater than 15 NM from the target and at altitudes of at least 20,000 AGL (high-altitude airspace). Importantly, the same amount of airspace is required whether the release of a weapon is actual or simulated. Some stand-off weapons training also requires an authorized laser-safe range. Most air-to-ground ranges lack sufficient land area or SUA or both to satisfy the demand for stand-off weapons training. Only one East Coast air-to-ground range (Patuxent River Complex) can support stand-off weapons training. Four West Coast ranges (China Lake, SCORE/SHOBA, Twentynine Palms, and Yuma complexes) can support stand-off weapons training, one of which (China Lake Complex) is a NAVAIR T&E range.

- **Overland Supersonic Flight -** The ability to train at supersonic airspeeds in an overland environment is critical to developing and refining aircrew tactics. Many air-to-ground training scenarios include (or have provisions for) the use of "friendly" escort fighter aircraft and/or "hostile" defensive Combat Air Patrol aircraft. Escort fighters (if available) protect the "bombers" against the threat posed by the Combat Air Patrol aircraft enroute to, in the vicinity of, or returning from the target. Even "self-escorting" platforms (like the F/A-18) must be able to employ offensive and defensive aerial tactics. Typical offensive and defensive aerial tactics are characterized by high-speed slashing engagements. These engagements often include high-altitude supersonic operations, especially from

the point of initial detection until the opposing aircraft "merge." Only one East Coast air-to-ground range (Patuxent River Complex) can support overland supersonic flight operations, but the supersonic capabilities at Patuxent River are limited to SUA located to a large degree over water (Chesapeake Bay). By contrast, five West Coast air-to-ground ranges (China Lake, Fallon Range Training, Twentynine Palms, and Yuma complexes and SCORE/SHOBA) can support overland supersonic operations.

- **Night-time Operations -** The evolution of Navy and Marine Corps high-altitude and low-altitude air-to-ground tactics has seen an increasing reliance on the use of night-time operations. These tactics take advantage of the family of low-light level sighting devices (e.g., night vision goggles, etc.) available to US and allied forces. These tactics also minimize the threat to friendly forces from visually-cued surface-to-air defensive weapons systems. All DoN ranges but two on the East Coast (Bloodsworth Island and Gulf of Mexico [McMullen Range]) support night-time operations. Unfortunately, only two of these nine East Coast ranges provide an environment that is compatible with real-world tactics development and refinement -- the AFWTF Inner Range and the Patuxent River Complex. By contrast, all eight of the West Coast air-to-ground ranges support night-time operations, with China Lake, Fallon Range Training, Twentynine Palms, and Yuma complexes also providing an environment that is compatible with real-world tactics development and refinement.

In summary, no individual DoN air-to-ground range is capable of supporting all elements of aircrew training demand. Several DoN air-to-ground ranges are capable of supporting only rudimentary air-to-ground training (like practice bombs). Other DoN air-to-ground ranges are able to support complex EW training demand but cannot support stand-off weapons employment training. Navy and Marine Corps squadrons compensate for these DoN air-to-ground range anomalies through the use of small-scale and large-scale training detachments to selected ranges that provide the required training support with the added cost for these detachments borne by Operations and Maintenance funds.

Another significant conclusion that can be drawn from this analysis is that although the DoN air-to-ground ranges are distributed almost equally between the east and west coasts of the US, this geographic distribution belies significant disparities in training quality offered by the ranges on each coast. In general:

- **East Coast Ranges** (with the exception of the AFWTF Inner Range) can be generally categorized as "back yard" ranges that provide for training in only rudimentary air-to-ground warfare disciplines. Air-to-ground events at East Coast ranges other than the AFWTF Inner Range, are in most cases, limited to small numbers of aircraft (typically not more than two to four aircraft), conducting canned deliveries. There is limited opportunity to use real-world tactics

development and refinement on these ranges. The AFWTF Inner Range, on the other hand, is a very capable range offering support for most of the air-to-ground training elements for small- and large-scale air-to-ground and combined arms training evolutions.

- **West Coast Ranges** offer diverse and highly capable training environments. Most ranges are capable of supporting large-scale air-to-ground training exercises. Several ranges support overland supersonic operations, integrated EW training and live ordnance expenditure. The Yuma Complex is the only DoN range that offers the opportunity for Navy and Marine Corps tactical aircrews to develop and refine air-to-ground tactics in a simulated urban environment (constructed at the old Moving Sands raked range target).

4.3.3 Accessibility of DoN Air-to-Ground Ranges

The results of the air-to-ground range utilization analysis documented in Chapter 3 supports the contention that proximity of a range to an air station or other similar installation increases its level of utilization. This bias by Navy and Marine Corps units is driven by three factors:

- Location from which an aircraft begins and ends the training event;
- Location of the range that has the capability to support the required training element(s);
- Available range time; and
- Fuel costs.

Available range time is a function of scheduling and utilization, which were discussed in Chapter 3 of this assessment. Distance to a complex with the required training is the focus of this subchapter.

The most important factor regarding range accessibility is maximizing time-on-range, thus maximizing training time and quality of training. Aircrews can achieve this goal by minimizing the distance from the point of departure to the operating area (in this case, an air-to-ground range) by training at a range as close as possible to their point of departure (usually a Naval or Marine Corps Air Station).

Another consideration affecting the amount of time-on-range that an aircrew can achieve relates to available fuel. Generally, aircraft must have sufficient fuel to fly from the point of departure to an operating area, conduct the required training in that operating area, and return to the point of departure. Design constraints on Navy and Marine Corps tactical aircraft that impose limitations

on size and weight in turn limit the amount of fuel (internal and external) that can typically be carried. Although most tactical Navy and Marine Corps aircraft have provisions for refueling from airborne tankers, most training flights are conducted without the benefit of airborne tankers. Total flight time during most training events is, therefore, limited by the amount of fuel available when aircrews leave their point of departure.

The first step in analyzing how far an aircrew must fly to find required air-to-ground training elements was to identify all shore-based Naval and Marine Corps air stations from which Navy and Marine Corps tactical aircraft training flights could originate (see Figure 1-2). This list includes all Navy and Marine Corps air station assets, whether or not they currently support tactical aircraft. The rationale for including all air stations was to provide latitude for future basing decisions.

The second step in the analysis was to measure the distance(s) required to be flown from each air station to a range supporting the required training elements. (Appendix I includes a master table of distances from air stations to ranges). When the results of these two analytical steps were considered together, a number of conclusions can be reached. A summary of the critical training element support is summarized in Table 4-5. Appendix G (Table G-3) presents a graphical depiction of the results of the analysis.

It is important to note that the information presented in both Table 4-5 and Appendix G is presented without regard to aircraft type. The reason for this was to provide future planners with a tool for assessing the availability of air-to-ground training opportunities when alternative aircraft basing strategies are being considered. In that context, several other key observations can be made regarding the data presented in Table 4-5. These observations are organized, for simplicity, by Fleet East Coast/Fleet West Coast, CNET, and reserve air stations:

- **East Coast Fleet Air Stations**

  - All critical training elements except EW IV can be met by aircrews at NAS Oceana and MCAF Quantico within 100 NM.

  - Aircrews stationed at all Navy and Marine Corps air stations, except those located in Virginia and North Carolina, must transit more than 200 NM to obtain most, if not all, critical training elements.

  - Aircrews at NAS Jacksonville or NS Mayport have “backyard” training opportunities available within 100 NM, but these aircrews must transit more than 200 NM to obtain training in most of the critical training elements.

Table 4-5

Summary of Distance to Fly to "Find" Critical Training Elements

State	Airfield	Critical Training Elements Available		
		Within 100 NM	101-200 NM	Beyond 200 NM
Arizona	MCAS Yuma	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
California	MCB Camp Pendleton	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
	NAF El Centro	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
	NAS Lemoore		EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time	
	MCAS Miramar	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
	NAS North Island	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
	NAS Point Mugu	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
	MCAGCC Twentynine Palms	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
Florida	NAS Jacksonville	Live Ordnance Night-time		EW III Chaff Stand-off Weapons Supersonic Flight
	NAS Key West			EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time

Table 4-5

Summary of Distance to Fly to "Find" Critical Training Elements

State	Airfield	Critical Training Elements Available		
		Within 100 NM	101-200 NM	Beyond 200 NM
Florida (Continued)	NAS Mayport	Live Ordnance Night-time		EW III Chaff Flare Stand-off Weapons Supersonic Flight
	NAS Pensacola and NAS Whiting Field			EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time
Georgia	NAS Atlanta		Night-time	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight
Louisiana	NAS JRB New Orleans			EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time
Maine	NAS Brunswick			EW II/III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time
Mississippi	NAS Meridian	Night-time		EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight
Nevada	NAS Fallon	EW III Live Ordnance Chaff Supersonic Flight Night-time		Stand-off Weapons
North Carolina	MCAS Cherry Point	Live Ordnance Chaff Night-time	Stand-off Weapons Supersonic Flight	EW III
	MCAS New River	Live Ordnance Chaff Night-time		EW III Stand-off Weapons Supersonic Flight
Pennsylvania	NAS JRB Willow Grove		EW III Live Ordnance Chaff Stand-off Weapons Air-to-Ground Missile Supersonic Flight Night-Time	
South Carolina	MCAS Beaufort	Night-time		EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight

Table 4-5

Summary of Distance to Fly to "Find" Critical Training Elements

State	Airfield	Critical Training Elements Available		
		Within 100 NM	101-200 NM	Beyond 200 NM
Texas	NAS Corpus Christi			EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time
	NAS Kingsville			EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time
	NAS JRB Fort Worth			EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time
Virginia	NAS Oceana	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
	MCAF Quantico	EW III Live Ordnance Chaff Stand-off Weapons Supersonic Flight Night-time		
Washington	NAS Whidbey			EW III Live Ordnance Chaff Stand-off Weapons Air-to-Ground Missile Supersonic Flight Night-time

- MCAS Cherry Point or MCAS New River aircrews must transit beyond 100 and 200 NM, respectively, to exercise stand-off weapons expenditure and overland supersonic flight training elements.

- MCAS Beaufort aircrews must transit beyond 200 NM to obtain training in all critical training elements except night-time operations.

- **West Coast Fleet Air Stations**

  - Aircrews at MCAS Yuma, NAF El Centro, MCB Camp Pendleton, MCAS Miramar, NAS North Island, NAS Point Mugu, and MCAGCC Twentynine Palms can meet all critical training elements within a distance of 100 NM, except EW IV.

  - NAS Fallon aircrews can obtain all critical training elements within 100 NM, except EW IV and stand-off weapons.

  - Aircrews at NAS Lemoore have no critical training element capability within 100 NM of the air station. All capabilities are available within 200 NM, but those capabilities are found at the China Lake Complex (an MRTFB range).

  - Because NWSTF Boardman is in caretaker status, NAS Whidbey aircrews have no active land range to provide required training elements available within 500 NM.

- **CNET Air Stations -** The mission of CNET air stations is to provide for basic and intermediate training; they do not have a need for access to critical training elements. The current training needs of these air stations are being met for the most part within 100 NM by their own ranges at the Gulf of Mexico Complex (McMullen County Range) and the Meridian Complex (Searay Multipurpose Target). However, if circumstances changed and the mission of the air stations necessitated aircrews meeting all the training elements, then transit beyond 200 NM would be required to obtain training in the critical training elements.

- **Reserve Air Stations** - Basically, reserve bases generally fill in the need for required training using US Air Force/Air National Guard or Army National Guard range assets. When the proximity of DoN range assets is considered, it can be seen that aircrews stationed at NAS Joint Reserve Base (JRB) Fort Worth and NAS JRB New Orleans do not have access to any DoN range assets within 200 NM that provide any critical training elements. NAS JRB Willow Grove aircrews have access to almost all training elements within 200 NM. NAS Atlanta aircrews have access to “backyard” ranges (Meridian Complex [Searay Multipurpose

Target] and Townsend Range) for the basic training elements; for the critical training elements, aircrews must transit over 200 NM.

4.3.4 Other Issues Affecting DoN Air-to-Ground Range Training Support Capabilities

As introduced in Chapter 1 of this analysis, there are additional issues that can affect the capability of existing DoN air-to-ground ranges to support training demand and their continued availability to meet these needs. Specifically, these may be defined as follows:

- **Encroachment Issues** - issues that impact the ability to train. These encroachments can take the form of physical impediments, incompatible adjacent land use, or environmental regulatory compliance.

- **Infrastructure Issues** - issues that involve the adequacy of range's physical plant (buildings, roads, targets, etc.) in terms of status of repair, refurbishment, etc.

Consideration of encroachment issues in combination with operational factors (i.e., the training elements described in Table 4-1) provide a more complete picture of how the capabilities of a range can support required training elements and contribute to the DoN defense mission. A summary of operational factors and encroachment and infrastructure issues for each of the East Coast and West Coast ranges is presented in Table 4-6.

4.3.5 Joint Use Strategies

Accessibility and capability issues associated with DoN air-to-ground ranges may require the consideration of using other service ranges, particularly on the East Coast. Shown in Figure 4-1 (Air-to-Ground Ranges Used by the US Air Force) are locations where the US Air Force has trained in the past. The capabilities of these ranges, as well as ranges with air-to-ground capabilities operated by the US Army, should be the focus of future investigations.

Table 4-6

Summary of Operational Considerations and Issues at DoN Ranges

Range/Range Complex	Operational Considerations	Encroachment Issues	Infrastructure Issues
East Coast Ranges/Range Complexes			
AFWTF Inner Range	•Live ordnance authorized, except after sunset and on Sunday mornings •Multi-purpose range accommodating air-to-ground, NFGS, and amphibious operations •Cluster munitions authorized •Live ordnance delivery halted when marine mammals are <1,000 yds of target area •Accommodates high-altitude bombing •Can support large scale air wing strike scenarios	•Residents concerned with safety and noise impacts of range operations •Property encompasses several critical habitats and environmentally sensitive resources •Limitation on the number of days range can be used per MOU/MOA between USFWS, NMFS, and Puerto Rico	•Infrastructure components in need of repair/refurbishment (tower, several buildings, water tower, roads)
Bloodsworth Island	•Live ordnance authorized up to MK-81 •Dual scheduling authorities •Military aircraft must be vigilant of General Aviation traffic entering target area •Ordnance use restricted during high fire threat conditions •Scheduling suspended until further notice	•Increasing residential development and tourism sensitive to aircraft noise •Range closed October through April for migratory bird season •Waters around the islands making up the range are frequented by recreational and commercial fishermen	•Targets are non-existent •No Scoring
Camp Lejeune Complex	•Offers CAS training	•Seasonal residents sensitive to noise from aircraft and ordnance delivery •No offshore ordnance expenditures during whale sightings/migratory season (February to April) •Endangered red cockaded wood-pecker habitat and other state listed species habitat	•No significant issues reported
Cherry Point Complex	•Live ordnance authorized at BT-9 up to MK-81 •EW capabilities include MAEWR and TACTS •Supports AGM-114 (Hellfire) firings on a case-by case basis •Flights below 3,000 ft prohibited over known wildlife preserves •Can support small scale air wing strike scenarios	•Seasonal residents sensitive to noise from aircraft and ordnance delivery •Hunters encroach on range lands •Endangered red cockaded wood-pecker habitat and other state listed species habitat •Near Cedar Island, Mattamuskeet/Swanquarter NWR and Cape Lookout National Seashore	•Submerged lands around water-based targets are leased from NC
Jacksonville Complex	•Live ordnance authorized at one target at Pinecastle Range up to MK-82 •Airspace limited; at FL230 minimally adequate for high-altitude bombing •Can support small scale airwing strike scenarios •US Forest Service restricts ordnance use during high fire threat conditions	•Pinecastle surrounded by the Ocala National Forest •Range provides habitat for threatened & endangered species	•Current special use permit for Pinecastle Range ends 31 Dec 00 •Erosion is encroaching on towers at Lake George and Pinecastle

Table 4-6

Summary of Operational Considerations and Issues at DoN Ranges

Range/Range Complex	Operational Considerations	Encroachment Issues	Infrastructure Issues
Patuxent River Complex	•MRTFB Complex; Fleet use on a not-to-interfere basis	•Increasing residential development and tourism sensitive to aircraft noise •Threatened & endangered species inhabit range •Range includes Blackwater and Glenn L. Martin NWR	•No significant issues reported •Operational fleet must pay for support services provided by an NWCF site
Quantico Complex	•Live ordnance authorized up to MK-81 •Principally an artillery bombardment and door gunnery training range	•Increasing residential development sensitive to aircraft noise	•No significant issues reported
Townsend Range	•Owned by USMC but scheduled by Georgia ANG •Available airspace limits tactical ordnance deliveries	•Rare species inhabit range	•Range road needs relocation to remove civilian traffic •Range expansion to north to accommodate GBU deliveries requires new lease
VACAPES Complex	•Laser designators a concern to surrounding community •Few tactical targets •Airspace limited; at FL205 minimally adequate for high-altitude bombing •Can support small scale air wing strike scenarios •Has a TACTS range	•Hunters encroach on range lands. •Navy Dare County Range surrounded by Alligator River NWR •Endangered red cockaded wood-pecker habitat	•Existing targets at Palmetto and Stumpy Points need repair and/or replacement •Navy Dare County Range owned by USAF, maintained by NC Forest Service
Gulf of Mexico Complex	•Range operations split between CNET (Dixie Target) and Texas ANG (Yankee Target)	•Threatened & endangered species inhabit range •Low level flight must be avoided in areas where migratory birds are known to feed	•Infrastructure requires upgrade or replacement •USAF currently considering a proposal to expand the land area of Yankee target
Meridian Complex	•No significant issues identified	•Hunters encroach on range lands •Endangered red cockaded woodpecker habitat	•No significant issues identified
West Coast Ranges/Range Complexes			
Camp Pendleton Complex	•Live ordnance authorized •Offers artillery bombardment, door gunner, CAS, and air wing training	•Increasing urban development sensitive to aircraft and artillery noise •Beaches separated from base by I-5, limiting access/egress points •Nuclear generating station/airspace off limits for training •Live ordnance use restricted during high fire threat conditions •Threatened & endangered species inhabit range	•No significant issues reported

Table 4-6

Summary of Operational Considerations and Issues at DoN Ranges

Range/Range Complex	Operational Considerations	Encroachment Issues	Infrastructure Issues
China Lake Complex	•Live ordnance authorized •MRTFB Complex except for Superior Valley Range •Accommodates high-altitude bombing •Opportunity for joint operations with adjoining Ft. Irwin	•Potential for air quality designation to limit airfield operations •Recreational users of Death Valley National Monument, Sequoia and Kings Canyon National Parks and Domeland and John Muir Wilderness Area are sensitive to aircraft noise from low flight operations •Threatened & endangered species inhabit range •Range contains extensive cultural resources; large portions of range yet to be surveyed	•No significant issues identified •Operational fleet must pay for support services provided by an NWCF site, except at the Superior Valley Range
El Centro Complex	•Airspace unavailable from FL 150 to 180 which limits flight and parachute drops	•Range areas are surrounded by public lands under BLM jurisdiction •Pressure exists to conduct geothermal exploration and development activities near R-2510	•Limited maintenance on access roads to range/target areas •Substantial ramp space for aircraft parking
Fallon Range Training Complex	•Live ordnance authorized •Accommodates high-altitude bombing, supersonic operations, and EW •Insufficient land for stand-off weapons deliveries •Expenditure of AGM-114 (Hellfire) missiles at B-17 and B-20 pending •Noise sensitive areas to be avoided include: Stillwater and Humboldt Wildlife Management Areas, Stillwater and Fallon NWRs, Sand Mountain Recreation Area, and Yomba Tribal Settlement	•Walker River Indian Reservation situated to south of B-16/B-19 •Potential for conflict due to growth of recreational development in Dixie Valley. Some residential growth pressures near Sheckler Reservoir •Range lands surrounded by areas of existing and potential mineral mining activities •Many cultural resources sites exist on the range lands	•No significant issues reported •Major need for EW systems (mobile) simulated or actual per Nov 98 Requirements Document •Lack of access roads for target construction and development at B-20
NWSTF Boardman Range	•Range in caretaker status •USAF/Oregon ANG considering adopting range	•Umatilla NWR north of range •Boeing/Inland Land Farming Venture is being developed west of range •Potlatch Corporation has planted trees in the range's avigation easement •Archaeological site and portion of Oregon Trail within range lands	•All range instrumentation removed
SCORE/SHOBA	•Live ordnance authorized (restricted during high fire threat conditions) •Multi-purpose range for air-to-ground, NFGS, amphibious, and coordinated air wing strike operations •Supports AGM-114 (Hellfire) firings on a case-by case basis •Supports night-time operations	•Threatened & endangered species inhabit range; operating hours reduced during Loggerhead Shrike breeding seasons (February to July)	•Many roads and living quarters in poor condition

Table 4-6

Summary of Operational Considerations and Issues at DoN Ranges

Range/Range Complex	Operational Considerations	Encroachment Issues	Infrastructure Issues
Twentynine Palms Complex	•Live ordnance authorized •Moratorium on release or firing of cluster munitions	•Cleghorn Lakes Wilderness Area south of complex •Threatened & endangered species inhabit range •Many cultural resource sites and other historic areas on range lands	•No significant issues reported
Yuma Complex	•Live ordnance authorized •Allows high altitude bombing •Flight corridor use is limited •No event reconstruction available except on TACTS range •Flight corridor usage limited in the Cabeza Prieta NWR	•22 Native American Tribes culturally affiliated with range land areas •Range includes 7 NWRs and 37 BLM designated Wilderness Areas. •Barry M. Goldwater range experiencing increased residential and commercial encroachment along I-8 •Proposed highway connector to Mexican border would pass through Barry M. Goldwater range •Threatened & endangered species inhabit range •Highly-flammable Minz cholla affects locations where incendiary ordnance can be used •Many cultural resource sites and other historic areas on range lands •Gold mining operations have already encroached on range lands at the R-2507 Chocolate Mountains Range.	•Ramp space at MCAS Yuma limits aircraft parking

Notes:
More detailed information on each range and range complex is available in Appendix D to this report and on the DoN Range Internet Website.

Chapter 5

Training Demand for Air-to-Ground Range Facilities

5 TRAINING DEMAND FOR AIR-TO-GROUND RANGE FACILITIES

Navy and Marine Corps fixed- and rotary- wing aircrew training progresses logically from basic to advanced-level coordination or battle group training. Basic and intermediate level training is achieved through adherence to the Navy's Training and Readiness (T&R) matrices, Marine Corps training manuals, and CNET syllabi, a structure that permits training demand to be readily quantified and predicted. This is important since completion of these prescribed training requirements must be achieved before aircrew and squadrons can move into advanced level or battle group training. Battle group training, on the other hand, has a stated goal, but the Fleet Commander is provided flexibility in how that stated goal is to be accomplished. Consequently, only basic and intermediate level training demand are addressed in this assessment.

In order to quantify basic and intermediate level training demand for air-to-ground range facilities and associated SUA for Navy and Marine Corps fixed- and rotary-wing aircrews, the analysis in this chapter expands upon the training demand tool that was developed during Phase III of the *DoN Air-to-Ground Range Needs Assessment.* The essential role of this predictive training demand tool was to forecast Fleet demand for DoN air-to-ground range capabilities and locations independent of any other goals or objectives. Furthermore, the same primary training elements introduced in Chapter 4 were used in developing the training demand tool. The demand for air-to-ground ranges and SUA as documented herein should be considered valid through the end of FY 2001. The addition of new or modified Navy/Marine Corps aircraft, weapons, and tactics to the DoN inventory, beyond those analyzed for this assessment, could change the demand for air-to-ground facilities and SUA as forecast in this assessment.

5.1 Overview of Analytical Methodology

Sources used to identify Navy and Marine Corps basic through intermediate level training demand included:

- *Draft Joint Commander, Air Forces, US Atlantic Fleet (CNAL)/Commander, Air Forces, US Pacific Fleet (CNAP) Squadron T&R Instruction* (Fall 1999);
- Volumes I and II of the *Marine Corps T&R Manual* (March 1999); and
- Selected *Air Wing Training Manuals* (F-14 and F/A-18).

Additionally, Chief of Naval Air Training (CNATRA) training requirements were provided by CNATRA (N3144). Training requirements for the Fleet Readiness Squadron (FRS) were provided by CNAL and CNAP. This printed information was supplemented by interviews with

CNAL, CNAP, NSAWC, and Marine Corps Headquarters representatives to collect and validate T&R requirements identified as requiring air-to-ground range facilities and SUA.

It is important to note that the original intent of DoN *Air-to-Ground Range Needs Assessment* was to present range demand for RDT&E activities in addition to tactical training demand. However, NAVAIR declined to participate in this study beyond providing basic data on T&E range capabilities (Hoag, May 26, 1998). Thus the focus of this assessment is on range demand to accommodate tactical training events.

The methodology used in preparing this analysis was as follows:

Step 1 Identify the types of air-to-ground range facilities and SUA demand information that could contribute to DoN planning and decision making and/or range facilities users.

Step 2 Using the results of the analysis conducted in Step 1, create an event analysis decision tree and database using the Navy/Marine *Corps T&R Manuals* for collecting and reporting the range facility and SUA demand information.

Step 3 Validate the methodology using the F/A-18 Hornet as the prototype platform.

Step 4 After successful methodology validation, repeat the process for each fixed- and rotary-wing platform in the DoN inventory.

5.2 Key Variables Influencing Training Demand

In order to quantify the demand for air-to-ground facilities and SUA, the basis for aircrew air-to-ground training and the environment within which the training would be accomplished was first evaluated. In completing this task, several key variables were identified that drive the type and timing of required air-to-ground training, including primary mission areas (which take into account the expected threat environment), aircrew training cycles, and aircrew manning. Each of these variables and how they fit into the analysis is described below in more detail.

5.2.1 Primary Mission Areas

All aircrew training is structured to allow aircrews to achieve proficiency in aircrew Primary Mission Areas (PMAs). These PMAs are related to warfare areas. For example, Strike Warfare (STW) is a PMA that requires demonstrated proficiency in overland tactics and weapons delivery. When an aircrew achieves qualification in the STW PMA, they are considered qualified

in the area of "Strike" warfare. The PMAs that could require range facilities and/or SUA support include:

- Amphibious Warfare (AMW);
- Anti-Air Warfare (AAW);
- Anti-Ship Warfare/Anti-Surface Ship Warfare (ASU/ASUW);
- Command and Control Warfare (C2W);
- Command, Control, and Communications (CCC);
- Intelligence (INT);
- Fleet Support Operations (FSO);
- Mine Warfare (MIW);
- Naval Special Warfare (NSW);
- Strike Warfare (STW); and
- Surface Warfare (SUW).

5.2.2 Aircrew Training Cycles

The Navy has developed a structured aircrew training Inter-Deployment Training Cycle (IDTC) that defines specific aircrew training demand. The IDTC is designed to provide an orderly increase in aircrew, squadron, and Carrier Air Wing (CVW) combat readiness (C) during a turnaround, with the highest state of combat readiness (C-1 or C-2) achieved coincident with the departure for a scheduled overseas deployment. This structured IDTC approach groups T&R events into readiness levels based upon their relative importance, complexity, and resource demand. The IDTC includes four phases (T-4 [basic] through T-1 [intermediate and advanced]).

During T-4, required training resources are normally minimal and a squadron may only have the ability and operations and maintenance (O&M,N) funding to fly basic "mobility" and selected core tactical events. More complex tactical events, which may also be core, generally occur later in the turnaround, when more supporting assets and O&M,N funding are available. For example, The F/A-18 Strike Fighter Advanced Readiness Program (SFARP), which is a concentrated air-to-ground and air-to-air training syllabi, would be conducted during IDTC Phase T-2. Similarly, a large-scale, integrated Battle Group event would be completed during IDTC Phase T-1. The demand for basic and intermediate level training during an entire IDTC (which would normally extend over a period of approximately 18 months) was analyzed for each fixed- and rotary-wing platform.

The Marine Corps does not have an IDTC, but their aircrew training process follows a building block approach. This process is referred to as the core "progression model." The following four phases of training may extend over a period of time as long as 36 months:

- Combat Capable Training;
- Combat Ready Training;

- Combat Qualification Training; and
- Full-Combat Qualification Training.

During each successive phase of training, the aircrew is exposed to training scenarios that are increasingly complex and demanding. For this assessment, only the demand associated with the first three phases of the core progression model (which normally extend over a period of 24 to 30 months) was analyzed for each fixed- and rotary-wing platform.

5.2.3 Aircrew Manning

Subchapter 5.2.1 introduced the concept of aircrews achieving individual combat readiness by demonstrated proficiency in assigned PMAs. Squadron combat readiness is, in turn, measured by the number of aircrews that have achieved individual combat readiness. The amount of air-to-ground training required for any type fixed- or rotary-wing platform squadron to achieve combat readiness is, therefore, dependent upon squadron aircrew manning. In order to predict effectively the demand for aircrew air-to-ground training, it is necessary to identify the number of times any T&R event must be completed in order to ensure that each aircrew member completes that event at least one time. For this report, that number is referred to as the completion factor.

The completion factor (as determined through discussions with Navy and Marine Corps representatives) varies among squadron platform types, depending upon squadron aircrew composition. All Navy and Marine Corps squadrons are manned by pilots. Some squadrons also have Naval Flight Officers (NFOs) assigned as weapons or EW employment specialists. For platforms that have a single crewmember (like the Navy's F/A-18C, which is manned by a single pilot), the completion factor is equal to the number of pilots assigned to the squadron. For other platforms that have aircraft manned by multiple pilots and/or pilots and NFOs, the completion factor is equal to the number of assigned NFOs or the number of formed aircrews. The completion factor for each type of fixed- and rotary-wing platform is identified in the tables presented in Appendix H.

The Navy and Marine Corps squadron aircrew manning levels for each type of fixed- and rotary-wing platform are presented in Tables 5-1 and 5-2. Sources of this information were:

- **Navy** - The data for Navy (Table 5-1) were obtained from Enclosure (24) of the *Joint CNAL/CNAP T&R Instruction* and during interviews with representatives from CNAL and CNAP. Enclosure (24) did not include the manning levels for an Unmanned Aerial Vehicle (UAV) squadron. UAV aircrew manning was provided by a representative from Fleet Composite Squadron Six (VC-6).

- **Marine Corps** - The data in the lower portion of Table 5-1 are as depicted in Volumes I and II of the Marine Corps *T&R Manual*, which were validated by a representative from Headquarters, Marine Corps.

Table 5-1

Navy and Marine Corps Aircrew Manning Levels Per Squadron

Platform	Number of Pilots	Number of NFO	Number of Crews
Navy Aircrew Manning			
E-2C	10	15	5
EA-6B (CVW)	6	18	6
EA-6B (Expeditionary)	6	18	6
EP-3	27	27	9
F-14	14	14	14
F/A-18A/C	17	0	17
H-46	50	0	25
MH-53	20	0	10
P-3	36	24	12
S-3	11	17	11
SH-60B	50	0	12
SH-60F/HH-60	20	0	10
UH-3	4	0	2
UAV	18	0	6
Marine Corps Aircrew Manning			
AH-1W	43	0	22
AV-8B	25	0	25
CH-46	28	0	14
CH-53	38	0	19
EA-6B	8	21	8
F/A-18D	19	19	19
UH-1N	23	0	12

Notes:
NFO = Naval Flight Officer.

Table 5-2

SNA and IUT Training Load

Aircraft Platform	Number of IUT's	Number of SNA's
T-45	36	301

Notes:
IUT = Instructor Under Training.
SNA = Student Naval Aviator.

- **CNATRA** - The CNATRA manning levels (Table 5-2) represent a typical one-year Student Naval Aviator (SNA) and Instructor Under Training (IUT) training load. They were provided by a CNATRA representative.

5.3 Analytical Assumptions

Certain assumptions were made in the development of the training demand tool that allowed a clearer definition of the methods used for data collection, verification, standardization, and presentation. Furthermore, the analysis was predicated on a demand scenario that was driven by Navy and Marine Corps mission needs -- to train to meet prevalent and uncertain threats to US security. Meeting these needs necessitates training at a maximum tempo. Thus, this assessment addresses the most conservative circumstances or most intense anticipated use of the air-to-ground ranges and associated SUA. Accordingly, these general assumptions were:

- The final assessment should be unclassified (only unclassified information was used).

- The compilation of the demands for Fleet (Navy/Marine Corps) aircrew T&R events and CNATRA air-to-ground training events included only those events that must be conducted within SUA associated with ranges located in the US.

- Training events that could be completed in SUA with or without an air-to-ground range facility (for example, Confined Area Landing and Terrain Navigation events) were assumed to use an air-to-ground range facility.

- Total demand for air-to-ground range facilities and/or SUA for a fixed- or rotary-wing platform squadron was assumed to represent the total range time required to complete all of that squadron's T&R events during a 12-month (360-day) period.

- Total range time required during a 12-month period (for any type platform squadron) was assumed to be a function of the amount of range time required to complete each T&R event one time multiplied by the number of times that each event must be completed within a 12-month period.

- The amount of range time required to complete each T&R event one time was computed based upon the planned flight time for that event. Deducted from the planned flight time for each event was an amount of time for take-off, transit to and from the range, and landing. The remaining flight time was considered air-to-ground range time. For example, if an event was programmed for 1.0 hours of flight time, 0.5 hours of range time were assumed; for an event that was programmed for 1.5 hours of flight time, 1.0 hours of range time were assumed.

- The number of times that any T&R event must be repeated in a 12-month period was assumed to be a function of the number of individuals (pilots or NFOs) or aircrews that must complete that T&R event and the currency period for that T&R event.

- The number of individuals (aircrew members or NFOs) or crews that must complete a given T&R event were as indicated in Tables 5-1 and 5-2.

- The currency period for any T&R event was based upon the information from the *Joint CNAL/CNAP T&R Manual* and Volumes I and II of the *Marine Corps T&R Manual*. For those CNATRA and FRS events not included in the T&R manuals, the information provided by representatives from CNATRA, CNAL and CNAP was used. The currency period determines the number of times each individual or aircrew must complete an event during a 12-month period by using the formula 360 days divided by the currency period. For example, it was assumed that an event with a currency period of 90 days would be repeated four times each year (360 divided by 90) by each individual or aircrew.

- The analysis represents the air-to-ground range facility and associated SUA demand for a single 12-month (360-day) period.

- The demand for air-to-ground range facilities and the associated SUA was depicted as a continuous and recurring demand, because at any given time, there will be squadrons (or training classes) of the same type platform at different phases of training (Figure 5-1, Example of Overlapping Training Phases, presents an example of three F/A-18 squadrons at different phases of training and deployment during the same timeframe).

- Based upon the immediately preceding assumption, an analysis of the air-to-ground range facilities and associated SUA demand for any defined 12-month period of time was assumed to provide an accurate representation of the past, present, and future demands for any 12-month period of time.

- The impact on total demand for air-to-ground range facilities and SUA for those T&R events that are flown simultaneously by two or more aircraft were reduced by dividing the amount of range time required to complete that T&R event one time by the number of aircraft participating in that single event.

- If a given event could be completed using either live or inert weapons, it was assumed that the weapons would be live.

- Although gun ammunition can be live or inert, it was assumed that all gunnery events require an air-to-ground range facility that allows the expenditure of live ordnance (see immediately preceding assumption).

- All air-to-ground missiles, GBUs, and PGMs, including the JDAM and JSOW families of weapons were assumed to be "stand-off' weapons.

- Stand-off weapons were assumed to be released at least 15 NM from the target and to require a high-altitude delivery profile, with "high-altitude" defined as 20,000 AGL and above.

- If an event could be completed during a day light or night time mission, it was assumed to be night time.

- EW support demands (EW I, EW II, EW III, and EW IV) were as defined by CNO (N889) in the *Tactical Training Range Roadmap* (July 1995).

Assumptions specific to operations conducted by Navy aircrews were:

- Requalification frequency for each event was assumed to be equal to the requalification frequency for an "L1" (least experienced) pilot.

- It was assumed that ASU events could be completed using an overland range facility.

- Aircrew manning is considered to be at 85 percent of M+1 (Table 5-1).

Assumptions specific to operations conducted by Marine Corps aircrews were:

- The Marine Corps training flow was assumed to be similar, but not identical to the Navy IDTC phases (T4, T3, T2, and T1).

- In order to standardize the Marine Corps and Navy IDTC phases, Marine Corps training events were reported as follows: "100" series were equal to Navy T4 events, "200" series were equal to Navy T3 events, and "300" series were equal to Navy T1 events.

- Training demands for CH-53D and CH-53E were consolidated and reported as CH-53.

- Some Forward Air Controller (FAC) and Combat Arms Coordination and Control (CACC) missions require a "live ordnance" range (even though the aircraft are

not carrying any ordnance) because other training participants (i.e., ships, artillery, etc.) will be expending live ordnance.

- Pilot manning is equal to the manning levels depicted in Table 5-1.

5.4 Training Demand Database

The basic through intermediate level training demand database was developed using the sources of training information for tactical fixed- and rotary-wing platforms previously identified (*CNAL/CNAP T&R Instruction*, *Wing Training Manuals*, Marine Corps *T&R Manual*, and CNATRA and FRS training events). These sources were subjected to an initial screening process in order to identify candidate training events (e.g., a fixed- or rotary-wing training sortie) requiring an air-to-ground range facility and associated SUA. The information for each candidate training event selected during the screening process was parsed as indicated in Figure 5-2 (Methodology Used for Populating Database Elements). The example used in Figure 5-2 is for the Navy F/A-18 training event STW 52-10 that appears in Table H-7 in Appendix H. STW 52-10 is single sortie (event SF-10; Division Target Acquisition) flown during the Strike Fighter Advanced Readiness Program (SFARP), which appears in the *Joint CNAL/CNAP T&R Manual* as event STW-52.

Training sorties that qualified for inclusion in the training demand database (i.e., sorties that required or could use an air-to-ground range facility) were input to a Microsoft Access database. Table 5-3 provides a description of the database elements (pertinent database field names, data types, and descriptions) that have subsequently been used for compiling the range facility and/or SUA demand reports. The training demand database contains a total of 521 events and is presented in Appendix H.

5.5 Demand For Air-to-Ground Range Facilities and SUA

The demand by fixed- and rotary-wing platforms for air-to-ground ranges and associated SUA was identified in the course of analysis and is presented in Appendix H. Each of the tables in Appendix H shows specific air-to-ground range facility demands generated by aircrew training demand for a single squadron of that type platform during any 12-month period. For example, Table H-2 (E-2C Range Facility Demands) represents the 12-month air-to-ground range facility demands generated by a single E-2C squadron. A summary of the 12-month air-to-ground range facility demands as detailed in Appendix H is presented in Table 5-4.

Table 5-3

Description of Database Elements

Field Name	Data Type	Description
T-Level	Text	Lists the recommended phase in training (1, 2, 3, 4, or F), where: 1=IDTC level 1, 2=IDTC level 2, 3=IDTC level 3, 4 =IDTC level 4, and F=FRS CNATRA events have no T-Level assigned
T&R Event	Text	The event code used in the T&R Instruction, T&R Manual, Wing Training Manual, or FRS/CNATRA syllabus.
Completion Factor	Number	Whole number that equals the minimum number of times an event must be completed in order to ensure all aircrew have completed the training. The completion factor assures each individual aircrew achieves the same level of combat readiness during IDTC.
Currency Period L1	Number	Whole number that identifies the number of days after completing the event that the qualification will expire for a pilot at the lowest experience level (L1).
No. of Reflies/Repeats for Each Event	Number	Number that identifies the number of times each calendar year the event must be repeated. Computed using the formula: 360 ÷ Currency Period L1.
Number of Aircraft/Event	Number	Whole number that indicates the minimum number of aircraft that are required on that event to complete that event during a single range period.
Total Demand for Each Event	Number	Whole number that equals the total number of times the event will be completed during a 12-month period. Computed by the formula: Completion Factor ÷ Number of Aircraft/Event x No. of Reflies/Repeats for each event.
Time on Range	Number[1]	Indicates the length of time (in hours and tenths of hours) that range facility support is required to complete the event a single time.
Total Range Time Overland	Number[1]	Total time (in hours and tenths of hours) that overland range facility support is required. Computed by the formula: Total Requirement for each Event x Time on Range.
Range Time EW I	Text	Yes or No, where Yes indicates that EW I support is required.
Range Time EW II	Text	Yes or No, where Yes indicates that EW II support is required.
Range Time EW III	Text	Yes or No, where Yes indicates that EW III support is required.
Range Time EW IV	Text	Yes or No, where Yes indicates that EW IV support is required.
Range Time Live Ordnance Expenditure	Text	Yes or No, where Yes indicates that a range facility supporting live ordnance expenditure is required.
Range Time Chaff Expenditure	Text	Yes or No, where Yes indicates that a range facility supporting chaff expenditure is required.
Range Time Flares Expenditure	Text	Yes or No, where Yes indicates that a range facility supporting flares expenditure is required.

Table 5-3

Description of Database Elements

Field Name	Data Type	Description
Range Time High-Altitude Airspace	Text	Yes or No, where Yes indicates that a range facility supporting high-altitude ordnance expenditure is required.[2]
Range Time TACTS	Text	Yes or No, where Yes indicates that a TACTS range is required.
Range Time Air-to-Ground Guns Expenditure	Text	Yes or No, where Yes indicates that a range facility supporting air-to-ground gunnery is required.
Range Time Air-to-Air Guns Expenditure	Text	Yes or No, where Yes indicates that a range facility supporting air-to-air gunnery is required.
Range Time Stand-off Weapons Expenditure	Text	Yes or No, where Yes indicates that a range supporting stand-off weapons[3] delivery is required.
Range Time Air-to-Ground Missiles Expenditure	Text	Yes or No, where Yes indicates that a range supporting air-to-ground missile expenditure is required.
Range Time PGM Expenditure	Text	Yes or No, where Yes indicates that a range supporting expenditure of PGMs is required.
Range Time Air-to-Air Missiles Expenditure	Text	Yes or No, where Yes indicates that a range supporting expenditure of air-to-air missiles is required.
Range Time Laser-Safe Range	Text	Yes or No, where Yes indicates that a range supporting the use of laser ranging/designating is required.
Range Time Range Scoring	Text	Yes or No, where Yes indicates that a range providing instrumented or manual scoring is required.
Range Time Cluster Weapons Expenditure	Text	Yes or No, where Yes indicates that a range supporting cluster munitions expenditure is required.
Range Time Air-to-Ground Rocket Expenditure	Text	Yes or No, where Yes indicates that a range supporting air-to-ground rocket expenditure is required.
Range Time Practice Bomb Expenditure	Text	Yes or No, where Yes indicates that a range supporting practice bomb expenditure is required.
Range Time General Purpose Bomb Expenditure	Text	Yes or No, where Yes indicates that a range supporting inert and/or live general purpose bombs expenditure is required.
Range Time Overland Supersonic Flight	Text	Yes or No, where Yes indicates that a range supporting supersonic flight is required.
Time on Range for Night-time Operations	Text	Yes or No, where Yes indicates that a range supporting non-daylight operations is required.
Platform Total	Number[1]	A single calendar year requirement; it represents the Total Range Time Overland required by a single squadron of that type fixed- or rotary-wing platform to support documented training demand.

Notes:
1. Time is represented by hours, rounded to the next highest tenth of an hour.
2. High-altitude airspace is defined to be above 20,000 ft AGL.
3. Stand-off weapons delivery is defined as weapons release/simulated weapons release at least 15 NM from the target. Stand-off weapons include AGM and GBUs, where GBUs include the family of PGMs.

Table 5-4

Summary of Range Facility Demands

Service/Platform	Range Time Overland	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flares Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser-Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-time Operations	Overland Range Time (12-Months)
Navy																									
E-2C	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	270.0
EA-6B (CVW)	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	524.7
EA-6B (Expeditionary)	Yes	No	Yes	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	417.6
EP-3E	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	144.0
F-14	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	732.0
F/A-18	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1225.7
H-46	Yes	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	12.5
MH-53E	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	89.6
P-3C	Yes	No	No	No	No	No	No	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	144.0
S-3B	Yes	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	No	Yes	Yes	No	Yes	262.9
SH-60B	Yes	No	Yes	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	No	45.6
SH-60F/HH-60	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	Yes	619.0
UH-3	Yes	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	3.0
UAV	Yes	No	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	51.0
Marine Corps																									
AH-1W	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	Yes	No	Yes	No	No	No	Yes	615.2
AV-8B	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	1240.8
CH-46	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes	545.1
CH-53	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	1358.5
EA-6B	Yes	No	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	400.0
F/A-18	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	1378.8
UH-1N	Yes	No	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	924.6
CNATRA																									
T-45	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	1020.8
FRS																									
F-14	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	566.3
F-18 A/B/C/D	Yes	No	No	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	No	No	Yes	Yes	No	Yes	1329.5
S-3B	Yes	No	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	Yes	Yes	No	Yes	320.9

Importantly, based on the information contained in Appendix H, it can be concluded that:

> The total 12-month air-to-ground range facility demand to support aircrew basic through intermediate level training demand for all squadrons of any type platform may be computed by multiplying the demand generated by that platform (last column in Table 5-4) by the total number of active squadrons of that type platform.

5.5.1 Critical Training Elements and Demand for Air-to-Ground Ranges

Demand for each of the critical training elements (EW III and IV, live ordnance, chaff expenditure, stand-off weapons, overland supersonic operations, night-time operations) was quantified and shown in Appendix H (and Table 5-5 provides similar analyses for each of the training elements not identified as critical) A summary of key observations for each of the critical training elements follows:

- **EW** (demand for this critical training element was broken down by EW level):
  - EW III training, which provides the aircrew with a realistic threat presentation, normally occurs during the Navy T3 and T2 phases and Marine Corps Combat Ready and Combat Qualification phases. Three Navy platforms (EA-6B CVW, F-14 [Fleet squadron and FRS], and F/A-18 [Fleet squadron]) and all Marine Corps platforms (except the AV-8B and UH-1N) require an overland range that can provide some EW III support.
  - EW IV training provides the aircrew with the most realistic and coordinated threat presentation and normally occurs during the Navy T2 and T1 phases and the Marine Corps Combat Qualification phase. Five Navy platforms (EA-6B CVW, EP-3E, F-14 [Fleet squadron], S-3B, and SH-60F/HH-60) and only one Marine Corps platform (AH-1W) require an overland range that can provide some EW IV support.
- **Live Ordnance Expenditure** - The ability to train with live ordnance is considered indispensable to Fleet aircrew and maintenance personnel training. With the introduction of more capable and expensive ordnance (e.g., GBUs and PGMs) and improvements in ground-based training and airborne weapons simulators, there is a perception by some that expenditure of live ordnance is less important than in the past. However, this perception overlooks the positive impact on combat readiness when training involves use of live ordnance. For some weapons, the only way to conduct an end-to-end evaluation of the complete

Table 5-5

Air-to-Ground Range Facility Demands for Non-Critical Training Elements

Demand Element	Analysis
Flares Expenditure	Most tactical fixed- and rotary wing platform aircrews require the ability to expend flares in conjunction with air-to-ground and air-to-air weapons training in environments that simulate the presence of ground-/air-launched IR missiles. Some platforms also use parachute flares to provide target illumination for night air-to-ground weapons delivery. Six Navy platforms (EA-6B CVW, F-14 [Fleet squadron and FRS], F/A-18 [Fleet squadron], S-3B, SH-60B, and SH-60F/HH-60) and all Marine Corps platforms require a flare-capable range.
High-Altitude Airspace	High-altitude has been defined as platform ingress and weapons release/simulated weapons release at or above 20,000 feet AGL. All stand-off weapons deliveries (e.g., AGMs and GBUs) require the delivery platform to be at high-altitude. It was also assumed that air-to-air tactics conducted in on overland environment would also require high-altitude airspace. Seven Navy platforms (EA-6B CVW, EA-6B Expeditionary, F-14 [Fleet squadron], F/A-18 [Fleet squadron and FRS], P-3C, SH-60B, and UAV) and a single Marine Corps platform (F/A-18) require an overland range that can provide some level of support for high-altitude operations.
TACTS	TACTS is the most capable training asset available for aircrew training, allowing for real-time tracking (in three dimensions), simulated weapons employment, simulated "kill" removal, and complete event reconstruction and replay for debriefing. Not all platforms are capable of carrying the TACTS airborne instrumentation pod. Three Navy platforms (F-14 [Fleet squadron and FRS], F/A-18 [Fleet squadron], and the SH-60F/HH-60) and all Marine Corps platforms (except the Ch-46 and CH-53) require TACTS range support.
Air-to-Ground Guns Expenditure	Air-to-ground gunnery ammunition comes in many forms (e.g., Training Projectile [TP], Armor Piercing [AP], or High Explosive Incendiary [HEI]) and many 'sizes' (from .50 caliber to 40 mm). This analysis assumes that all air-to-ground gunnery events that require an overland range also require a range that is live ordnance capable. Five Navy platforms (F-14 [Fleet squadron], F/A-18 [Fleet squadron and FRS], H-46, SH-60F/HH-60, and UH-3) require a range that will support air-to-ground gunnery events and all Marine Corps platforms (except the EA-6B) require a range that will support air-to-ground gunnery events.
Air-to-Air Guns Expenditure	Air-to-air gunnery ammunition also comes in the TP, AP, and HEI forms and in various "sizes." The Navy conducts almost all air-to-air gunnery training in over-water Warning Areas. There are, therefore, no Navy platforms that require an overland range to support air-to-air gunnery training. Only the Marine Corps F/A-18 requires overland air-to-air gunnery range support.
Air-to-Ground Missiles Expenditure	Air-to-Ground Missiles include the AGM-65 Maverick, AGM-84 Harpoon, AGM-88 HARM, AGM-114 Hellfire, AGM-119 Penguin, AGM-122 Sidearm, AGM-154 (JSOW), and the Stand-off Land Attack Missile (SLAM). A training event that requires AGM release or simulated AGM release is also considered a high-altitude and stand-off weapon training event. Five Navy platforms (EA-6B CVW, F/A-18 [Fleet squadron], P-3C, SH-60B, and SH-60F/HH-60) and three Marine Corps platforms (AH-1W, AV-8B, and F/A-18) require a range that will support AGM training events.
Precision-Guided Munitions Expenditure	PGMs include the family of GBUs, the Laser-Guided Training Round (LGTR), and JDAM. GBUs and JDAM are MK-80 series general purpose bombs fitted with precision guidance kits. Only two Navy platforms (F-14 [Fleet squadron] and F/A-18 [Fleet squadron and FRS]) and the Marine Corps' AV-8B and F/A-18 platforms require a range that will support PGM expenditure.

Table 5-5

Air-to-Ground Range Facility Demands for Non-Critical Training Elements

Demand Element	Analysis
Air-to-Air Missile Expenditure	There are a limited number of air-to-air missiles available for expenditure in support of Fleet training or Follow-on Test and Evaluation (FOT&E). In general, aircrew assigned to air-to-air capable platforms should expect to expend no more than two or three air-to-air missiles in their entire career. The Navy conducts all air-to-air missile training in over-water Warning Areas. Only the Marine Corps F/A-18 requires an overland range facility that can provide some level of support for air-to-air missile expenditure.
Laser-Safe Range	Laser capable range facilities are required for LGTRs and GBUs and guns equipped with laser aiming devices. Four Navy platforms (F-14 [Fleet squadron], F/A-18 [Fleet squadron and FRS], SH-60B, and SH-60F/HH-60) and four Marine Corps platforms (AH-1W, AV-8B, CH-46, and F/A-18) require a range facility authorized for the laser system to be employed.
Range Scoring	A "scored" range facility includes a manned facility that provides manual scoring feedback or a facility equipped with an automatic scoring system. This analysis does not attempt to make a distinction between the demand for manual or automated scoring support. Seven Navy platforms (F-14 [Fleet squadron and FRS], F/A-18 [Fleet squadron and FRS], H-46, S-3B [Fleet squadron and FRS], SH-60B, SH-60F/HH-60, and UH-3). All Marine Corps platforms (except the EA-6B) and the CNATRA T-45 require range scoring facilities.
Cluster Weapons Expenditure	Cluster weapons include the family of weapons that pack (or "cluster") many smaller munitions within a larger weapon shell. The larger weapon shell is designed to open at some predetermined altitude above the ground to allow the submunitions to be dispersed, thereby achieving a large weapon impact footprint. Cluster weapons also include 'specialty' weapons, like the Fuel Air Explosive (FAE). Only three Navy platforms (F-14 [Fleet squadron], F/A-18 [Fleet squadron], and S-3B [Fleet squadron and FRS] and the Marine Corps AV-8B require a range facility that will support cluster weapons expenditure.
Air-to-Ground Rocket Expenditure	The 2.75-inch Folding Fin Rocket (FFR) and 5.0 inch rockets are the only air-to-ground rockets in use today. These rockets are typically equipped with high explosive (HE) or White Phosphorous (WP) warheads. The WP rockets are used in the Forward Air Controller (FAC) mission to "mark" targets for engagement by other weapons delivery platforms. Only the Navy F/A-18 (Fleet squadron) and three Marine Corps platforms (AH-1W, F/A-18, and UH-1N) require supports for air-to-ground rocket expenditure.
Practice Bomb Expenditure	Practice bombs are inert weapons. They represent the largest family of bombs. Many/most practice bombs are typically smaller than live ordnance. Many types of practice bombs are equipped with a small smoke charge that detonates upon impact with the ground in order to mark the bomb's point of impact. Only three Navy platforms (F-14 [Fleet squadron and FRS], F/A-18 [Fleet squadron and FRS], and S-3B [Fleet squadron and FRS]), two Marine Corps platforms (AV-8B and F/A-18), and the CNATRA T-45 require a range facility that supports expenditure of practice bombs.
General Purpose Bomb Expenditure	General purpose bombs may be "live" or inert. The "live" rounds will contain between 100 and 945 pounds of high explosive. The inert bombs are filled with some inert material (often cement) that ensures the weight, drag, and aerodynamic flight of the bomb replicates the weight, drag and aerodynamic flight of the "live" bombs. Many general purpose bombs can be converted to PGMs by the addition of a guidance package (laser seeker or Paveway kit, for example). For this assessment, the general purpose family of bombs also includes the MK-77, which is a bomb filled with Napalm. Only three Navy platforms (F-14 [Fleet squadron and FRS], F/A-18 [Fleet squadron and FRS], and S-3B [Fleet squadron and FRS]) and the Marine Corps AV-8B and F/A-18 require a range that supports the expenditure of general purpose bombs.

weapons system -- man, machine (ship and aircraft platform), and weapon -- is to handle and expend a "live" version of that weapon. In addition, training evolutions involving live ordnance allow aircrew and maintenance personnel to experience and manage the increased demands and stress of using live ordnance under controlled conditions, rather than having their first exposure to this environment occur during a real combat situation. Consequently, this analysis assumes that live ordnance range support would be required for:

- any event that stipulated "live ordnance;"
- any event that offered the options for "live or inert;" and
- for all air-to-ground gunnery events.

The Navy platforms requiring an overland range that can provide some level of live ordnance support include the F-14 (Fleet squadron and FRS), F/A-18 (Fleet squadron and FRS), H-46, S-3B (Fleet squadron and FRS), SH-60F/HH-60, UH-3, and UAV. All Marine Corps platforms, except the EA-6B, require an overland range that can provide some level of live ordnance support.

- **Chaff Expenditure** - Most tactical fixed-wing and rotary-wing platform aircrews require the ability to expend chaff in conjunction with EW training. Seven Navy platforms (EA-6B CVW, F-14 [Fleet squadron and FRS], F/A-18 [Fleet squadron and FRS], MH-53E, S-3B, SH-60B, and SH-60F/HH-60) and all Marine Corps platforms require a chaff-capable range.

- **Stand-off Weapons Expenditure** - Stand-off weapons were defined as those weapons where actual or simulated weapons release occurs at least 15 NM from the target. Seven Navy platforms (EA-6B CVW, EA-6B Expeditionary, F-14 [Fleet squadron], F/A-18 [Fleet squadron and FRS], P-3C, SH-60B, and SH-60F/HH-60) require an overland range that can provide some level of stand-off weapons training support. The Marine Corps F/A-18 also requires this support.

- **Overland Supersonic Flight** - There are only two Navy platforms (F-14 [Fleet squadron] and F/A-18 [Fleet squadron]) and one Marine Corps platform (F/A-18) that are capable of supersonic flight and require an overland range facility that supports supersonic flight profiles. There are other Navy aircraft capable of supersonic flight, but these aircraft are assigned to "aggressor" squadrons and are used only in a training support role. The T&R demand associated with aircrew assigned to these "aggressor" squadrons is not addressed in this analysis.

- **Night-time Operations** - The evolution of tactics development has seen a significant increase in the use of non-daylight hours for the delivery of air-to-ground weapons. Night tactics are designed to take advantage of the family of low-light level vision enhancement devices (for example, forward-looking

infrared [FLIR] and night vision goggles) available to US forces. Night tactics are also employed to increase the fixed- and rotary-wing platforms' survivability by minimizing the potential for engagement of these platforms by visually-cued weapons. An equally important advantage of night tactics is the probability of Fleet fixed- and rotary-wing platforms encountering defensive forces that are less alert than the forces that would be encountered during a daylight raid. Seven Navy platforms (EA-6B CVW, EA-6B Expeditionary, F-14 [Fleet squadron], F/A-18 [Fleet squadron and FRS], P-3C, S-3B [Fleet squadron and FRS], and SH-60F/HH-60) require an overland range facility that will support night tactics and weapons employment. All Marine Corps platforms require an overland range facility that will support night tactics and weapons employment.

5.5.2 Air Wing Training Demands

The Navy warfighting doctrine is based upon the use of the aircraft assets assigned to carrier air wings (CVWs). Aircrew training and the IDTC are designed to ensure individual pilots and aircrew hone their warfighting skills first in their own platforms and then as an element of an integrated CVW. It makes sense, therefore, to look at the 12-month demand for air-to-ground range facilities and associated SUA that will be generated by the assets assigned to a typical CVW. A summary of the 12-month demand for air-to-ground range facilities and associated SUA that would be generated by a typical deployable Navy CVW is presented in Table 5-6. Importantly, the total air-to-ground range facility demand for this period would be approximately 6,100 hours.

5.6 Summary

The Carrier Battle Group (CVBG), as the Navy's standard organization of combat forces and their assigned personnel, is a principle element of our national power projection capability. Similarly, the Amphibious Ready Group (ARG)/Marine Expeditionary Unit (MEU), which provides the nation's forward deployed rapid crisis response capability, must be prepared to conduct conventional, amphibious, and selected maritime special operations. The primary objective in building the CVBG and ARG/MEU character and composition is to provide commanders with adequately balanced capabilities to deal with a variety of present and future threats.

The IDTC process (described in Subchapter 5.2.2) is dedicated to the certification of the Navy and Marine Corps fixed- and rotary-wing aircrews' demonstrated competence through basic, intermediate, and advanced training phases. The T&R matrices and training manuals provide specific basic and intermediate event description and completion criteria that ensure aircrew preparation for participation in advanced level (Battle Group) training. The T&R matrix and

Table 5-6

Generic CVW Range Facility Demands

Squadron	Range Time Overland	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flare Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser-Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-time Operations	Overland Range Time (12-Months)
E-2C	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	270.0
F-14	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	732.0
F/A-18	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1225.7
F/A-18	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1225.7
F/A-18	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	1225.7
EA-6B (CVW)	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	524.7
S-3B	Yes	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	Yes	No	Yes	Yes	No	Yes	262.9
SH-60F/HH-60	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	Yes	619.0
																								Total 12 month Overland Range Time Requirement	6085.7

training manual events that are part of phases T2 and T1 of the IDTC present the aircrew with increasingly complex intermediate training scenarios. Completion of these training scenarios prepares individual squadron aircrew and maintenance personnel and the CVW (collectively) for participation in the culmination of the IDTC advanced (Battle Group) level training -- the Composite Unit Training Exercises (COMPTUEX) and Joint Task Force Exercise (JTFEX) -- which is the final phase in predeployment training. In order to fully quantify air-to-ground range and associated SUA demand, a method for capturing the *advanced level training* (i.e., JTFEX or COMPTUEX) demand will need to be developed. In addition, surge capacity required for wartime throughput should also be addressed.

The results of this analysis indicate a demand for air-to-ground facilities and SUA to support Navy and Marine Corps aircrew *basic through intermediate level training*. Although the demand for this support varies by service, aircraft platform type, and phase of IDTC, the demand analysis documented in this assessment can be used by Navy and Marine Corps leadership to make informed decisions concerning air-to-ground range facilities, SUA, and aircraft basing strategies.

Chapter 6

Conclusions and Recommendations

6 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis presented in Chapters 2 through 5, this chapter identifies conclusions and recommendations. Both conclusions and recommendations are organized in the same order as the report: data collection/internet website, range utilization, range capabilities, and training demand.

6.1 Conclusions

6.1.1 Data Collection/Internet Website

- Definitive range boundaries data are not readily available for some ranges or are difficult to translate from original survey data (e.g., there is a lack of accurate coordinates).

- Range manuals provide the primary source of information on range capabilities but existing DoN range manuals differ in content and are not consistently formatted. This lack of consistency makes it difficult to read and verify essential information, particularly when attempting to determine specific types of ordnance that can be fired or released at a range. Further complicating this issue is that the range manuals are available to the public who could have negative perceptions of the reasons for these inconsistencies.

6.1.2 Range Utilization

- Existing data collection mechanisms are capable of collecting data on basic elements (such as hours scheduled, hours utilized, and cancellations, etc.). The information, as it is currently collected, does not, however, provide insight into the actual pattern of usage during a typical range day (i.e., do users primarily schedule mid-mornings and mid-afternoons or how many operations occur during evening or nighttime hours?).

- Historical utilization data available for a range does not necessarily reflect its value for training. Available utilization data appear to reflect range geographical location (i.e., proximity to user airfields) and restrictions or limitations on range use due to encroachment by non-range uses, environmental compliance issues, current events, or other factors not in the control of the range or range users.

- CNAP and CNAL have agreed to move toward a common range utilization reporting system (TRIMS).

6.1.3 Range Capabilities

6.1.3.1 General Conclusions

- The DoN air-to-ground range infrastructure (targets, facilities, range area, and SUA) available on the West Coast is significantly better and more capable of supporting required air-to-ground training demand than is the DoN air-to-ground infrastructure available on the East Coast.

- There is no single DoN air-to-ground range that supports every required aircrew training element.

- The use of live weapons during training is essential to combat readiness. It provides end-to-end experience with the procedures for managing, storing, handling, and employing live weapons. Moreover, training with live ordnance permits full systems verification and validation by all levels of the operational chain of command. Of the 16 DoN ranges that support expenditure of general purpose bombs, 69 percent authorize expenditure of live general purpose bombs. Of these, five ranges are on the East Coast and six ranges are on the West Coast. However, the expenditure of live ordnance is severely limited at each of the East Coast ranges:

  – ***AFWTF Inner Range*** - This range has a documented capability of offering the broadest extent of authorized live ordnance (including cluster weapons). However, the range is currently closed to live ordnance training and its continued future use for live ordnance expenditure is uncertain.

  – ***Bloodsworth Island Shore Bombardment and Bombing Range*** - Although the expenditure of live general purpose bombs (up to 100 lbs net explosive weight [NEW] or MK-81) is authorized at this range, the current and future availability of this range asset is uncertain with scheduling suspended until further notice.

  – ***Cherry Point Complex*** - BT-9 is only authorized for the expenditure of live ordnance up to 100 lbs NEW (MK-81).

  – ***Quantico Complex*** - The range at Quantico is only authorized for the expenditure of live ordnance up to 192 lbs NEW (MK-82).

  – ***Jacksonville Complex (Pinecastle Range)*** - Pinecastle range is authorized for live ordnance expenditure up to 192 lbs NEW (MK 82) and is severely limited in what it can tactically support due to delivery restrictions and a periodic fire index moratorium.

- Electronic Warfare Training capabilities available on each coast are summarized as follows:

  - EW I and II training are readily available at existing ranges on both the East and West coasts.

  - EW III training capability is concentrated on the West Coast.

- There is no single DoN range complex that supports EW IV training. However, when the capabilities of multiple ranges are integrated to support JTFEX, as has been proposed by CINCLANTFLT and CINCPACFLT for the East and West Coast littoral warfare complexes, the combined participating complexes could present a virtual EW IV capability.

- Actual or simulated release of stand-off weapons requires the same amount of airspace.

- DoN ranges have limited capability to support the expenditure of standoff weapons and 40 percent of this capability concentrated at the T&E ranges.

- The limited capability to support stand-off weapons training (actual expenditure or simulated release) results in an insufficient range capability to expend air-to-ground missiles. In fact, only 20 percent of the ranges support expenditure of air-to-ground missiles. The only range on the East Coast that supports air-to-ground missiles expenditure is Patuxent River, a T&E range. Of the three ranges on the West Coast (China Lake, Twentynine Palms, and Yuma), China Lake is a T&E range.

- Night-time operations are supported at 90 percent of DoN air-to-ground ranges.

- The capability to expend basic PGMs (e.g., laser-guided bombs and LGTRs) is supported at 80 percent of DoN air-to-ground ranges, two of which are T&E ranges.

- Four DoN air-to-ground ranges (20 percent) can support the expenditure of cluster munitions. Of these four ranges, two are T&E ranges and the others are the AFWTF Inner Range and Chocolate Mountain (Yuma Complex).

- Scoring capability exists at 70 percent of DoN ranges, mainly in form of WISS. There is a correlation between scoring capability and range utilization.

- East Coast ranges are substantially smaller than the West Coast ranges in terms of geography and airspace.

- Some of the most capable ranges are the T&E ranges operated by NAVAIR. However, these ranges are operated as NWCF sites and scheduling of Fleet training is difficult due to the variability of T&E requirements. Thus, Fleet operating units would not be guaranteed use of these facilities on a regularly scheduled basis.

6.1.3.2 East Coast Range Conclusions

- No single East Coast range supports all six of the critical training elements as defined in this assessment (Chapter 4).

- There is insufficient DoN air-to-ground range infrastructure on the East Coast to support all required air-to-ground training requirements for East Coast squadrons. The most significant shortfall is in the ability to support the high-altitude operations, stand-off weapons expenditure, and overland supersonic flight training elements.

- East Coast squadrons compensate for the existing East Coast range shortfalls through the use of training detachments to West Coast ranges. This practice to achieve documented and necessary training is detrimental to the quality of life of DoN personnel by contributing to excessive family separations.

- During advanced level training exercises, it is essential that all participating assets of the Carrier Battle Group (CVBG) be in the same place, exercising and honing warfighting skills from “magazine-to-target.” Simply shifting East Coast aircrew training to the West Coast would be counter to achieving this vital training need as Atlantic-based CVBG would not be available to provide for concurrent training.

- There is currently limited overland supersonic capability on the East Coast (Patuxent River) and given existing airspace constraints, it is unlikely that additional capability will be realized in the near future.

- Only two ranges on the East Coast can support chaff expenditure (Cherry Point and Patuxent River).

- The airspace at most of the East Coast ranges barely exceeds the minimum 20,000 ft AGL criteria for high-altitude bombing capability. This capability is essential for supporting training involving standoff weapons.

- The combination of range land and airspace capacity, in combination with live fire capability, makes the AFWTF Inner Range unique on the East Coast. While there are five East Coast ranges that can support expenditure of live ordnance,

four of these ranges (Bloodsworth Island [not being scheduled until further notice], Cherry Point, Pinecastle, and Quantico) are severely limited as previously discussed in Subchapter 6.1.3.1. Other differences also exist between AFWTF Inner Range and the other four ranges (airspace, land space, activity approval, etc.) that affect their respective capabilities to support different levels of activity (e.g., numbers of aircraft, tactics, etc.).

- Population densities on the East Coast are higher than on the West Coast. As a result, East Coast ranges are experiencing greater encroachment by civilian land uses. This is a problem at the VACAPES, Cherry Point, and Camp Lejeune complexes, where seasonal and retirement community development has substantially increased in the past decade. Seasonal residents and retirees are not especially tolerant of aircraft noise disturbances.

6.1.3.3 West Coast Range Conclusions

- Three West Coast ranges (China Lake, Twentynine Palms, and Yuma) can support all six of the critical training elements as defined in this assessment (Chapter 4).

- There is sufficient DoN air-to-ground range infrastructure on the West Coast to support all required air-to-ground training requirements for West Coast squadrons.

- Seven West Coast ranges support high-altitude airspace and five support the expenditure of standoff weapons. It should be reiterated that regardless of whether live or simulated release of stand-off weapons is performed, the same amount of airspace is required.

- Encroachment issues on the West Coast involve urbanization and general population growth, Native American, mining, and environmental interests. The final resolution of these issues has the potential to impact the quality of training on ranges.

- Expansion or modification of West Coast range lands in many cases involves public land. Such actions may require coordination with the Bureau of Land Management (BLM). When NEPA documentation is needed, BLM serves as a co-operating agency.

- NAS Lemoore currently uses China Lake's Superior Valley range, about 140 NM from the air station, as a backyard range. COMSTRKFIGHTWINGPAC is investigating the use of Ft. Hunter-Ligget, significantly closer (about 67 NM)

from the air station, as a possible target location for expenditure of practice bombs.

6.1.4 Training Demand

- Demand for DoN air-to-ground ranges and SUA to support basic through intermediate aircrew training (as documented in this assessment) is valid through the end of FY 2001 for fixed- and rotary-wing aircraft and UAVs.

- The analysis of aircrew basic through intermediate level training demand for air-to-ground range facilities is made easier through the use of the Joint CNAL and CNAP *T&R Manual,* the Marine Corps Training Manual and the CNET syllabi.

- The DoN air-to-ground range infrastructure supports aircrew training in all PMAs.

- The existence of a structured IDTC allowed the identification and prediction of a 12-month demand for air-to-ground range facilities to support aircrew basic through intermediate level training.

- A total of 20 training elements for measuring aircrew training demands and air-to-ground range training capabilities were identified. Six of these training elements (EW, live ordnance expenditure, chaff expenditure, stand-off weapons training, overland supersonic flight, and night-time operations) were identified as critical training elements because of their importance in developing and refining real-world tactics.

- Most support for the critical training elements is required during the final phases of IDTC, specifically T2 and T1.

- This assessment articulates a procedure to calculate the number of range hours necessary to support each platforms' training proficiency requirements:

  - The total 12-month air-to-ground range facility demand to support aircrew training requirements for all squadrons of any type platform may be computed by multiplying the demand generated by a single squadron of that type of platform by the total number of active squadrons of that type platform.

  - The 12-month demand for air-to-ground range facilities and associated SUA that would be generated by a typical deployable Navy CVW is

approximately 6,100 hours. Note that a single airwing deployment to the Fallon Range Training Complex averages 3,440 flight hours.

- Aircrews are able to meet more than one training element when participating in complex training events that require multiple aircraft. This reduces demand on range infrastructure because the less time-on-range is needed by individual aircrews.

6.1.5 Decision-Maker's Planning Tool

During the preparation of this assessment, it became apparent that a significant volume of data had been collected that could be used as guidance material by Navy and Marine Corps leadership to make informed decisions concerning air-to-ground range facilities, SUA, and aircraft basing strategies. To this end, a Decision-Maker's Planning Tool was developed and discussed in detail in Appendix G. In addition, examples showing how to apply the Decision-Maker's Tool are provided in Appendix G.

6.2 Recommendations

A flexible approach was adopted in developing and identifying the recommendations documented in this assessment. Principally this approach recognizes that future conditions with respect to basing, range infrastructure, and training requirements may be significantly different from those in effect today. For example, new basing decisions may occur, new airspace may be obtained, or range land acreage could be expanded beyond existing boundaries.

6.2.1 Data Collection/Internet Website

- Data included in this assessment should be reviewed every two to three years to determine if updates are warranted. Range managers should be encouraged to edit the Range Internet Website on-line to maintain data currency.

- The lack of consistency between range manuals needs to be addressed by facilitating a meeting of key players to create and implement a template for range manual revision and publication.

6.2.2 Range Utilization

The usefulness of range utilization data is dependent on whether statistically valid comparison can be made. Current data does not meet this important criterion and as a result, current data must be interpreted with extreme caution. The following recommendations, if adopted, could facilitate valid comparison of future range utilization data. Suggested approaches would include:

- Reporting range utilization in “blocks” using a standard block duration.
- Using specific definitions of each data collection term needed to avoid the collection and submission of disparate and/or redundant data.
- Developing a standardized data collection form for use by DoN ranges that addresses the following:
  - hours available for scheduling (if this is equivalent to hours manned), this should be identified by the range;
  - hours used for training (with day/night split and split between use of range area versus airspace);
  - hours used for range cleanup;
  - hours subject to user cancellation and the reason (weather, no show [if range was unable to reschedule same period of use], user, and fouled range/instrument failure);
  - users by general category (not individual units) and what installations these units are from.
- Collecting data that can be used to describe range demand situations (e.g., situations where a potential user has been turned away because the range is already scheduled for the times requested or the range cannot support the type of training requested/required).

6.2.3 Range Capabilities

- DoN should develop necessary strategies (fiscal and political) to sustain capabilities, meet new requirements, and ensure efficient use of resources.

- DoN should adopt a goal of establishing at least one range on each coast to that is capable of supporting (at a minimum) the six critical training elements identified in this assessment. The West Coast DoN range infrastructure already satisfies this goal, with three ranges (China Lake, Twentynine Palms, and Yuma) capable of satisfying all six training elements. Adopting and implementing this recommendation on the East Coast will be far more difficult, due to the land and SUA limitations associated with all of the existing DoN East Coast ranges. In spite of these difficulties, it is reasonable to assume the goal of this recommendation could be realized through one of three alternative approaches:

  - ***Alternative 1, New Range*** - This approach would result in DoN identifying and acquiring the necessary range area and SUA for development of a new East Coast range with capabilities similar to the West Coast ranges mentioned above. The greatest potential difficulty with this alternative is the requirement for an area that will support overland live ordnance expenditure and overland supersonic operations.

  - ***Alternative 2, Joint Service Initiative*** - Under this approach DoN would identify and develop a new range infrastructure in partnership with the US Army and/or US Air Force or begin steps, under a joint service initiative, for the acquisition of additional land and SUA at an existing DoD range for use as a backyard range and/or for advanced level or CVBG training. Preliminary research indicates that two existing DoD ranges (Fort Bragg and Fort Knox) may be candidates for expansion, principally because they both have the existing capability of supporting the use of live ordnance and appear to offer the opportunity for expansion of both land area and airspace. In particular, Victor Airways exist within the general vicinity of both of these restricted areas but do not appear to present insurmountable obstacles. Table 6-1 summarizes pertinent facts about each of these range complexes.

  - ***Alternative 3, Expand Existing DoN Range*** - Under this approach, DoN would select an existing East Coast range and expand its range area, SUA, or enhance other capabilities (e.g., obtain authorization for live ordnance expenditure). The Cherry Point Complex and the Townsend Range would be good candidates under this scenario. Key facts about each of these ranges are summarized in Table 6-2.

- For the near-term, East Coast squadrons should continue to supplement the training support available at East Coast DoN air-to-ground range facilities by maximizing opportunities for training support that is available while on detachments at West Coast DoN air-to-ground range facilities.

Table 6-1

Joint Service Initiative Candidates: Fort Bragg and Fort Knox

Range Complex	Key Facts
Fort Bragg, North Carolina	Fort Bragg schedules R-5311A, B, and C is in proximity to offshore carrier capabilities and the proposed East Coast Shallow Water Training Area (SWTR) as well as Navy and Marine Corps air stations. Fort Bragg's R-5311 is approximately 15 NM long and 10 NM wide, with SUA up to FL290. Underlying this airspace are ranges and impact areas that can accommodate live ordnance released by high performance aircraft. Fort Bragg is a viable alternative for both backyard training and CVBG training.
Fort Knox, Kentucky	The US Army Armor Center at Fort Knox schedules R-3704A and B. This restricted airspace is approximately 12 NM long and 8 NM wide, with SUA up to 20,000 ft MSL. Ranges at Fort Knox authorized for live fire include small arms, tank/Bradley/vehicles, special purpose, artillery firing point, demolitions, and aerial gunnery ranges. At 500 NM from the major East Coast Navy and Marine Corps tactical aircraft bases and 600 NM from the center of W-72 (a major offshore CVBG operations training area), the Fort Knox alternative is not a viable backyard training range. However, it could be a candidate for supporting intermediate level squadron and CVW training in the critical training elements.

Table 6-2

DoN Range Expansion Candidates

Range Complex	Key Facts
Cherry Point Complex	Cherry Point is easily accessible from a number of airfields (NAS Oceana, MCAS Cherry Point, and MCAS Beaufort) as well as CVBGs operating in the Atlantic Ocean Warning Areas. It is also under consideration for basing of the East Coast F/A-18E/Fs. In order to support all the critical training elements, the range complex would require the acquisition of additional real estate and SUA to accommodate the high-altitude/stand-off weapons training, an expanded list of live weapons authorized for expenditure, and supersonic operations. The Marine Corps is actively engaged in establishing two new MOAs at Cherry Point. The Core and Mattamuskeet MOAs will expand the airspace available in northeastern North Carolina allowing a smooth transition between W-122, the BT-9 and BT-11 target areas, and the airspace (when combined with existing Air Force and Navy Dare County Range SUA and the newly approved Phelps A, B, and C MOAs) will permit the simulated release of stand-off weapons and high altitude bombing.
Townsend Range	The Townsend Range is approximately 68 NM from MCAS Beaufort, but 310 NM from MCAS Cherry Point and 430 NM from NAS Oceana. These distances reduce its attractiveness as a location for basic and intermediate training. However, it is accessible from a CVBGs operating in the Atlantic Warning Areas. It would need additional range land area, final approval of the proposed Coastal MOA, and authorization for the expenditure of live ordnance.

- In order to maximize use of range assets at the El Centro Complex, DoN should consider securing additional SUA to connect the SUA now associated with the El Centro Complex and the R-2507 Chocolate Mountain Range (Yuma Complex).

- DoN should continue existing and encourage future efforts for joint use of existing DoD service ranges (US Army and US Air Force) to supplement training, particularly on the East Coast, for those critical elements not otherwise available at existing DoN ranges. Furthermore, DoN should pursue the possibility of combining certain range operations with the US Air Force. One obvious example is combining and enhancing the SUA of the Navy and Air Force Dare County ranges that would provide sufficient airspace for stand-off weapons training. In addition, some operational scenarios may merit further quantitative analysis, such as combining certain range operations of the Marine Corps and US Air Force that are associated with the Barry M. Goldwater Range (R-2301E and W) or participating in the proposed Southwest Defense Complex (a private and local government consortium).

- The capability to expend chaff on East Coast ranges needs to be expanded beyond the Cherry Point and Patuxent River complexes. Potential additional ranges for chaff expenditure include Camp Lejeune and Pinecastle. Even though chaff may not fall within the bounds of the respective range areas for various reasons (weather, aircraft tactics, etc.), the potential environmental impacts of such releases would not be significant, as confirmed by several recent studies on chaff releases by the US Air Force (1997), General Accounting Office (1998), and Naval Research Laboratory (1999). The released chaff could be perceived by some individuals as litter, however.

- Currently, Navy and Marine Corps squadrons operating out of the Fallon Range Training Complex conduct stand-off weapons training at the China Lake Complex or at the US Air Force's Utah Test and Training Range. Both of these ranges are MRTFB T&E ranges. The capability to train with standoff weapons (actual and simulated release) at Fallon Range Training Complex should be secured. This could be achieved by adding range area and SUA. Obtaining this capability at the Fallon Range Training Complex would allow DoN to control where and when this training occurs in coordination with ongoing airwing training at Fallon.

- The DoN should continue efforts to play a proactive role in monitoring and addressing the variety of encroachment issues potentially impeding DoN use of its ranges. These issues have serious potential consequences to range operational capabilities and ultimately, force readiness. The DoN RAICUZ program can provide guidance and policy in these efforts.

- T&E ranges should be required to publish range scheduling information for Fleet benefit and/or guarantee certain reasonable scheduling times for Fleet use of the T&E ranges.

- The system for using and reimbursing T&E ranges by Fleet training units needs to be addressed by both senior Navy leadership and the Office of the Secretary of Defense.

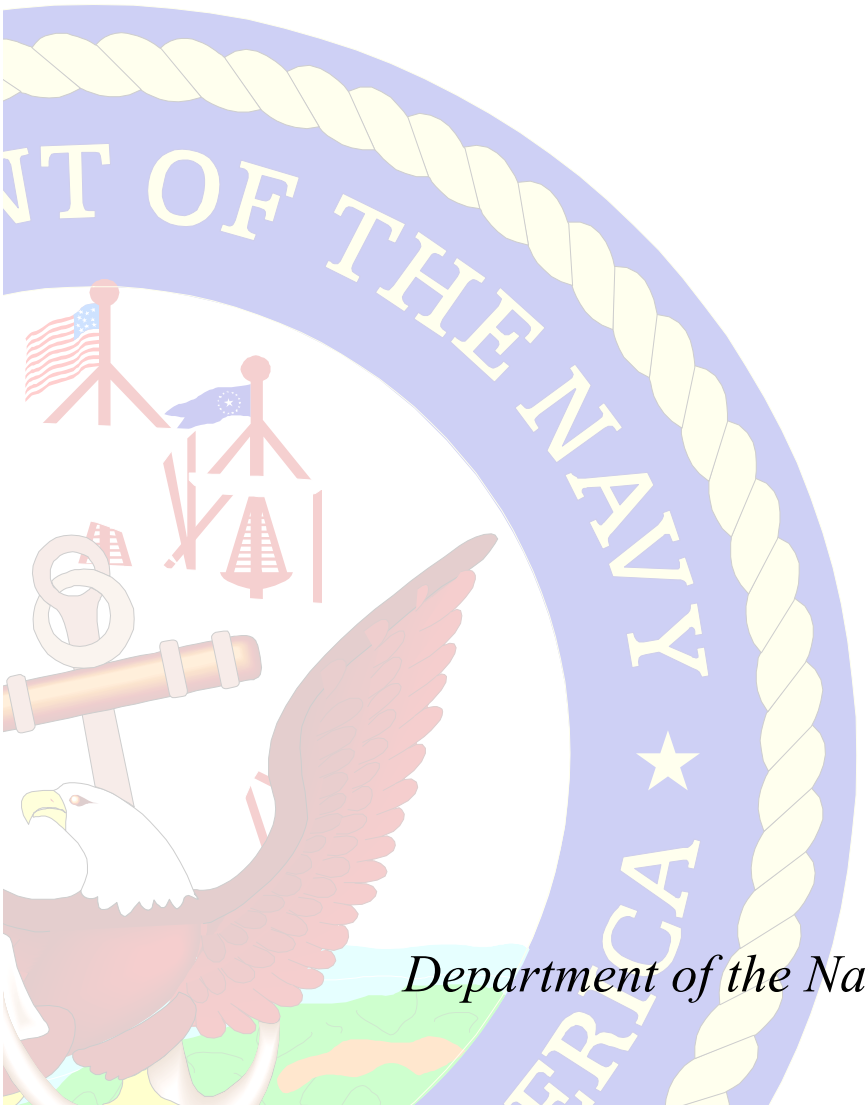
6.2.4 Training Demand

- Investigate the feasibility of integrating readiness reporting with range utilization reporting.

- Subsequent DON air-to-ground range assessments should be provided with a more definitive description of advanced level training events and completion criteria, so that this information can be included in the training demand tool.

Chapters 7-10

Reference Materials



Department of the Navy Range Needs Assessment:
Air-to-Ground Ranges

7 ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AAA	Anti-air artillery
A-A	Air-to-Air
AAW	Anti-air Warfare
ACE	Air Combat Element
ACM	Air Combat Maneuver
ACMR	Air Combat Maneuvering Range
ADDS	Advanced Display and Debriefing Subsystem
AFB	Air Force Base
AESO	Aircraft Environmental Support Office
AFWTF	Atlantic Fleet Weapons Training Facility
A-G	Air-to-Ground
AGL	Above Ground Level
AGM	Air-to-Ground Missile
AICUZ	Air Installation Compatible Use Zone
AIM	Air Intercept Missile
AIRLANT	Naval Air Force, Atlantic Fleet
AIRPAC	Naval Air Force, Pacific Fleet
ALCM	Air Launch Cruise Missile
ALTRV	Altitude Reservation
AMRAAM	Advanced Medium Range Air-to-Air Missile
AMW	Amphibious Warfare
ANG	Air National Guard
APU	Auxiliary Power Units
APZ	Accident Potential Zones
ARG	Amphibious Readiness Group
ARTCC	Air Route Traffic Control Center
ASW	Anti-Submarine Warfare
ASUW	Anti-Surface Warfare
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
BASH	Bird/Aircraft Strike Hazard
BDU	Bomb Dummy Unit
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLU	Bomb/Mine Live Unit, Load Unit
BRAC	Base Realignment and Closure
C	Combat Readiness Rating
C2W	Command and Control Warfare
CACC	Combat Arms Coordination and Control
CAE	Control Area Extension
cal	caliber
CAS	Close Air Support
CBU	Cluster Bomb Unit
CCC or C^3	Command, Control, and Communications
C2W	Command and Control Warfare

Acronym/Abbreviation	Definition
CCS	Control and Computation Subsystem
CEM	Combined Effects Munitions
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CINC	Commander in Chief
CINCLANTFLT	Commander in Chief Atlantic Fleet
CINCPACFLT	Commander in Chief, Pacific Fleet
CNAL	Commander Naval Air Force, US Atlantic Fleet
CNAP	Commander Naval Air Force, US Pacific Fleet
CNATRA	Chief of Naval Air Training
CNET	Chief of Naval Education and Training
CNO	Chief of Naval Operations
COMCABEAST	Commander Marine Corps Bases East
COMNAVAIRLANT	Commander, Naval Air Forces Atlantic
COMNAVAIRPAC	Commander, Naval Air Forces Pacific
COMPTUEX	Composite Training Unit Exercise
CONUS	Continental United States
CTR	Chesapeake Test Range
CVBG	Carrier Battle Group
CVW	Carrier Airwing
CZ	Clear Zone
DASH	Deer/Aircraft Strike Hazard
DB	Decibel
DDS	Display and Debriefing Subsystem
DLG	Digital Line Graph
DMA	Defense Mapping Agency
DNL	Day-Night Average Sound Levels
DoD	US Department of Defense
DOI	US Department of the Interior
DON	US Department of Navy
ECM	Electronic Countermeasures
EM	Electromagnetic
EMR	Electromagnetic Radiation
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
ESQD	Explosives Safety Quantity Distance
EW	Electronic Warfare
FAA	Federal Aviation Administration
FAC	Forward Air Controller
FACSFAC	Fleet Area Control and Surveillance Facility
FAE	Fuel Air Explosive
FAR	Federal Aviation Regulation
FCLP	Field Carrier Landing Practice
FFAR	Folding Fin Rocket
FFARP	Fleet Fighter Air Combat Maneuvering Readiness Program
FICAN	Federal Interagency Committee on Aviation Noise
FL	Flight Level

Acronym/Abbreviation	Definition
FLIP	Flight Information Publication
FLIR	Forward-Looking Infrared
FLPMA	Federal Land Planning and Management Act
FR	Federal Register
FRS	Fleet Replacement Squadron
FRTC	Fallon Range Training Complex
FSO	Fleet Support Operations
ft	Feet
FY	Fiscal Year
GBU	Guided Bomb Unit (usually refers to Laser guidance units)
GCA	Ground Controlled Approach
GIS	Geographic Information System
GP	General Purpose
GPS	Global Positioning System
GSE	Ground Support Equipment
HARM	High Speed Anti-Radiation Missile
HE	High Explosive
HEI	High Explosive Incendiary
IDTC	Interdeployment Training Cycle
IFR	Instrument Flight Rules
INT	Intelligence
IR	Infrared
IUT	Instructor Under Training
JTCTS	Joint Tactical Combat Training System
JDAM	Joint Attack Munition
JTFEX	Joint Task Force Exercise
JRB	Joint Reserve Base
JSF	Joint Strike Fighter
JSOW	Joint Standoff Weapon
L	Pilot Proficiency Level
LANTIRN	Low-Altitude Navigation and Targeting Infrared for Night
Laser	Light Amplification through Stimulation of Emitted Radiation
LATR	Large Area Tracking Range
LGB	Laser Guided Bomb
LGTR	Laser Guided Training Round
LSTSS	Large Scale Target Sensor System
LTS	Laser Training System
LWTC	Littoral Warfare Training Complex
M	Mobility
MAGTF	Marine Air-Ground Training Force
MAMS	Military Airspace Management System
MARSA	Military Accepts Responsibility for Separation of Aircraft
MAW	Marine Air Wing
MCAF	Marine Corps Air Facility
MCAGCC	Marine Corps Air Ground Combat Center
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MEU	Marine Expeditionary Unit
MILCON	Military Construction
MIW	Mine Warfare

Acronym/Abbreviation	Definition
MK	Mark
mm	millimeter
MMPA	Marine Mammals Protection Act
MOA	Military Operations Area
MOUTS	Military Operations in an Urban Terrain
MRTFB	Major Range and Test Facility Base
MSL	Above Mean Sea Level
MTR	Military Training Route
NAB	Naval Amphibious Base
NAD	North American Datum
NAF	Naval Air Facility
NAS	Naval Air Station
NASMOD	Navy Aviation Simulation Model
NATO	North Atlantic Treaty Organization
NATOPS	Naval Aviation Training and Operating Procedure Standardization
NATS	Naval Aviation Training System
NAVAID	Navigational Aid
NAVAIR	Naval Air Systems Command
NAVFACENGCOM	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
NAWCAD	Naval Air Warfare Center Aircraft Division
NAWCWD	Naval Air Warfare Center Weapons Division
NAWS	Naval Air Weapons Station
NDBSS	No Drop Bomb Scoring System
NDWS	No Drop Weapon Scoring
NFO	Naval Flight Officer
NFS	National Forest Service
NGFS	Naval Gun Fire Support
Ni-Cd	Nickel-cadmium
nmi	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPS	National Park Service
NSAWC	Naval Strike and Air Warfare Center
NSFS	Naval Surface Fire Support
NSW	Naval Special Warfare
NTTR	Navy Tactical Training Ranges
NVG	Night Vision Goggle
NWCF	Navy Working Capital Fund
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
NWSTF	Naval Weapons Systems Training Facility
OLF	Outlying Landing Field
ONC	Operational Navigation Chart
OPNAV	Office of the Chief of Naval Operations
OPNAVINST	Chief of Naval Operations Instruction
OPTAR	Operating Target
PGM	Precision-Guided Munitions
PL	Public Law

Acronym/Abbreviation	Definition
PMA	Primary Mission Area
psf	pounds per square foot
R-XXXX	Restricted Area
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RDT&E	Research, Development, Test, and Evaluation
REWS	Range Electronic Warfare System
RF	Radio Frequency
RFMSS	Range Facility Management Support System
ROC	Required Operational Capabilities
SAM	Surface-to-Air Missile
SAR	Search and Rescue
SCORE	Southern California Offshore Range
SEPTAR	Seaborne-powered Target
SHOBA	San Clemente Island Shore Bombardment Area
SIMMOD	FAA s Airfield and Airspace Capacity Model
SLAM	Standard Operating Procedure
SLAM-ER	Standoff Land Attack Missile
SNA	Student Naval Aviator
SOAR	Southern California Antisubmarine Warfare Range
SOCAL	Southern California
SOP	Standoff Land Attack Missile - Expanded Response
SFARP	Strike Fighter Advanced Readiness Program
sq ft	Square Feet
STW	Strike Warfare
SUA	Special Use Airspace
SUW	Surface Warfare
T	Tracer
T	Turn-Around (Training) Phase
TACAIR	Tactical Aircraft
TACTS	Tactical Aircrew Combat Training System
T&E	Test and Evaluation
T&R	Training and Readiness
TIS	Tracking Instrumentation Subsystem
TOW	Tube-Launched, Optically-Tracked Wire Command (link guided missile)
TP	Training Projectile
TRIMS	Targets and Ranges Information Management System
TYCOM	Type Commander
UAV	Unmanned Aerial Vehicle
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USFS	United States Forestry Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USMC	United States Marine Corps
USN	United States Navy
UTM	Universal Transverse Mercator
UTS	Underwater Tracking System
UXO	Unexploded Ordnance

Acronym/Abbreviation	Definition
VACAPES	Virginia Capes
VFR	Visual Flight Rules
V/STOL	Vertical/Short Takeoff and Landing
WISS	Weapons Impact Scoring System
WMA	Wildlife Management Area
WP	White Phosphorus
W-XXX	Warning Areas

8 GLOSSARY

Term	Definition
Aerial Delivery	Flights in which aircraft release parachuting personnel, sensors, equipment or supplies other than ordnance.
Aerial Photography	Flights designed to develop handheld camera proficiency.
Aerial Refueling	Flights designed to develop the ability of aircrews to perform tactical aerial refueling operations, day and night.
Air Combat Maneuvering	Flights that include offensive tactics with air-to-air weapons-equipped aircraft for defensive tactics with aircraft without air-to-air weapons.
Air-to-Air Missile Firing	Flights that include firing of air-to-air missiles at an airborne drone target.
Air-to-Ground	Flights designed to attack surface targets.
Air-to-Ground Ordnance Inert Delivery	Flights designed to attack surface targets with conventional inert ordnance under day or night visual or instrument weather conditions.
Air-to-Ground Ordnance Live Delivery	Flights designed to attack surface targets with conventional live ordnance under day or night visual or instrument weather conditions.
Air Route Traffic Control Center	A regional air traffic control facility operated by the Federal Aviation Administration.
Airborne Command and Control	Flights designed to command/control supporting arms and aircraft in the same battle area.
Airspace for Special Military Use	Airspace established in coordination with the Federal Aviation Administration for the support of certain military aviation training activities. Examples of airspace for special military use include restricted areas, MOAs, and MTRs.
Air Traffic Control Assigned Airspace	Airspace having a defined vertical and lateral limit, assigned by the Federal Aviation Administration air traffic control facility for the purpose of providing air traffic segregation between the specified activities being conducted within this assigned airspace and other Instrument Flight Rules traffic within the surrounding vicinity. ATCAAs are normally designated for military utilization and are established at altitudes of 18,000 ft MSL and above. They are usually placed above a MOA.
All-Weather Flight Training	Flights designed to train aircrews to perform selected missions under all weather conditions including air-to-air weapons system intercepts commenced beyond visual range where weapons engagement does not depend on visual identification. No weapons are actually launched or fired in this training.

Term	Definition
Altitude Reservation	A short-term, time-limited airspace reservation used to allow multiple aircraft (airwings) to set-up and organize outside a MOA before entering the simulated combat environment. ALTRVs extend from 18,000 to 28,000 ft MSL and are reserved only for the time the aircraft are within the ALTRV.
Basic Flight Training	The initial training administered to all Naval aviators from the first day of flight training to the day the aviator earns his or her wings.
Battle Group Workups	The period during which an airwing deploys aboard an aircraft carrier to operate and train with an entire Battle Group (aircraft carrier, cruisers, destroyers, frigates, and submarines).
Chaff	Fiberglass fibers (or dipoles) coated with aluminum and biodegradable stearic acid that are released by an aircraft or ship to thwart radar and radar-controlled weapons. Chaff fibers, about the thickness of fine human hair, are compressed into small packages or canisters. Only 1.6 oz of chaff are needed to cause an echo equal in size to a large bomber.
Close Air Support Training	Flights designed to train aircrews to support friendly ground forces by delivering conventional air-to-ground ordnance, under the direction of a forward air controller, on aggressor positions in proximity to friendly lines.
Cluster Bomb	Cluster bombs break up in mid-air, releasing and spreading submunitions over wide areas. These weapons are produced in a variety of sizes and with a range of submunitions (antipersonnel, incendiary, fragmentation, time-delay, and anti-tank). Development is underway to produce submunitions that can detect and guide themselves to targets (so-called “brilliant” munitions)
Combined Strike Tactics	Tactical training sorties in which several aircraft types join in a combined mission.
Commercial Air Carrier	Scheduled airlines, charter airlines, and commercial operators like UPS or Federal Express.
Controlling Agency	A designated Federal Aviation Administration air control facility that maintains overall cognizance and controlling authority over the use of any parcel of Special Use Airspace or airspace for special military use.
Deployment	The action of aircraft carriers going to sea for an extended period of time or the action of a carrier’s aircraft unit going to an installation for training.
Direct Air Support Holding	Flights designed to train aircrews in the tactics of timing a supporting strike from a nearby holding position.
Electronic Warfare	Simulation of enemy radar detection systems and radar missile sites, thereby creating a simulated warfare threat environment.

Term	Definition
Electronic Warfare Radar System	The equipment used to simulate the systems that detect aircraft at long-range, that determine the altitude of incoming aircraft, and that provide tracking information so that a missile or other weapon can be launched against or otherwise engage a targeted aircraft.
Endangered Species	A species that is threatened with extinction throughout all or a significant portion of its range.
Expeditionary Airfield/Road Operations	Flights designed to train aircrews to conduct day or night shortfield landing and takeoffs from a road or other expeditionary airfield.
Familiarization Flights	Flights/events in which aircrews gain basic knowledge of aircraft flight or system characteristics, limitation, emergency procedures, and crew position responsibilities
Field Carrier Landing Practice	Flights designed to prepare aircrews for operation in an aircraft carrier or expeditionary airfield environment utilizing an optical landing system and/or landing signal officer or landing signal equipment
Fighter Intercepts	Air-to-air weapons system intercept, commencing beyond visual range where weapons engagement depends on visual identification. No weapons are actually launched or fired in this training
Flare	Flares are released by an aircraft to attract heat-seeking or infrared-homing weapons targeted on that aircraft. When activated, an electrical firing mechanism ignites the flare and expels it from the aircraft. The flare begins burning immediately, reaching its highest temperature, 2,000°F), by the time it passes the tail of the aircraft .
Fleet Replacement Squadron	The initial training in fleet aircraft.
Formation Flight Training	Flights designed to develop basic proficiency in section and/or division formation flying, day or night, and to develop basic skills in tactical formations and maneuvering
Forward Air Controller Airborne	Flights designed to control attack/fighter aircraft in close air support or direct air support missions
General Purpose Bomb	Variable size steel cases filled with high explosives, fuses at each end, and fins for stabilization in flight. Different tail cones allow them to be release in either a basic, low-drag, or high-drag configuration.
Guided Bombs	Also called “smart bombs,” guided bombs are general purpose, iron-bomb warheads fitted with a Glide Bomb Unit (GBU) kit. The kit is composed of a laser seeker and control section attached to the front of the warhead and a set of steerable fins attached to the end of the weapons. A laser bean directed from the attacking aircraft (or a sister aircraft or a soldier on the ground) at the target is used to guide the weapon. the bomb tracks the reflected laser light from the target.

Term	Definition
Gun Ammunition	A wide variety of cannon, machine gun, and small-arms ammunition is expended on air-to-ground ranges: 40 mm, 30 mm, 25 mm, 20 mm, .50 cal, 7.62 mm, and 5.56 mm. Three types of ammunition are fired on DoN ranges. The Target Projectile (TP) is a non-explosive steel slug. The Target Projectile Tracer (TPT) contains a tracer material. The High Explosive Incendiary (HEI) ammunition is a steel projectile encasing an explosive charge.
Helicopter Attack	Flights designed to teach the fundamentals of and/or develop proficiency in any aspect of helicopter attack
Helicopter External Cargo Lifts	Flights in which weights, personnel, cargo, vehicles, or aircraft are suspended from a helicopter and transported
Helicopter Night Vision Goggle Training	Day or night training flights in helmet-mounted, thermal imaging device flying techniques
Integrated Airwing Training	Squadrons brought together to train as a team.
Jammer	An electronic warfare device that emits radar-like signals and interferes with the operation of an enemy's air/surface defense system. They are designed to free-fall or are towed to misdirect enemy incoming missiles
Joint Direct Attack Munition (JDAM)	The weapon is built around a variety of current conventional bomb warheads and is guided to its target by an on-board GPS receiver. Once the target position has been provided in GPS coordinates, the JDAM can be dropped from standoff ranges in any weather and strike its target without the laser designation required of current laser-guided ordnance.
Joint Standoff Weapon (JSOW)	The weapon is a glide bomb designed to deliver a variety of cluster munitions from standoff ranges of up to 40 nmi into heavy air defense environments. It employs small wings that deploy after launch and GPS-based guidance.
Low-Altitude Flight Training	Flights in fixed-wing tactical aircraft designed to develop proficiency in low altitude (less than 500 ft AGL) tactics in visual day or night conditions
Manned Range	A training area/range where the exercise participant receives real time feedback of the exercise results.
Military Operations Area	Airspace having a defined vertical and lateral limit, that has been established by the Federal Aviation Administration below Class A airspace to separate or segregate certain military aviation activities from Instrument Flight Rules traffic, and to identify where these activities are conducted for Visual Flight Rules traffic. Only nonhazardous activities may be conducted within a MOA.

Term	Definition
Military Training Route	Routes established generally below 10,000 ft MSL for use by military aircraft to conduct low-altitude, high-speed navigation, and tactical training at airspeeds in excess of 250 knots. A MTR is made up of several route segments with each individual segment having a designated route width and vertical altitude block within which the aircraft using the route must remain. There are two types of MTRs -- IR Routes (Instrument Flight Rules) and VR Routes (Visual Flight Rules). MTRs designated as VR Routes require that all flights be conducted in accordance with visual flight rules except that flight visibility shall be five miles or more, and no flights will be conducted below a ceiling of less than 3,000 ft AGL.
Native Americans	Used in the collective sense to refer to individuals, bands, or tribes who trace their ancestry to indigenous populations of North America prior to Euro-American contact.
No Drop Bomb Scoring System	Systems that record simulated bomb releases, execute a computer simulation of the bomb drop, and generate a simulated-bomb score.
Operating Area (OPAREA)	An ocean area that is defined by geographic coordinates for use of Fleet units for training and weapons system testing.
Ordnance	Artillery, including all military weapons and ammunition.
Podded Aircraft	Aircraft outfitted with tracking instrumentation.
Post Maintenance Check Flights	Flights conducted to review and validate the conditions of an aircraft following maintenance.
Practice Bombs	Practice bombs are manufactured as either solid cast-metal bodies or thin sheet-metal containers that can be filled with wet sand or water to meet desired weight requirements.
Precision-Guided Munitions	A weapon that uses a seeker to detect electromagnetic energy reflected from a target or reference point, and through processing, provides guidance commands to a control system that guides the weapon to the target. Also called a PGM. Includes weapons with Laser, IR, GPS guidance systems, for example.
Remotely Piloted Vehicle Operation	Flight operations conducted with a remotely piloted vehicle.
RDT&E Facility	A facility whose primary mission is Research, Development, Test and Evaluation. Training support is provided on a not-to-interfere basis.
Restricted Area	Airspace having a defined vertical and lateral limit, that has been established by the Federal Aviation Administration within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Restricted Areas are established to contain or segregate activities, such as ordnance delivery or air-to-air gunnery, which would be hazardous to nonparticipating aircraft.

Term	Definition
Rockets	A rocket is generally launched at close range and is more accurate than a free-falling bomb. Rockets are driven forward by the discharge of rapidly expanding gases from the nozzle of a motor. These gases are produced from the burning of a solid propellant that consists of a fuel and an oxidizer.
Scheduling Activity	The organization or military command that has been designated as the primary point of contact and/or coordinating activity for scheduling the use of a particular parcel of Special Use Airspace or a particular type of airspace for a special military use, such as an MTR.
Special Use Airspace	Airspace of defined dimensions wherein activities must be confined because of their nature, and/or wherein limitations may be imposed upon nonparticipating aircraft.
Stand-Off Weapon	A precision guided munition that is launched beyond 15 NM from the target.
Strike Warfare	The destruction or neutralization of enemy targets ashore through the use of conventional or nuclear weapons. These include, but are not limited to, strategic targets, building yards, and operating bases from which the enemy is capable of conducting air, surface, or subsurface operations against US or allied forces.
TACTS	Computer system that allows pilots to train in realistic air-to-air and air-to-ground situations without firing air-to-air or air-to-ground ordnance. Specifically, the system provides real-time display and post mission playback of air combat maneuvering (ACM), simulated air-to-ground ordnance deliveries, simulated mine laying, simulated anti-radiation missile employment and electronic warfare systems employment. The training capacity of the TACTS has been increased from the original capability of supporting four aircraft to the current capability of supporting up to 36 high-dynamic aircraft.
Unit Level Training	The day-to-day training performed in a deployed squadron. It emphasizes single aircraft, section (two aircraft), and division (four aircraft) events. Unit level training achieves initial basic qualifications for new aircrews and maintains proficiency for aircrews that are already qualified.
Visual Cueing Device	A piece of equipment placed on the ground to train aircrews to sight and recognize ground threats. Active visual cueing devices primarily consist of the Smoky SAM, which simulates the initial boost phase of a surface-to-air missile. Passive visual cueing devices consist of mock mobile launch vehicles, tanks, personnel carriers, and replicated or actual foreign mobile (vehicular) weapon systems.
Warning Area	A specified area over international waters where there may exist activities constituting a potential danger to aircraft.

Term	Definition
Weapons Safety Footprint	The total ground area needed to contain potential live and practice/inert ordnance for the test/training activities at ranges based on test or operational requirements and parameters. The analysis to develop the footprint accounts for specific types of aircraft, types of ordnance, delivery parameters (including dive angle, release altitude, aircraft heading, and airspeed), terrain, and self-imposed operational restrictions.
Weapons System	An aircraft combined with its target acquisition equipment (for example, radar, optical television tracking system, laser or infrared targeting system, or gun sight) and weapons (guns, rockets, bombs, or missiles) are considered to be a weapons systems.
Wildlife Refuge	An area designated for the protection of wild animals, within which hunting and fishing are either prohibited or strictly controlled.
WISS	A manned video-optical system capable of scoring impact points of air-to-ground and ship-to-shore ordnance within a 300-ft to 2000-ft radius of a defined land/water target, under day and night conditions. One operator is required to score and relay impact point data to aircrews via UHF communications within seconds after weapon impact.

9 REFERENCES

AIRLANT. 1997. *Commander-in-Chief Atlantic Fleet (CINCLANTFLT) Training Range Utilization Summary.* Compiled in accordance with CINCLANTFLTINST 3624.1B.

AIRLANT. 1998. *Commander-in-Chief Atlantic Fleet (CINCLANTFLT) Training Range Utilization Summary.* Compiled in accordance with CINCLANTFLTINST 3624.1B.

Atlantic Fleet Weapons Training Facility, July 9, 1997. *Manual for Use of the Atlantic Fleet Weapons Training Facility, Naval Station Roosevelt Roads.* AFWTFINST 3120.1L.

Chief of Naval Operations/N44 Range Planning Office. 1998. Data Collection Packages for Department of the Navy Ranges.

Chief of Naval Operations. March 1997. *Forward…From the Sea: The Navy Operational Concept.*

Chief of Naval Operations (N889). July 1995. *Department of the Navy Tactical Training Range Roadmap.*

Department of Defense. 1999. *Secretary of Defense Annual Report to the President and Congress.*

Department of Defense. March 1999. *The Need for Ranges and Training Areas.*

Department of Defense. September 1, 1998. *Military Airspace Management System (MAMS) Concept of Operations*.

Department of the Navy and Bureau of Land Management. January 2000. *Final Environmental Impact Statement for the Proposed Fallon Range Training Complex Requirements.*

Department of the Navy. April 1998, *Final Environmental Impact Statement for Withdrawal of Public Lands for Range Safety and Training Purposes, Naval Air Station Fallon, Nevada.*

Department of the Navy. January 1997. *Final Environmental Impact Statement for the Yuma Training Range Complex.*

Federal Aviation Administration. February 26, 1998. *Military Training Routes: North and South America*. Flight Information Publication AP/1B.

Federal Aviation Administration. July 17, 1997. *Special Use Airspace: North and South America*. Flight Information Publication AP/1A.

Federal Aviation Administration. November 7, 1997. *Special Use Airspace*. FAA Order 7400.8E.

Finch, Terry. Marine Corps Base Camp Pendleton Range Control. January 20, 1999. Personal communication by telephone.

Gardner, Sherrill, Naval Facilities Engineering Command, Headquarters. January 1999. Personal communication by telephone.

General Accounting Office. September 1998. *Environmental Protection: DOD Management Issues Related to Chaff*. GAO/NSIAD-98-219.

Georgia Air National Guard. 1997. *Utilization Reports for Townsend Range* compiled by the Georgia Air National Guard.

Georgia Air National Guard. 1998. *Utilization Reports for Townsend Range* compiled by the Georgia Air National Guard.

Hedberg, Art. January 1999. High Technology Solutions, Inc. Personal communication by telephone.

High Technology Solutions, Inc. 1997. *Targets and Ranges Information Management System (TRIMS) Reports.* Prepared for AIRPAC under CINCPACFLTINST 3642.1F.

High Technology Solutions, Inc. 1998. *Targets and Ranges Information Management System (TRIMS) Reports.* Prepared for AIRPAC under CINCPACFLTINST 3642.1F.

Marine Corps Air Facility Quantico. Undated. *Standard Operating Procedures for Ranges and Training Areas.* Base Order P3570.1.

Marine Corps Air Ground Combat Center, Twentynine Palms. April 14, 1997. *Standard Operating Procedures for Range/Training Areas and Airspace*. Combat Center Order P3500.4E.

Marine Corps Air Station Cherry Point. April 16, 1997. *Target Facilities and Operation Areas*. AirStaO P3570.2N.

Marine Corps Air Station Yuma. March 31, 1995. *Range Regulations for the Use of Aircraft Targets, Restricted Areas and Military Operating Areas/Air Traffic Control Assigned Airspace (MOA/ATCAA) Scheduled by MCAS Yuma, AZ*. AirStaO 3710.6H.

Marine Corps Base Camp Lejeune. 2 June 1994. *Standard Operating Procedures for Range Control Operations*.

National Safety Council, Environmental Health Center. February 1998. *Coastal Challenges: A Guide to Coastal and Marine Issues.*

Naval Air Station Kingsville. 1997. *Monthly Flight Reports for McMullen Target.*

Naval Air Station Kingsville. September 12, 1997. *Operation Procedures for McMullen Target Complex.* NASKINGSINST 13160.1A, Code 30000.

Naval Air Station Oceana. Undated. *Navy Dare Bombing Range Complex Operations Manual*. (NASOCEANAINST 3710.19).

Naval Studies Board, National Research Council. 1997. *Technology for the United States Navy and Marine Corps, 2000-2035.*

Naval Air Warfare Center, Aircraft Division. *Training Range Quarterly Reports for Bloodsworth Island Shore Bombardment and Bombing Range (FY 92-95).*

Naval Warfare Assessment Division. March 17, 1997. Fleet Training Area/Range Directory.

Naval Air Weapons Station China Lake. May 1, 1997. *R-2508 Restricted Area Complex User's Handbook.*

Naval Command, Control and Ocean Surveillance Center, et al. July 1994 *Project Blue Air Update II: An Analysis of Naval Airspace Utilization and Requirements.*

Naval Engineering Facilities Command, Atlantic Division. 1998. *FEIS for Realignment of F/A-18 Aircraft and Operational Functions from NAS Cecil Field, Florida to Other East Coast Installations.*

Naval Research Laboratory. August 31, 1999. *Environmental Effects of RF Chaff*. NRL/PU/G110-99-389.

Naval Strike and Air Warfare Center. August 5, 1997. *Fallon Range Users Manual*. NSAWCINST 3752.1.

Naval Strike and Air Warfare Center. February 28, 1998. *Memorandum from JR Worthington, Deputy Commander, Naval Strike and Air Warfare Center on FY-98 Fallon Range Training Complex (FRTC) Range Maintenance Closure Schedule, Change 3*.

Naval Strike and Air Warfare Center. September 2, 1998. *Memorandum from CDR J.W. Stotz, Naval Strike and Air Warfare Center on FY-99 Fallon Range Training Complex (FRTC) Range Maintenance Closure Schedule*.

Tahimic, Robert. Southern California Offshore Range. January 20, 1999. Personal communication by telephone.

US Air Force. *Range Operations and Maintenance* (Chapter 5). Instruction 13-212).

US Air Force. August 1997. *Environmental Effects of Self-Protection Chaff and Flares: Final Report.*

US Air Force. March 1999. *Legislative Environmental Impact Statement for the Renewal of the Nellis Air Force Range Land Withdrawal.*

10 LIST OF PREPARERS

This report was prepared under the direction of:

NAVAL FACILITIES ENGINEERING COMMAND

Alan F. Zusman
Deputy Director of Base Development
Special Assistant for AICUZ and Ranges (N441E)

and

Sherrill Gardner
Program Manager

with critical review by:

DoN RANGE REVIEW PANEL

CAPT Jeffrey Tubello (CNO N441P)
CDR Patrick Jeck (CNO N444C)
CDR David Kelch (CNO N885F)
LCDR Ted Kaehler (CNO N889K1)
LCDR Robert Henderson (CNO N813F)
CAPT(S) James Scholl (CLF N7AA)
CDR James Casey (CLF N731)
Chuck Maguire (CLF N4561)
Kim McConnaughey (CNAL N36)
Mark Kaminski (CPF N465)
LTCOL Stanley Hitchcock (CNAP N8M)
John Bergman (CNAP N8MA)
COL Dave Bixler (HQMC LFL)
MAJ Terrence Larkin (HQMC) AVN-ASL
John Smith (NSAWC N8A)
Larry Jones (NAS Fallon)

with the technical expertise of:

TAMS CONSULTANTS, INC.
2101 Wilson Boulevard, Suite 300
Arlington, Virginia 22201

in affiliation with

ARINC, Inc.
Charleston Region
4055 Faber Place Drive, Suite 300
Charleston, South Carolina 29405

Key personnel included:

James J. Coyle, Project Director, TAMS Consultants, Inc.

Dawn S. Roderique, Project Manager, TAMS Consultants, Inc.

James Kawchak, Engineer, TAMS Consultants, Inc.

Stephen J. Golle, Senior Manager, ARINC, Inc.

Contributors to the development of the Internet Website:

Julia O. Domingue, TAMS Consultants, Inc.

Sherry Felix, TAMS Consultants, Inc.

Steven J. Ko, TAMS Consultants, Inc.

Mina Kim, TAMS Consultants, Inc.

Appendix A

Range Data Collection Form

APPENDIX A

RANGE DATA COLLECTION FORM

AIR-TO-GROUND RANGE NEEDS ASSESSEMENT
DATABASE COLLECTION PACKAGE

RANGE_____

PREPARER_____

DATE_____

1. General Information

Applicable Instruction:

_____

_____

Scheduling Control:

_____

_____

Published Hours of Operation:

_____

_____

Range Officer in Charge:

_____

_____

Bearing:

_____

_____

2. Regional Range Location Map Data Inputs

For each range, a regional location map will be prepared showing the general location and dimensions of the range, target areas, major roadways, and water bodies. The electronic map file will also include a layer that identifies range dimensions. These maps will be used to develop a separate spreadsheet that tabulates the acreage of the range and individual target areas.

General

a. Do you have range maps in digital format? Yes No (Circle one)

b. Is the digital format AutoCad or DXF format? (Identify software version, where appropriate.)

_____

_____

_____

_____

c. Can you provide a file(s) on disk? Yes No (Circle one)

Data Table

Range Boundary Coordinates	
Beginning at Southeast Corner	29E05=31.37≅N - 81E41=32.39≅W
To	29E05=35.13≅N - 81E44=27.49≅W
To beginning	

3. Airspace

The Regional Range Location Map (described above) will also depict range airspace including restricted areas, MOAs, etc. available at your range. Data collection parameters include coordinates of the restricted airspace, MOAs, etc., operating hours, altitudes, etc.

Data Tables

Airspace Summary Data			
Airspace Type	Min/Max Altitudes	Controlling Agency	Time of Designation
R-2910 5 nm Radius Northeast Extension Southeast Extension	 surface to FL 230 surface to 9,000 feet MSL surface to 9,000 feet MSL	- FAA, Jacksonville ARTCC for altitudes below 11,000 ft MSL - Range Control or FACSFACJAX Schedules to activate altitudes above 11,000 ft MSL	0500-0100 L, daily; other times by NOTAM 6 hours in advance

Airspace Type = Restricted airspace, MOA, ATCAA.

For each individual restricted airspace type, use a separate table to identify boundaries.

Airspace Boundaries	
R-2910 A circle within a 5NM radius centered at:	29B06=53≅N - 81B42=54≅W

Airspace Boundaries	

Airspace Boundaries	

Airspace Boundaries	

Airspace Boundaries	

4. Low Level Ingress/Egress

The Regional Range Location Map will also show low altitude military training routes (IRs/VRs) that provide access to your range. As with airspace, your are asked to provide route numbers, altitudes, route widths (at the approach to the range) as shown in the data collection table below.

General

a. There are _____ MTRs that provide ingress/egress to the range. These MTRs are (list MTRs):

_____

_____

_____

_____

Data Table

Military Training Routes				
Name/Number	Point Outside Airspace	Turn Point Inside or Near Airspace Boundary	Range Convergence Point	Controlling Agency
IR123	29E41=00≅N 82E16=00≅W	None	29E07=00≅N 81E43=00≅W	NAS Cedar Pt

5. Ordnance Permitted

For this data collection parameter, you are requested to identify ordnance that may be employed at your range, including but not limited to inert, explosive, laser ordnance, etc. Ordnance use restrictions for specific targets should not be identified here (addressed in Item 6, next). Please specify the general ordnance type and the specific ordnance designations as shown in the example below.

General

a. Have any requests been made by range users to employ ordnance that is not permitted at your range? If so, please specify ordnance type and designation.

_____

_____

_____

b. How frequently is the range swept of UXO or other ordnance-related inert debris?

_____

_____

_____

Data Table

Ordnance Type	Designation
Practice ordnance	MK-76/BDU-33
	BDU-48
	MK-106

6. Targets

The purpose of this data request is to characterize targets and target areas on your range. You are asked to identify the location of each target (including its geographic [lat/long] coordinates); provide a general description of the target and its overall condition; identify the type of scoring (if a scored target); and identify if the target is a tactical target, and if so, the type of target. If possible, please attach photographs of each of the targets.

General

a There are _____targets on the range.

b. Are there any plans (funded) to replace existing targets or construct new ones?

_____

Data Table

Target Name	Coordinates	Target Description	Condition	Ordnance Use Restrictions	Target Scoring	Tactical Target
Paradise Island	Lat 38E13'00"N Long 76E09'26"W	Two scuttled cargo ships	Target needs replacement-ships are disappearing from view due to rusting	Inert Only	Not Scored	No

Target Name	Coordinates	Target Description	Condition	Ordnance Use Restrictions	Target Scoring	Tactical Target

7. Range Procedures

Please summarize basic range procedures (e.g., run-in lines, pull offs) in the data collection table below along with appropriate references to your range manual.

General

a. Date Range Manual published_____

b. If date of publication is more than 5 years ago, is an update scheduled?

_____

Data Table

Range Target Run-In Headings (Magnetic)	
Conventional Bull	Omni-directional. WISS direction calls are based on 317E/137E run-ins.
Special Weapons Bull	Left-hand pattern for 317E Right-hand pattern for 137E

8. Laser Operations

Please provide information on the laser certified targets in your range and any operating restrictions.

General

a. Specify the number of laser certified targets at your range _____.

b. Identify/specify any restrictions on laser use and operation to include weapons delivery restrictions (e.g., run-in headings, etc.).

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

c. Identify the authorized laser systems that are located at your range.

_____

_____

_____

_____

_____

_____

_____

9. Range Instrumentation

The purpose of this data request is to document range instrumentation, including the type and purpose of the instrumentation.

General

a. Where is the instrumentation control room? _____

_____

Data Table

Range Instrumentation Summary	
Type of Instrumentation	Purpose of Instrumentation
WISS	Scoring

Instrumentation System examples: WISS, TOSS, M-2, telemetry systems.

10. Electronic Warfare Capability (Simulated Threats)

The purpose of this data collection area is to identify the EW capabilities that exist at your range. Threat simulators employed at the range are also to be identified (including simulated SAMs such as the USAF Smokey SAM).

Data Table

Type Asset	Location
Site 1 Threat Emitter Units Height Finders Radar Search Radar Communications Link Microwave Voice Transmitter Miscellaneous Equipment	Lat 38E13'00"N Long 76E09'26"W

11. Range Towers

General

a. There are _____ spotting towers on the range.

b. There are also _____ towers on the range.

Data Table

Types and Locations of Towers on the Range		
Type of Tower	Designation	Location
Spotting	Tower 1	29E06=27≅N - 81E42=54≅W

12. Weapons Safety Footprints

For your information, a Quick Look will be taken of each range, using available weapon safety footprints, to determine if the range has potential off-range weapons impacts. This Quick Look will be generated using selected data provided for your range in this data collection package.

Any comments or concerns:

_____

_____

_____

_____

_____

_____

13. Operations/Administration Areas

Identify where operations and administration are located at your range.

Data Table

Range Operations and Administration Areas	
Operations Area Center	29E08=31.53≅N - 81E38=10.22≅W

14. Surrounding Land Use

A generalized land use map will be developed that broadly identifies land uses surrounding your range that could potential encroach upon and affect future range operations. Of particular interest to our data collection efforts is the proximity of your range to land areas open to the public (e.g., National Parks, Monuments, Wildlife Refuges), private interests (e.g., mines, large residential communities), or Native Americans (e.g., reservations). Also of interest is the presence of larger communities.

General

a. Identify planning/environmental agencies with jurisdiction within five miles of the boundaries of your range (with points of contact, if known):

Local planning/environmental agencies: _____

_____

_____

_____

State planning/environmental agencies: _____

_____

_____

_____

_____

Federal planning/environmental agencies: _____

_____

_____

_____

_____

b. Please characterize your range=s current working relationship with the above identified agencies (be specific):

_____

_____

_____

_____

_____

_____

_____

c. Identify critical land use issues that are important to surrounding property owners, communities, and other federal agencies:

_____

_____

_____

_____

_____

_____

_____

d. Does your range have procedures for receiving and responding to noise complaints? If so please described these procedures:

_____

_____

_____

_____

_____

15. Infrastructure

Range infrastructure ownership and maintenance have been identified as critical issues for future range management planning. Please list below only those specific situations where concerns exist about the ownership/continued use/maintenance of infrastructure that is essential to the range in accomplishing its mission. Examples are: a radar owned by the FAA that provides support to the range; a building or tower where range equipment is stored or operated, but is not owned by the range; a parcel of property not owned by the Navy; inadequate power; poor road maintenance that impacts the ability of the range to repair equipment, etc.

Condition Codes: 1 - Not Useable or Unsafe; 2 - Poor but Useable; 3 - Fair/Needs Work; 4 - Good

Infrastructure Component	Description of Infrastructure Component	Ownership	Overall Condition	Characterize Maintenance Issues
Road	5 mi single-lane dirt road leading to radar installation	NAS Cedar Point	1, Road is impassable	Budget constraints at NAS Cedar Point have resulted in an impassable road and range personnel are unable to access radar site to perform routine maintenance/repair of the antenna.

Infrastructure Component	Description of Infrastructure Component	Ownership	Overall Condition	Characterize Maintenance Issues

16. Environmental Issues and Concerns

Environmental issues and concerns can pose limitations to range capabilities and utilization. These issues/concerns would include, but not be limited to the existence of cultural resources (e.g., tribal sacred sites), threatened or endangered species habitat (e.g., bald eagle nests). Furthermore, environmental constraints as identified in National Environmental Policy Act (NEPA) documentation (Environmental Assessments, Environmental Impact Statements, Findings of No Significant Impact [FONSIs], and Records of Decision [RODs] may constrain range operations. In the data table below, please identify any environmental constraints that affect the operations at your range.

Data Table

Identify Environmental Issue/Concern	Characterize Issue/Concern	Reference Document (Name/Date)
Migratory waterfowl	Use of Target A prohibited from October to April to protect migratory waterfowl	EA for Future Operations (May 1997)

Identify Environmental Issue/Concern	Characterize Issue/Concern	Reference Document (Name/Date)

17. Range Users

Please provide a general list of users of your range (e.g., Air National Guard, Carrier Air Wing 8, etc.).

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

18. Other Constraints/Concerns Not Addressed

This section is intended to address constraints/concerns not mentioned elsewhere. For future planning purposes, there is particular interest regarding constraints/concerns that would require the improvement of range capabilities to meet existing and future user demand (e.g., additional airspace is needed or the air wing would like a tactical target installed at your range).

Constraint/Concern	Characterize Constraint/Concern
Airspace	Maximum altitude over range limited to FL180; we are repeatedly requested to expand this by air wings training at the range.

Appendix B

Air-to-Ground Ordnance

APPENDIX B

AIR-TO-GROUND ORDNANCE

Table B-1

Ordnance Database Categories For Navy Range Assessment Website

Missiles (Live or Inert)
AGM-45 (Shrike)
AGM-62 (Walleye)
AGM-65 (Maverick)
AGM-84D (Harpoon)
AGM-84E (Harpoon/SLAM)
AGM-88 (HARM)
AGM-114 (Hellfire)
AGM-119 (Penguin)
AGM-122 (Sidearm)
AGM-123 (Skipper)
AGM-154A (JSOW Baseline-BLU-97)
AGM-154B (JSOW/BLU-108 Sensor Fuzed)
AGM-154C (JSOW Unitary)
SLAM-ER
Cluster Bombs - Classified by Submunition (Live or Inert)
BLU-61 (CBU-52)
BLU-63 (CBU-58)
BLU-77 (CBU-59 Rockeye II)
BLU-73 (CBU-72 FAE)
BLU-97 (CBU-87 CEM)
MK-118 (MK-20 Rockeye)
Gun Ammunition (Live)
.30 Caliber
.50 Caliber
.50 Caliber (T)
.50 Caliber (TPT)
5.56 mm
7.62 mm
7.62 mm (TPT)
20 mm
20 mm (TP)
20 mm (TPT)

Table B-1

Ordnance Database Categories For Navy Range Assessment Website

Gun Ammunition (Continued)
20 mm HEI
25 mm
25 mm (TP)
25 mm (TPT)
30 mm
30 mm (TPT)
30 mm (TP)
40 mm
40 mm (TP)
40 mm (TPT)
40 mm HEI
Rockets (Live or Inert)
2.75-inch
5.0-inch
Practice Bombs (Inert)
MK-76/BDU-33
MK-106/BDU-48
BDU-6
BDU-11
BDU-20
BDU-24
BDU-36
BDU-42
BDU-43
BDU-45
BDU-50
BDU-87
MK-52
MK-72
MK-73
General Purpose Bombs (Live or Inert)
MK-77 (Always Live)

Table B-1

Ordnance Database Categories For Navy Range Assessment Website

General Purpose Bombs (Continued)
MK-81
MK-82
MK-83
MK-84
M117
Laser-Guided Bombs (Live or Inert)
LGTR
GBU-10 (MK-81)
GBU-12 (MK-82)
GBU-16 (MK-83)
GBU-24 (MK-84)
GBU-31 (JDAM)
GBU-32 (JDAM)
Chaff (Inert)
RR-129
RR-144
RR-170
RR-184
RR-188
RR-189
Flares (Inert)
MK-24 (Paraflare)
MK-45/LUU-2 (Paraflare)
LUU-19
MK-46
MJU-8
MJU-22
MJU-27A/b
MJU-32B
MJU-38B
MJU-52B

Table B-1

Ordnance Database Categories For Navy Range Assessment Website

Flares (Continued)
SM-44
SM-875
Other (Live or Inert)
Dragon (M47)
TOW (M220)

Table B-2

Air-to-Ground Ordnance by Weight of Projectile and Weight of Explosives

Ordnance Type		Total Weight of Projectile (lbs)	Weight of Explosives (lbs)
Designation	Type		
MK-24	Parachute Flare	26	18
MK-45/LUU-2	Parachute Flare	28	17.6
MK-76	Practice Bomb	25	0.03
BDU-33	Practice Bomb	25	0.03
MK-77	Fire Bomb	479-539	*
MK-81/BDU	Live, High Explosive	250	100
MK-81	Inert	250	0
MK-82	Live, High Explosive	500	192
MK-82	Inert	500	0
MK-83	Live, High Explosive	1,000	455
MK-83	Inert	1,000	0
MK-84	Live, High Explosive	2,000	945
MK-84	Inert	2,000	0
MK-106/BDU-48	Practice Bomb	10	0
MK-118	Rockeye	1.3	0.38
MK-1181	Inert Rockeye	1.3	0
2.75-inch Rocket	Inert	6.5	0
5-inch Zuni Rocket	Inert	56	0
20 mm	Machine Gun, Inert	0.56	0
25 mm	Machine Gun, Inert	0.92	0

Notes:
* Gallons of Napalm
Source: US Navy Explosive Ordnance Disposal Office

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Atlantic Fleet Weapons Training Facility Inner Range		
Target 1		MK-76 MK-106
Target 2 (TARGET REMOVED)		
Strafe Banner	20 mm TP 25 mm TP	
Aircraft Revetment North/South/Center	2.75 in rockets	2.75 in rockets
Ammo Dump	5.0 in rockets	5.0 in rockets
North/South Convoy	MK-77	MK-76
Fuel Farm	MK-81	MK-106
RR Tunnel	MK-82	MK-81
Runway Center	MK-83	MK-82
	MK-84	MK-83
	GBU-10	MK-84
	GBU-12	GBU-10
	GBU-16	GBU-12
	GBU-24	GBU-16
		GBU-24
		MK-45/LUU-2 (paraflare)
SAM West		MK-76 MK-106 MK-81 MK-82
SAM East	MK-118 (MK-20 Rockeye)	
Bloodsworth Island Shore Bombardment and Bombing Range		
All Targets (Range not being scheduled until further notice)	20 mm 30 mm MK-77 MK-82 GBU-12	2.75 in rockets 5.0 in rockets BDU-50 MK-76 MK-81
NWSTF Boardman Range		
Targets 5, 6, 7, 13-17, 25-28, 30, 31, 35, 37, 38, 41-50	.50 cal 5.56 mm 7.62 mm 20 mm TP 40 mm	2.75 in rockets MK-76 MK-106

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
NWSTF Boardman Range (Continued)		
Targets 1, 4, 8-12, 18-24, 34, 36, 40	.50 cal 5.56 mm 7.62 mm 20 mm TP 40 mm	MK-76 MK-106
Offset Bull (Target 2)	.50 cal 5.56 mm 7.62 mm 20 mm TP 40 mm	5.0 in rockets MK-81 MK-82 MK-83
LGB (Target 3)	.50 cal 5.56 mm 7.62 mm 20 mm TP 40 mm	5.0 in rockets MK-81 MK-82 MK-83 GBU-10 GBU-12 GBU-16
Camp Lejeune Complex		
BT-3/N-1 (All Targets)	.50 cal 5.56 mm 7.62 mm 20 mm TPT 25 mm TPT 30 mm TPT	2.75 in rockets MK-76 MK-81 MK-82 MK-83 MK-84
G-10 (All Targets)	.50 cal 5.56 mm 7.62 mm 20 mm 25 mm TPT 30 mm TPT 40 mm	2.75 in rockets MK-76 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 TOW DRAGON
K-2 (No Hard Targets)	5.56 mm 7.62 mm 40 mm	MK-76 MK-81 MK-82 MK-83 MK-84

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Camp Pendleton Complex (R-2503)		
Door Gunner #1/#2	.50 cal 7.62 mm	
R-212 TOW (All Targets)	.50 cal 7.62 mm 20 mm TOW	TOW
R-220 (Whiskey) - All Targets	.50 cal 7.62 mm 20 mm 20 mm HEI 20 mm TPT 25 mm/25 mm TP 30 mm 30 mm TP 40 mm 2.75 in rockets 5.0 in rockets MK-77 MK-81 MK-82	2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-82 MK-45/LUU-2 (paraflare) SU-44 Flare Chaff
R-440 (Zulu) - All Targets	.50 cal 7.62 mm 20 mm 20 mm HEI 20 mm TPT 25 mm 25 TP 30 mm 30 mm TP 40 mm 2.75 in rockets 5.0 in rockets MK-77 MK-81 MK-82	2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-82 MK-45/LUU-2 (paraflare) SU-44 Flare Chaff

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Cherry Point Complex		
BT-9	20 mm TP MK-81 GBU-10	2.75 in rockets 5.0 in rockets BDU-45 BDU-50 MK-76 MK-106 MK-81 MK-82 MK-83 GBU-10 GBU-12 LGTR Flares Chaff
BT-11		
North Guns	5.56 mm 7.62 mm 20 mm 25 mm 30 mm	2.75 in rockets MK-76 MK-106 MK-81 MK-82 BDU-45 LGTR
TOW	5.56 mm 7.62 mm 20 mm 25 mm 30 mm	2.75 in rockets MK-76 MK-106 LGTR TOW
Hammock Point Simulated Airstrip		MK-76 MK-106
Simulated Truck Convoy	5.56 mm 7.62 mm 20 mm	MK-76 MK-106 LGTR Flares
Barge	5.56 mm 7.62 mm 20 mm 25 mm 30 mm	2.75 in rockets MK-76 MK-106 LGTR Flares

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Cherry Point Complex (Continued)		
BT-11 (Continued)		
PT Boat		MK-76 MK-106 LGTR
500 Ft Bullseye		2.75 in rockets MK-76 MK-106 LGTR
Strafing Banners	5.56 mm 7.62 mm 20 mm 25 mm 30 mm	
800 Ft Bullseye Simulated Train Target MLT		2.75 in rockets MK-76 MK-106
Sam Site		MK-76 MK-106 MK-81 MK-82 LGTR
China Lake Complex		
Airport Lake Range		
Airport Lake	All types of ordnance	All types of ordnance
Convoy Target Center	All types of ordnance	All types of ordnance
HABR Targets (Gunbutts/Tunnel)	AGM-62 AGM-123	AGM-62 AGM-123
Maverick Road Area	All types of ordnance	All types of ordnance
Sam's Town	Tomahawks	

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
China Lake Complex (Continued)		
Baker Range		
B-1-A`		Inert and fuzed bombs
B-1-B/C		Inert free-fall and forward-firing ordnance (including fuzed bombs)
Baker Revetment		
LB Bridge		
Northwell		
B-1-D	NO ORDNANCE	NO ORDNANCE
B-2 Target Center	HE up to 500 lbs max./no cluster munitions	
Charlie Range (All targets)		All types free-fall inert ordnance
Coles Flats Range		
SAM Site		Inert ordnance
CF23		Anti-radiation missile systems
Coso Military Targets		Inert free-fall and forward-firing ordnance
Coso Bridge		
East Tunnel		Inert ordnance, no forward firing ordnance
Pinon Bridge		
SAM Site		
Truck Convoy		
West Tunnel		
George Range		
Aircraft	All types of ordnance (no HE submunitions)	All types of ordnance
Aircraft Revetment		
G-Zap-0		
FAE		
PMT Target Center	Data Not Available	Data Not Available
Renegade Tunnel	All types of ordnance	All types of ordnance
ALAST		Captive ordnance only
Bullpup		Anti-radiation missile systems
G-9		All types of inert free-fall ordnance

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
China Lake Complex (Continued)		
George Range (Continued) Shrike VABY Pole		 Short-range anti-radiation missiles IR ordnance
Wild Horse Mesa Range		Anti-radiation missile systems
Mojave North Range Mojave South Range	Data Not Available	Data Not Available
Superior Valley Range	7.62 mm 20 mm 25 mm	2.75 in rockets MK-76 MK-106 BDU-45 MK-81 MK-82 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR MK-45/LUU-2 (paraflare)
El Centro Complex		
R-2510 Range Loom Lobby Shade Tree	 20 mm 20 mm	 2.75 in rockets MK-76 MK-106 MK-45/LUU-2 (paraflare) 2.75 in rockets MK-76 MK-106
R-2512 Range (Inkey Barley/Kitty Baggage)	20 mm	2.75 in rockets MK-76 MK-106

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Fallon Range Training Complex		
ALL RANGES/ALL TARGETS	Flares (MJU-8/-22/-27/-38/-52/MK-46/SM-875) Chaff (R-129/-144/-170/-188/-189)	
B-16 Range B-16-1 Nuclear Weapons Bull B-16-2 Conventional Weapons Bull		2.75 in rockets MK-76 MK-106 MK-45/LUU-2 (paraflare)
B-17 Range B-17-1, 2, 3, 14, 19, 25	No Drop Weapons Scoring	No Drop Weapons Scoring
B-17 Impact Area (Targets B-17-21, 23, 24)	.50 cal TPT 7.62 mm TPT 20 mm TPT 20 mm HEI 25 mm TPT 30 mm TPT 2.75 in. rockets (WP) 5.0 in rockets (WP) MK-77 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24	2.75 in rockets 5.0 in rockets BDU-45 MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR MK-45/LUU-2 (paraflare)
B-17-5, 6, 7, 8, 9, 10, 15, 17, 18		2.75 in rockets MK-76 MK-106 LGTR

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Fallon Range Training Center (Continued)		
B-17 Range (Continued) B-17-11, 12, 13		2.75 in rockets MK-76 MK-106 BDU-45 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR MK-45/LUU-2 (paraflare)
B-17-S	7.62 mm 20 mm TP 25 mm TP	
B-17-28 Hart Bunkers	.50 cal TPT 7.62 mm TPT 20 mm TPT 20 mm HEI 25 mm TPT 30 mm TPT	2.75 in rockets MK-76 MK-106 LGTR
B-19 Range B-19-1 Conventional Bull		2.75 in Rockets MK-76 MK-106 LGTR MK-45/LUU-2 (paraflare)
B-19-2 Strafe Target	7.62 mm 20 mm TP 25 mm TP	

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Fallon Range Training Center (Continued)		
B-19 Range (Continued) B-19 Impact Area Center Targets B-19-3, 4, 5	.50 cal TPT 7.62 mm TPT 20 mm TPT 20 mm HEI 25 mm TPT 30 mm TPT 2.75 in. rockets (WP) 5.0 in rockets (WP) MK-77 MK-81 MK-82 MK-83 GBU-10 GBU-12 GBU-16	2.75 in rockets 5.0 in rockets BDU-45 MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR MK-45/LUU-2 (paraflare)
B-20 Range B-20-1, 2 Conventional Bulls		2.75 in rockets MK-76 MK-106 LGTR MK-45/LUU-2 (paraflare) (Shape BDU authorized only on Target B-20-1)
B-20-3 LGB Target		2.75 in rockets MK-76 MK-106 BDU-45 MK-81 MK-82 MK-83 GBU-10 GBU-12 GBU-16 LGTR MK-45/LUU-2 (paraflare)
B-20-4, 5 Strafe Targets	7.62 mm 20 mm TP 25 mm TP	

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Fallon Range Training Complex (Continued)		
B-20 Range (Continued)		
B-20-6 Impact Area/Lone Rock	.50 cal TPT 7.62 mm TPT 20 mm TPT 20 mm HEI 25 mm TPT 30 mm TPT 2.75 in. rockets (WP) 5.0 in rockets (WP) MK-77 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24	2.75 in rockets 5.0 in rockets BDU-45 MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR MK-45/LUU-2 (paraflare)
B-20-7, 9, 10		2.75 in rockets MK-76 MK-106 LGTR
B-20-8 Heavy Inert Area		2.75 in rockets 5.0 in rockets MK-76 MK-106 BDU-45 MK-81 MK-82 MK-83 MK-84 MK-45/LUU-2 (paraflare)
Jacksonville Complex		
Lake George Range		
Northern target		MK-76 MK-82 MK-83 MK-84
Center target		2.75 in rockets 5.0 in rockets MK-76 BDU-45

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Jacksonville Complex (Continued)		
Lake George Range (Continued)		
Center Target (Continued)		MK-82 MK-83 MK-84 MK-45/LUU-2 (paraflare)
Southern target		MK-76
Minex (All targets)		BDU-45 MK-82 MK-83 MK-84
Pinecastle Range		
Day/Night Conventional Bull	20 mm TP	MK-76
Special Weapons Bull		MK-106 MK-81 GBU-10 LGTR
SAM Site	20 mm TP	2.75 in rockets
Mini-Convoy		5.0 in rockets
Red Box		Mk-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR
Strafing Target	5.56 mm 7.62 mm 20 mm TP 25 mm TP 30 mm TP	

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Jacksonville Complex (Continued)		
Pinecastle Range (Continued) Live Ordnance Impact	20 mm TP 25 mm 30 mm 2.75 in rockets 5.0 in rockets MK-81 MK-82 GBU-10 GBU-12	2.75 in rockets MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24
Rodman Range Conventional Bull		MK-76
Gulf of Mexico Complex - McMullen Range		
Yankee/Dixie Targets (All targets)	20 mm TP	2.75 in rockets MK-76
Patuxent River Complex		
Chesapeake Test Range (All targets)	0.50 cal 5.56 mm 7.62 mm 20 mm 25 mm 30 mm 40 mm	2.5 in rockets AGM-45 AGM-65 AGM-84 AGM-88 SLAM MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 GBU-31/32 MK-118 BLU-73 BLU-77 Flares Chaff

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Quantico Complex		
Range 7 (All targets)	.50 cal 5.56 mm 7.62 mm 20 mm 25 mm TPT 30 mm MK-81 MK-82 GBU-10 GBU-12 TOW	2.75 in rockets 5.0 in rockets MK-76 MK-45/LUU-2 (paraflare) TOW DRAGON
Range 15 (All targets)	.50 cal 5.56 mm 7.62 mm 20 mm 25 mm TPT 30 mm DRAGON	MK-76 MK-45/LUU-2 (paraflare) DRAGON
Meridian Complex - Searay Multipurpose Target		
All Targets	20 mm TP	MK-76
Southern California Offshore Range Complex		
SHOBA - All Targets	.30 cal .50 cal 7.62 mm 20 mm 25 mm 30 mm 40 mm 2.75 in rockets 5.0 in rockets MK-81 MK-82 MK-83 GBU-10 GBU-12 GBU-16	2.75 in rockets 5.0 in rockets MK-76 MK-106 BDU-45 MK-81 MK-82 MK-83 GBU-10 GBU-12 GBU-16 Flares Chaff

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Townsend Range		
Target 1, 2		2.75 in rockets MK-76 MK-106
Target 3, 6, 7, 8		MK-76 MK-106
Target 4	30 mm	Mk-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24
Target 5	30 mm	
Strafe Target 1	20 mm	
Strafe Target 2	20 mm 30 mm	
Strafe Target 3	20 mm	
Twentynine Palms Complex		
R-2501 North R-2501 South R-2501 East (All but WISS Bullseye)	Unlimited except cluster munitions	Unlimited except cluster munitions
WISS Bullseye		2.75 in rockets MK-76 MK-106

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
VACAPES Complex		
Navy Dare County Range Navy East Conventional Target Navy Nuclear Target Short Bull Navy Bomb Dummy Unit (BDU) Target Strafe Target	 .50 cal 5.56 mm 7.62 mm 20 mm 25 mm	2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR
Palmetto Point Range (All Targets)		5.0 in rockets MK-76 MK-106 MK-81 MK-82
Stumpy Point Range (All Targets)		2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 Flares
Yuma Complex		
Barry M. Goldwater Range (R-2301W) Moving Sands/Cactus West	 .50 cal 5.56 mm 7.62 mm 20 mm 25 mm 30 mm	 MK-76 MK-106 MK-81 MK-82 MK-83

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Yuma Complex (Continued)		
Chocolate Mountains Range (R-2507) North Impact Area Targets 1N, 6N, 7N, 8N, 12N, 15N	5.56 mm 7.62 mm 20 mm 20 mm TP 25 mm TP	2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-81 MK-82 MK-83 MK-84
Targets 2N, 3N, 9N, 10N, 11N. 13N, 14N	AGM-65 AGM-114 .50 cal 5.56 mm 7.62 mm 20 mm/20 mm TP 25 mm TP 30 mm TP 2.75 in rockets 5.0 in rockets MK-81 MK-82 MK-83 MK-84 LGTR TOW	AGM-65 2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 LGTR MK-24 (paraflare) MK-45/LUU-2 (paraflare) MJU-8/ MJU-22/SM-875 RR-129 and R-144 TOW

Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Yuma Complex (Continued)		
Chocolate Mountains Range (R-2507)		
South Impact Area (Targets 1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 10S, 11S, 12S, 13S, 14S)	AGM-65 AGM-114 .50 cal 7.62 mm 20 mm 20 mm TP 25 mm 25 mm TP 30 mm 30 mm TP 2.75 in rockets 5.0 in rockets MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR TOW	2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR MK-24 (paraflare) MK-45/LUU-2 (paraflare) MJU-8 MJU-22 SM-875 RR-129 RR-144
Target 15S	AGM-65 AGM-114 .50 cal 7.62 mm 20 mm/20 mm TP 25 mm/25 mm TP 30 mm 30 mm TP 2.75 in rockets 5.0 in rockets MK-77 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16	2.75 in rockets 5.0 in rockets MK-76 MK-106 MK-81 MK-82 MK-83 MK-84 GBU-10 GBU-12 GBU-16 GBU-24 LGTR MK-24 (paraflare) MK-45/LUU-2 (paraflare) MJU-8/MJU-22/SM-875 R-129/RR-144 TOW

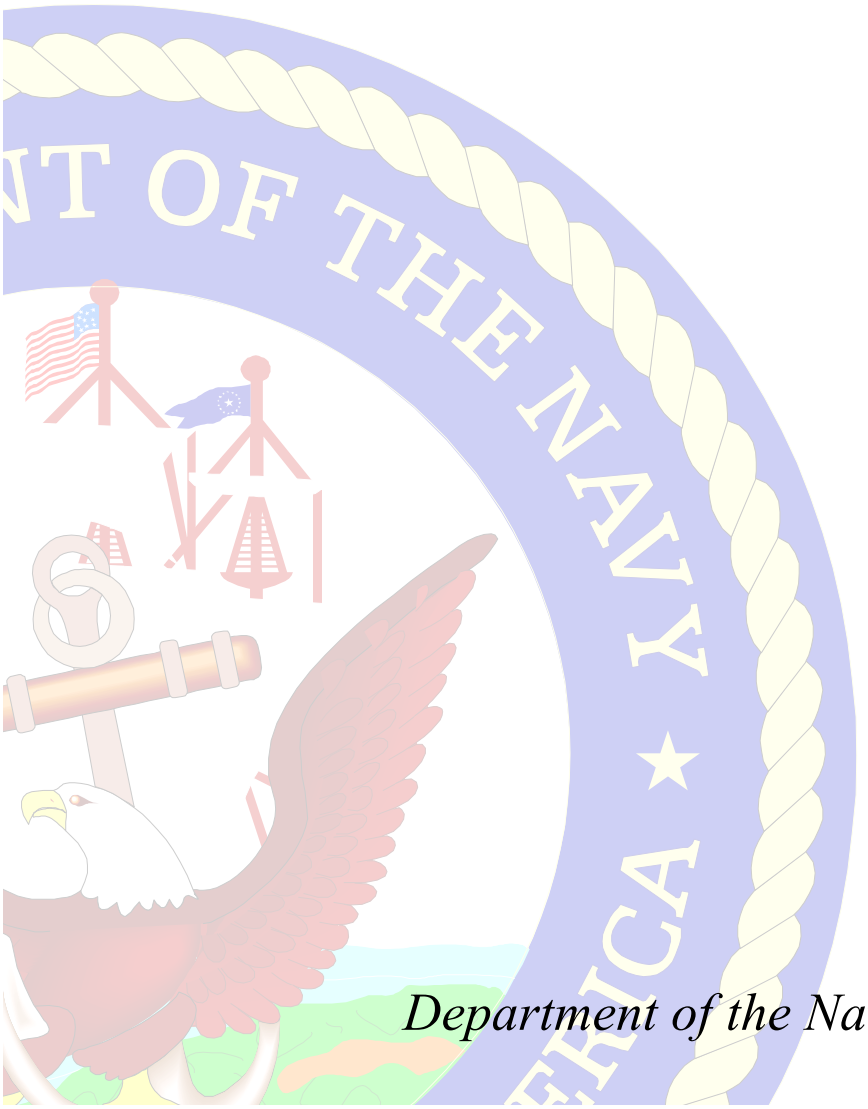
Table B-3

Live/Inert Ordnance Authorization - Range or Range Complex by Target

Range/Target	Ordnance	
	Live	Inert
Yuma Complex (Continued)		
Chocolate Mountains Range (R-2507) South Impact Area (Continued) Target 15	GBU-24 LGTR	
ICM Box	MK-118 (Rockeye) BLU-61 (CBU-52) BLU-63 (CBU-58) BLU-77 (CBU-59) BLU-97 (CBU-87) MK-77	
Mt. Barrow (Helos Only)	2.75 in rockets 5.0 in rockets 20 mm AGM-114 TOW	

Appendix C

DoN Range Website Overview



APPENDIX C

DoN RANGE WEBSITE OVERVIEW

APPENDIX C - RANGE WEBSITE OVERVIEW

This appendix provides a tour of the CNO (N44) Range Planning Office's website, beginning with the electronic maps and proceeding to the types of information that can be found in the database. A sample range is presented for this tour -- the Cherry Point Complex (includes BT-9 Target and BT-11 Range).

C.1 Accessing the Website

The first screen that the website user will encounter is the required login. All users will be issued passwords. These passwords will only allow entrance to the site; a separate login and password will be issued to those persons authorized to input and/or edit database information. After login, the user will see the title screen as shown in Figure C-1.

Clicking on the Air-to-Ground Ranges link will send the user to a map of the US that identifies the complexes and ranges for which maps and data are available (Figure C-2). The user then may select:

- The complex or range in which he is interested by clicking on that name;
- Sending e-mail to the website; and
- Obtaining more information about the design of the website.

C.2 Touring the Web Site

The sample site for the website tour is the Cherry Point Complex. This complex is located in coastal eastern North Carolina. It consists of two air-to-ground ranges (BT-9 and BT-11) and a Tactical Aircrew Combat Training System (TACTS) range (however, the focus of the website, is not on the TACTS range). Brant Island Shoal in the waters of the Pamlico Sound is the location of BT-9. The BT-11 range, also surrounded by the waters of Pamlico Sound, is located on a peninsula of land known as Piney Island.

C.2.1 Accessing the Range GIS Maps

To access maps showing the Cherry Point Complex, the user clicks on the star labeled "Cherry Point Complex." The user is then linked to a map of the Cherry Point Complex. This base map (Figure C-3) shows several default layers or "themes," including:

- Bounds of the overlying airspace;
- Bounds of the real estate parcel comprising the range;
- Location of targets, towers, operations/administration buildings;
- MTR routes; and
- Roads, rivers and other bodies of water, and urbanized areas near the range.

Themes may be turned off and on as can labels for these features. In addition, the website provides the user with the capability of zooming in and out of whatever portions of the map he so chooses. For example, the user may select BT-9 or BT-11 individually, or together, as a focus of map study.

Not included as default layers in the opening map screen are four land use layers that show federal, state, and local land, and land whose ownership is unknown. These layers may be selected as desired. While labels may be turned on for these layers, the large number of labels may overlap and become confusing when the user is zoomed out from a map. However, even without the labels function turned on, features of the map may be easily identified. The user clicks on the "I" button on the website screen, then clicks on the location in question on the map. An identification label will appear in the box on the right (for example, Figure C-4 shows a list of identified targets). The identification button also works for the airspace, MTRs, towers, operations/administration buildings, land use types, and other features.

A user may also measure distances on the maps and determine estimated areas. In addition, a selected map view may be labeled and printed as the user desires.

C.2.2 Accessing the Database

The information contained in the database for the Cherry Point Complex can be accessed in two ways:

- Clicking the "View Data" button on the Cherry Point map menu, which links the user to a menu of choices (Figure C-5); and

- Using the "I" button to identify a map object and then linking to the database.

The types of information that are available on a complex versus range level is summarized below in Table C-1.

Table C-1

Database Information Available for Complexes and Ranges

Database	Information Available For:	
	Complex	Range/Target
Range		X
Airspace	X	X
MTRs	X	
Targets/Ordnance		X
Emitters	X	X
Towers		X
Operations/Administration Bldgs	X	
Range Users	X	
Infrastructure Issues	X	
Environmental Issues	X	

All of the information in the database can be viewed for any range by anyone with access to the website. Additionally, most of the data can be edited for a particular range. The view screens are described in the next section. The edit data screens are not shown but are generally comparable to the view data screens.

Each of the database areas and the types of information displayed on the website for the Cherry Point Complex and is constituent ranges are briefly described below:

- **Range Database** - On the range level, as shown in Figure C-6, the scheduling authority is listed on the screen with other pertinent information.

- **Airspace Database** - On the complex level, as shown in Figure C-7, all special use airspace associated with the complex is listed. The types of special use airspace listed for the Cherry Point Complex include restricted airspace, military operations areas (MOAs), and Air Traffic Control Alert Areas (ATCAAs). Although not available for the Cherry Point Complex, the database also includes Altitude Reservations (ALTRVs) associated with several complexes. On the range level, the only airspace listed is that immediately overlying the land area comprising a range. For BT-11 (Figure C-8), this is R-5306A.

  The information provided for each listed airspace includes:

- airspace boundaries (in latitude and longitude);
- minimum and maximum altitudes;
- controlling agency, address, and telephone number; and
- time of airspace designation.

- **MTRs** - Listed in the database (Figure C-9) are all MTRs that intersect the special use airspace of the Cherry Point Complex. The name of the controlling agency is also provided. There are three MTRs that feed the Cherry Point Complex. A notation at the end of the display directs users of the website to DoD Flight Information Publication AP/1B for more exact information on each MTR.

- **Targets/Ordnance** - A separate display is shown for each of the Cherry Point Complex's ranges (e.g., BT-11 is shown in Figure C-10). Each target location (in latitude/longitude) and the type of scoring available at that target is identified. As can be seen, the display also shows whether laser operations can be conducted at the target and the run-in line to the target. Ordnance permitted for use at the target is also listed and whether it is live or inert.

- **Emitters -** A display on emitters is available for both the Cherry Point Complex level and on the range level. The information shown on the complex level display is a Electronic Warfare (EW) rating using the definitions documented by Chief of Naval Operations (N889) in the *Tactical Training Ranges Roadmap* (1995). The Cherry Point Complex has an EW rating of II. This means that the complex can provide a variety of high-density real and/or simulated/stimulated threats throughout the exercise area and may also support coordinated threat operations. The range level display shows the range's EW rating (where available), however, individual applicable EW ratings were not available for BT-9 and BT-11. The range level display will list the emitters available at each range -- there are no emitters at BT-9 and 11 emitter sites at BT-11.

- **Towers** - Each tower on a range is listed in the display, including its location (in latitude/longitude). There are no towers at BT-9, but towers are listed for BT-11 (Figure C-11).

- **Operations/Administration Building** - The location of operations/administration buildings are identified on a complex-basis (Figure C-12).

- **Range Users** - A generalized list of complex users are listed in this display (Figure C-13). This list is only as detailed as the range provided.

- **Infrastructure Issues** - The purpose of listing infrastructure issues is to show situations where concerns exist about the ownership/continued use/maintenance of infrastructure essential to the complex in accomplishing its mission. Examples

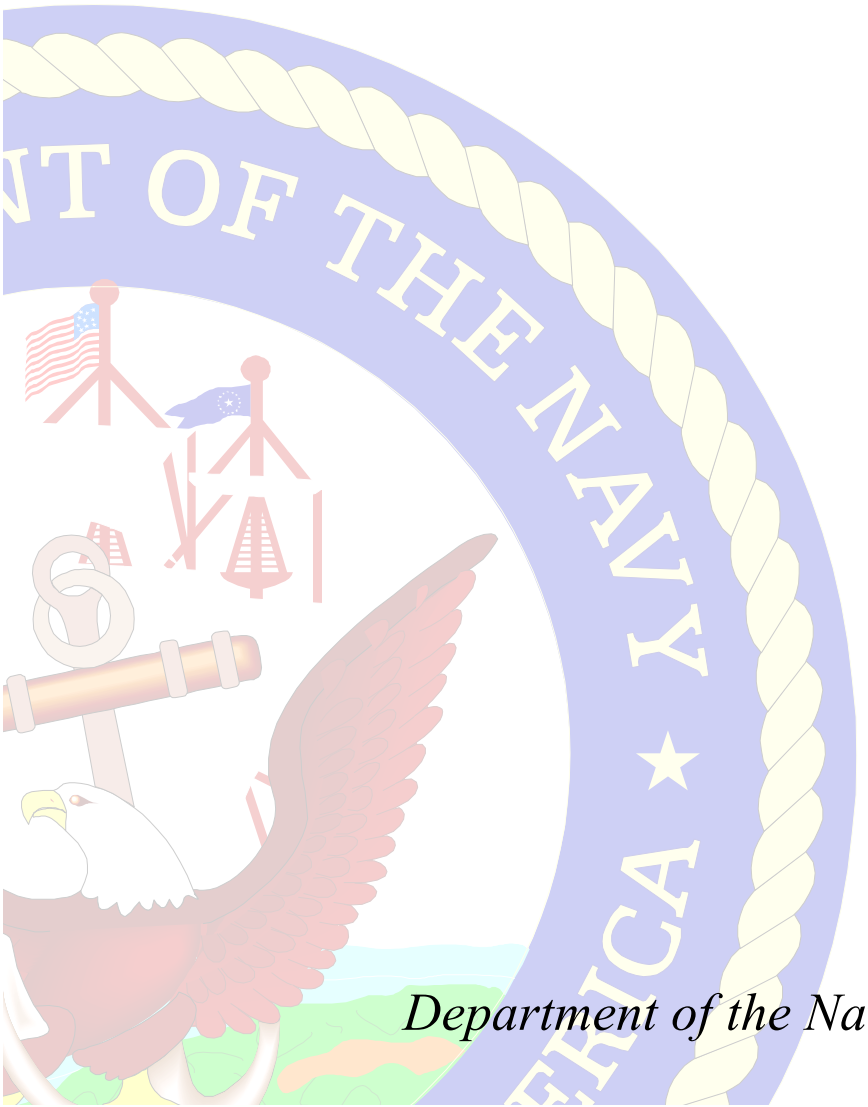
of such situations provided to range representatives for guidance included: were: a radar owned by the Federal Aviation Administration that provides support to the range; a building or tower where range equipment is stored or operated, but is not owned by the range; a parcel of property not owned by the Navy; inadequate power; poor road maintenance that impacts the ability of the range to repair equipment, etc. Where critical infrastructure issues were identified by the range manager, they are listed in the display (Figure C-14). Where no infrastructure issues were identified by the range representative, this is so indicated in the display.

- **Environmental Issues** - Range representatives were requested to list any environmental issues and concerns that could pose limitations to range capabilities and utilization. Examples of environmental issues/concerns included: the existence of cultural resources (e.g., tribal sacred sites), threatened or endangered species habitat (e.g., bald eagle nests); and environmental constraints as identified in National Environmental Policy Act (NEPA) documentation (Environmental Assessments, Environmental Impact Statements, Findings of No Significant Impact (FONSIs), and Records of Decision (RODs). Where critical environmental concerns were identified by the range manager, they are listed in the display (Figure C-15). Where no environmental issues were identified by the range manager, this is so indicated in the display.

Also included on the site are self-extracting compressed downloadable map files for use with the HAZARD program for identifying weapons impacts. These files are in AutoCAD version 12 DXF format. They include layers for hydrography, roads, range boundaries, impact areas, target locations and labels, and range building locations and labels. The data for hydrography and roads is 1:100,000 scale DLG data. The other data were digitized or entered from maps and coordinates supplied by the individual ranges and are considered extremely accurate. All HAZARD map data files are in the UTM meters, NAD 27, as required by the HAZARD program. The mapping extends five miles past the range boundary.

Appendices D and E

DoN Range Capability and Issues Summaries



Department of the Navy Range Needs Assessment: Air-to-Ground Ranges

APPENDIX D

DoN RANGE CAPABILITY AND ISSUE SUMMARIES

DoN EAST COAST RANGES

Atlantic Fleet Weapons Training Facility Complex
(Puerto Rico)

Number/Names of Range(s): 1 / Inner Range

Hours of Operation: Generally, NET 0700 to NLT 2300 local time, Monday, Wednesday, Thursday, Saturday, Sunday; NET 0900 to NLT 2300 Tuesday and Friday (live MK-83 and MK-84 bombing will only be permitted during daylight hours and after 1230 on Sundays)

Airspace:

Designation: Combination of Warning and Restricted Areas

Description: W-428 - surface to 50,000 ft MSL
R-7104 - surface to 50,000 ft MSL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Inner Range	14	WISS-IV: except the Strafe Target Acoustic: Strafe Target	Yes (except the Strafe Target)

Ordnance:

Types Authorized: Gun (up to 25 mm); A-G Rockets (up to 5-inch); Practice Bombs (MK-76/BDU-33 and MK-106/BDU-48); General Purpose Bombs (MK-80 series up to 2,000 lbs); GBUs (GBU-10, -12, -16, and -24); CBUs (MK-118 submunition), and Flares (MK-45/LUU-2)

Live Ordnance Authorized: Yes (all but Target 1 and SAM West); CBUs only on SAM East; Gun ammunition on Strafe Banner

Electronic Warfare Level: Not Available

Issues

Environmental:

1. Navy range property encompasses several critical habitats and environmentally sensitive resources, including South Coast Bays, Ensenada Honda, Cayo Conejo,

Punta Este, Tortuga Beach, Yellow Beach, North Coast, and Bahia de la Chiva. These conservation zones are generally outside the live impact area that is designated for air-to-ground exercises.

2. No air-to-ground activities at Punta Este.

3. Flights over Cayo Conejo are restricted to protect the Brown Pelican.

4. Concern has been expressed by residents and regulatory agencies about the effects of ordnance on water quality.

5. Beaches are surveyed 60 days prior to and during exercises to protect sea turtles.

6. Puerto Mosquito National Natural Landmark is located adjacent to range property.

7. Mangrove stands are within live impact area of Inner Range. These stands provide habitat for the federally-listed endangered cabana negra, a plant species.

8. Navy range property encompasses 33 cultural resources eligible for inclusion on the National Register of Historic Properties. None of these cultural resources is located within the live impact area.

9. Fishermen are authorized in the waters around the target area from 0700-0900 Tuesday and Friday.

10. Limitation on the number of days per year the range can be used per Memorandum of Understanding/Memorandum of Agreement between USFWS, NMFS, and Commonwealth of Puerto Rico.

Land Use/Encroachment:

1. Navy property surrounds 9,300 civilian residents of Vieques. The Live Impact Area is on the eastern end of the island, about 7-8 miles east of civilian communities. Residents of Vieques have expressed heated concerns regarding the safety and noise impacts of range activities as well as the impact of range activities on the island's economy. Residents are opposed to the continued use of the range.

2. A municipal sports complex and a landfill is located adjacent to Navy property on land excessed by the Navy.

***Infrastructure**:*

1. Range tower OP-1 is in need of repair, but there is an “ownership” conflict: Naval Station Roosevelt Roads owns the tower, but AFWTF owns the equipment on the tower.

2. Other range-related infrastructure components are in need of refurbishment or repair, including Bldg Nos. 4702 and 03, 4005, 4710 to 4713, water tanks, and roads.

***Operations/Training**:*

1. Multipurpose range that supports A-G weapons training, shore bombardment, amphibious landings, etc.

2. Only East Coast range complex that allows expenditure of cluster munitions (MK-118 submunitions).

3. Surface-to-surface or air-to-surface guided missiles firing is prohibited in the complex.

4. Laser-guided and heavy inert weapons are authorized.

5. Live ordnance delivery must be discontinued when marine mammals are sighted within 1,000 yds of target area.

6. No live ordnance may be used after sunset or on Sunday before 1230.

7. Can support large-scale air wing strike scenarios.

8. Accommodates high-altitude bombing.

Bloodsworth Island Shore Bombardment and Bombing Range
(Maryland)

Number/Names of Range(s): 1 / Bloodsworth Island

Hours of Operation: Closed to scheduling until further notice (when operational, 0730-1600, daily)

Airspace:

Designation: Restricted Area

Description: R-4002 - surface to FL200

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Bloodsworth	1	None	Yes

Ordnance:

Types Authorized: Gun (up to 30 mm); A-G Rockets (up to 5-inch); Practice Bombs (MK-76/BDU-33 and BDU-50); General Purpose Bombs (MK-77 and MK-80 series up to 500 lbs); GBUs (GBU-12)

Live Ordnance Authorized: Yes

Electronic Warfare Level: No emitters

Issues

Environmental:

1. Range is closed during migratory bird season (generally, from October through March/April).

2. Northern one-third of the island reserved as a “no-fire area” to protect: (1) nesting herons, egrets, and other colonial shore birds’ nesting sites and habitat; and (2) cultural resources.

3. Nearby residents of Dorchester and Somerset counties have complained to elected officials regarding safety and noise issues associated with use of the range.

Land Use/Encroachment:

1. The counties on the Eastern Shore of Maryland are experiencing moderate increases in population. The new residents are particularly sensitive to aircraft noise impacts.

2. Tourism, particularly ecotourism is becoming a more important factor in the local economy with associated sensitivity to Navy activities on the Chesapeake Bay.

3. Waters around the islands making up the range are frequented by recreational and commercial fishermen.

Infrastructure*:* Targets formerly used on the island are non-existent and/or in poor repair.

Operational/Training:

1. Range use has been suspended pending completion of a new range manual.

2. Range scheduling is awkward: the "island impact area" is scheduled through NAB Little Creek (Norfolk, VA); airspace is scheduled through NAWCAD Test Range and Facilities Department Central Scheduling at NAS Patuxent River.

3. Because of the location of the complex with respect to civilian flight corridors in the northeast US, military aircraft must be vigilant for General Aviation traffic entering into the target area.

4. Gunfire/ordnance expenditure is restricted during dry spells, to minimize the chance of a fire spreading into the northern one-third of the island. White Phosphorous (WP) ordnance is not authorized.

Camp Lejeune Complex
(North Carolina)

Number/Names of Range(s): 3 / BT-3/N-1, G10, and K-2

Hours of Operation: Continuous, but BT-3/N-1 is available only 12 hours per day. Scheduling coordinated through Camp Lejeune Range Control

Airspace:

Designation: Restricted Area

Description: R-5306 - surface to 17,999 ft MSL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
BT-3/N-1	1	None	No
G-10	37	None	Yes
K-2	1	None	No

Ordnance:

Types Authorized: Gun (generally, .50 cal to 40 mm); A-G Rockets (up to 2.75-inch); Practice Bombs (MK-76/BDU-33); and General Purpose Bombs (MK-80 series up to 2,000 lbs); GBUs (GBU-10, -12, -16, -24), TOW, DRAGON.

Live Ordnance Authorized: Yes (at K-2 range gun ammunition)

Electronic Warfare Level: II (Camp Lejeune is dependent on the Cherry Point MAEWR assets for any EW capability)

Issues

Environmental:

1. No ordnance expenditures authorized from 4 NM off the coast and seaward during whale sightings and migratory season (February through April).

2. There is a 200 ft buffer around each aggregate “cavity” tree to protect federally listed endangered Red Cockaded Woodpecker habitat.

3. The federally-listed endangered rough-leaved loosestrife is usually found in or adjacent to wetlands. Areas where these plants are found are clearly marked as restricted areas to be avoided.

4. The use of certain areas is restricted to protect the Venus Fly Trap, a North Carolina-listed threatened species.

Land Use/Encroachment:

1. Ranges are wholly enclosed by MCB Lejeune property.

2. Increases in seasonal residents in coastal communities to the north and south of MCB Camp Lejeune may increase concerns with aircraft and ordnance delivery noise.

3. Croatan National Forest is located to the northeast of MCB Camp Lejeune.

Infrastructure*:* No issues reported.

Operational/Training*:*

1. Although the airspace is limited, this range complex offers good Close Air Support (CAS) training -- aircraft hold in W-122 and are “called” into the target.

2. Only light inert ordnance is authorized.

3. There has been some success in developing (within the Camp Lejeune Complex) a training environment (similar to Yuma Urban Warrior) to support training in the Military Operations in Urban Terrain (MOUTS) scenario.

4. The ranges at Camp Lejeune is part of the Littoral Warfare Training Complex (LWTC) that is being development to provide for joint operational training in a littoral warfare environment. The tactical training support role for the LWTC is advanced over-the-beach amphibious assaults and subsequent maneuver ashore, and special operations. The LWTC also includes the assets of the Cherry Point and VACAPES complexes.

Cherry Point Complex
(North Carolina)

Number/Names Of Range(s): 2 / BT-9 and BT-11

Hours Of Operation: At BT-9 - Continuous; At BT-11 - 0800-2240, Monday through Thursday and 0800-1500, Friday; For both, other times must be coordinated through the range and Airspace Scheduling office at MCAS Cherry Point

Airspace:

Designation: Restricted Area, MOA, and ATCAA

Description: R-5306 - surface to 17,999 ft MSL
Hattaras F MOA - 3,000 ft to 17,999 ft MSL
Neuse ATCAA - FL180 to FL230

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
BT-9	1	WISS	Yes
BT-11	18	WISS: All but North Guns, TOW Target, Hammock Point, Simulated Truck Convoy, Simulated Train, SEPTAR Track, Trimaran TOW Acoustic: Strafing Banners Laser Spot/Tone: ALAST, LSTSS, IWTS	Yes (except Strafing Banners, SEPTAR Track, Trimaran TOW, IWTS, and Helo Pad)

Ordnance:

Types Authorized: Gun (up to 30 mm); A-G Rockets (up to 5-inch); Practice Bombs (MK-76/BDU-33, MK-106/BDU-48, and BDU-45 and -50); General Purpose Bombs (MK-80 series up to 100 lbs live or 1,000 lbs inert); GBUs (GBU-10, -12, 16 and LGTR); Flares; and Chaff

Live Ordnance Authorized: Yes (up to 100 lbs explosives on BT-9; gun ammunition on BT-11)

Electronic Warfare Level: II with Cherry Point TACTS (Multiple threat emitters and simulators, but size of operating area limits concept of “coordinated threat” environment)

Issues

Environmental:

1. Known habitats of the federally-listed endangered Red Cockaded Woodpecker and Spring Goldenrod exist throughout the range complex; known areas are avoided.

2. Extensive wetlands exist within the range complex, disturbance to which is minimized.

3. Complex is in proximity to Cedar Island and Mattamuskeet/Swanquarter National Wildlife Refuges, Cape Lookout National Seashore, and Goose Creek Game Lands.

Land Use/Encroachment:

1. Ranges are surrounded by predominantly rural land uses including summer youth camps, recreational uses such as hunting and fishing and agricultural uses.

2. Increases in seasonal residents in coastal communities to the east and south of the Cherry Point Complex may increase concerns with aircraft and ordnance delivery noise.

3. Hunters encroach on range lands.

4. Croatan National Forest surrounds MCAS Cherry Point.

Infrastructure:

1. North Carolina is studying and considering renegotiating agreements (i.e., leases) for use of water-based targets with the intent of ensuring the proper management of submerged lands

2. Bulk head and boat landing and parking area at BT-11 owned by North Carolina.

Operational/Training:

1. Houses the Mid-Atlantic EW Range (MAEWR) and a 36-aircraft TACTS with lateral dimensions of 30 by 40 NM. Tracking can be achieved from 50 ft to 60,000 ft AGL.

2. No ordnance may be expended on BT-11 targets with Laser Spot/Tone scoring system (ALAST, LSTSS, IWTS).

3. Flights below 3,000 ft over known wildlife preserves are prohibited as is firing at wildlife (fish, fowl, mammal, or game).

4. There is some impact on training due to airspace limitations. Environmental documentation is pending on a proposal to combine the Cherry Point MOA with R-5306 and the Camp Lejeune Core MOA. If approved, the size of the combined range complex (approximately 60-70 nmi in diameter) would provide one of the best tactical training complexes on the east coast.

5. The complex has supported firings of AGM-114 (Hellfire) in the past on a case-by-case basis only.

6. One of four East Coast range complexes that can support small-scale (up to 12 aircraft) air wing strike scenarios.

7. The Cherry Point Complex is part LWTC, which also includes the assets of the Camp Lejeune and VACAPES complexes.

Jacksonville Complex
(Florida)

Number/Names of Range(s): 3 / Lake George, Pinecastle, and Rodman

Hours of Operation: Lake George and Rodman - 0730-1000; Pinecastle - 0700-2300; For all, other times with 6 hours advance notice, coordinated through FACSFACJAX

Airspace:

Designation: Combination of Restricted Areas and MOAs

Description: R-2907B - surface to 9,000 ft MSL
R-2907A - surface to FL230
R-2906 - surface to 14,000 ft MSL
R-2910 - surface to 23,000 ft MSL
MOA (Palatka) - 3,000 ft MSL to 17,999 ft MSL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Lake George	7	WISS: all	No
Rodman	2	WISS: Conventional Bull SSS-101: Strafe Target	No
Pinecastle	7	WISS: All but Inert Ordnance Runway/Convoy, SAM Site, and Strafe Targets Acoustic: Strafe Target	Yes (except Special Weapons Bull and Strafe Target)

Ordnance:

Types Authorized: Gun (up to 30 mm); A-G Rockets (up to 5-inch); Practice Bombs (MK-76/BDU-33, MK-106/BDU-48, and BDU-45); General Purpose Bombs (MK-80 series up to 2,000 lbs); and GBUs (GBU-10, 12, 16, -24 and LGTR)

Live Ordnance Authorized: Yes (Pinecastle only)

Electronic Warfare Level: No emitters

Issues

Environmental:

1. Targets at Lake George Range lie entirely within the waters of Lake George, a tributary to the St. Johns River.

2. US Forest Service restricts use of ordnance during high fire threat conditions.

3. More than 13 endangered, threatened, or sensitive species of plants and animals inhabit the Pinecastle Range. A Natural Resources Management Plan is being prepared for Pinecastle and Rodman ranges.

4. Use of fabricated targets (wood/sheet metal) instead of old vehicles would increase positive environmental responsiveness.

5. Possible archaeological sites on Rodman Range. The sites are away from the immediate target area but may limit helicopter operational areas.

Land Use/Encroachment: Pinecastle Range entirely surrounded by the Ocala National Forest. This resource is a popular hiking, camping, and swimming destination. Aircraft noise and explosions may be a source of annoyance to recreational users of the National Forest.

Infrastructure:

1. Special use permit for Pinecastle Range is required from owner -- US Department of Agriculture and US Forest Service. Current permit ends 31 December 2000, EIS ongoing to establish another 20-year permit.

2. The road around the complex is maintained by the US Forest Service.

3. Radar at complex owned by Gainesville Airport fed through TRACON to FACFACJAX.

4. Erosion of land at the Lake George Tower threatens the tower's integrity by approximately 25 ft. Erosion is also encroaching on tower bases at Pinecastle Range.

Operational/Training:

1. Pinecastle offers live ordnance expenditure, and limited high altitude bombing (within 5 NM of the target).

2. Rodman provides basic ordnance expenditure training.

3. The range complex offers no EW training and chaff expenditure is not authorized.

4. Additional airspace is required, up to FL230 across the entire range complex.

5. One of four East Coast range complexes that can support small-scale (up to 12 aircraft) air wing strike scenarios.

6. The Navy Armed Helicopter (SH-60F Variant) has requested authorization to fire Hellfire (AGM-114) on the Pinecastle Target. This request has been (and will continue to be) denied because the weapon hazard pattern/footprint at launch exceeds range boundaries.

Patuxent River Complex
(Maryland)

Number/Names of Range(s): 1 / Chesapeake Test Range

Hours of Operation: 0700-2300

Airspace:

Designation: Restricted Areas

Description: R-4002 - surface to FL200
R-4005 - surface up to but not including FL250
R-4006 - 3,500 ft MSL up to but not including FL250
R-4007 - surface up to 5,000 ft MSL
R-4008 - FL250 to FL850
R-6609 - surface to FL200

Supersonic: Yes

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Chesapeake Test Range	3	No except Hooper where range instrumentation includes: GPS Radars/TSPI Automatic Laser Tracking System Fixed & Portable Cinetheodolites Multiple Target Instrumentation Radar	Yes

Ordnance:

Types Authorized: Gun (.50 cal up to 40 mm); A-G Rockets (up to 2.5-inch); A-G Missiles (AGM-45, AGM-65, AGM-84, AGM-88, AGM-114, SLAM); Practice Bombs (MK-76/BDU-33, MK-106/BDU-48); General Purpose Bombs (Mk-80 series up to 2,000 lbs); GBUs (GBU-10, -12, -16, -24 and GBU-31/32 [JDAM]); CBUs (Submunitions MK-118, BLU-73, and BLU-77); Mines, Flares; and Chaff

Live Ordnance Authorized: Yes (Gun ammunition)

Electronic Warfare Level: III

Issues

Environmental:

1. Aircraft noise is an issue with a growing population residing in within the range boundaries. Aircraft noise can also have an impact on the poultry industry.

2. Water quality and stormwater discharges to Chesapeake Bay are closely monitored.

3. The range boundaries include Blackwater and Glenn L. Martin National Wildlife Refuges and numerous state wildlife management areas and state and local parkland.

4. Federal- and state-listed endangered and threatened species inhabiting the range include sea turtles, the northeast beach and puritan tiger beetles, least tern, and bald eagle.

5. No known underwater cultural resources are known to exist in the target areas.

Land Use/Encroachment:

1. The land area underlying the range airspace is growing rapidly in population.

2. Ecotourism and other forms of tourism (e.g., bed and breakfasts) are growing sectors of the economy.

3. Recreational boating is a growing industry in the Chesapeake Bay.

Infrastructure: No issues reported.

Operational/Training:

1. Range is a DoD MRTFB range. Range assets are sized, operated, and maintained primarily for DoD T&E missions. However, as an MRTFB range, Patuxent River is available to commercial and other users on a reimbursable basis.

2. Fleet use on a not-to-interfere basis with scheduled RDT&E events.

3. Airspace:

   - Difficult to get airspace above 20,000 ft (F-14s and F/A-18 want 20-30,000 ft).

- Spill-out from the area puts aircraft into airspace under control of Washington ARTCC that has a high density of commercial and general aviation traffic.

- Airspace around the targets is “tight” (requires sharp pull-off to remain within designated target airspace).

- Will accommodate medium-sized strike packages.

4. Targets:

   - All overland targets are “no-drop” targets intended for use in target recognition or airborne reconnaissance.

   - At one outlying runway target, they can position trucks or other vehicles that can be used for visual and/or IR target recognition.

   - Over-water targets (ship hunks, etc.) don’t offer much realism.

   - Mining range (Hooper Target) offers camera scoring (and Pax River will recover the mines if desired). Completed first Mine Readiness Certification Inspection (MRCI) at Patuxent River with good results.

5. The Patuxent River Complex has good EW capabilities and can replicate many types of surface-to-air threats. There are multiple emitters, some of which are mobile.

Quantico Complex
(Virginia)

Number/Names of Range(s): 2 / Range 7 and Range 15

Hours of Operation: Continuous

Airspace:

Designation: Combination of Restricted Areas and MOAs

Description: R-6608 - surface to 10,000 ft MSL
MOAs - not lower than 500 ft and not higher than 15,000 ft MSL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations[1]
R-7	8	None	Yes
R-15	5	None	Yes
Notes: 1. Range has laser capability but is not currently certified.			

Ordnance:

Types Authorized: Gun (.50 cal up to 30 mm); A-G Rockets (up to 5-inch); Practice Bombs (Mk-76/BDU-33); General Purpose Bombs (MK-80 Series up to 500 lbs); GBUs (GBU-10 and -12); and Flares (MK-45/LUU-2); TOW; DRAGON

Live Ordnance Authorized: Yes

Electronic Warfare Level: No Emitters

Issues

Environmental: No issues reported

Land Use/Encroachment:

1. MCAF Quantico is located adjacent to the Prince William Forest Park, a popular campground and picnicking and hiking area.

2. Adjacent Fauquier, Prince William and Stafford Counties are experiencing rapid residential population growth.

3. Noise and vibration associated with aircraft operations are issues with residential neighbors.

***Infrastructure**:* No issues reported

Operational/Training: It is a multi-purpose range, used principally for artillery bombardment and door gunnery training; of limited value in A-G weapons training.

Townsend Range
(Georgia)

Number/Names Of Range(s): 1 / Townsend

Hours Of Operation: 0800-2200, with 1-hour "breaks" at lunch and dinner. Closed on weekends, except by special request through the Georgia ANG.

Airspace:

Designation: Combination of Restricted Area and MOA

Description: R-3007 - blocks from surface to 13,000 ft MSL
Quick Thrust MOA - blocks from 100 ft AGL to 14,000 ft MSL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Townsend	9	WISS: all but Target 5 and Strafe Pits ADI Acoustic: Strafe Pits	Yes (except Target 5)

Ordnance:

Types Authorized: Gun (30 mm); A-G Rockets (up to 2.75-inch); Practice Bombs (MK-76/BDU-33 and MK-106/BDU-48); General Purpose Bombs (MK-80 series up to 2,000 lbs); and GBUs (GBU-10, -12, -16, and -24 and LGTR)

Live Ordnance Authorized: No

Electronic Warfare Level: I (Smokey SAMs)

Issues

Environmental:

1. Two rare species (Bachman's Sparrow and Flatwood's Salamander) exist on several areas of the range.

2. Use of range areas identified as "palusterine" wetlands is minimized to maintain a relatively undisturbed natural habitat.

Land Use/Encroachment: The predominant land use in the vicinity of the range is forestry.

Infrastructure:

1. Blues Reach Road (which transits west of the range) needs to be relocated to remove civilian traffic from the strafing weapon "descriptors" for PGU-27/28.

2. Range expansion to the north to accommodate delivery of GBUs will require a new lease.

Operational/Training:

1. Although this is a USMC range, scheduling authority (and reporting) has been delegated to the Georgia ANG.

2. The range is used in conjunction with the Beaufort TACTS, which is located in the Atlantic Ocean.

3. There is a limit to the number of days each year that most MOAs can be active.

4. Has been used frequently in the past by NAS Cecil Field-based F/A-18s.

5. The range is limited by available airspace (i.e., good range complex for "one pass" tactical deliveries, but multiple-run deliveries require aircraft to use non-tactical patterns in the target area).

Virginia Capes (VACAPES) Complex
(North Carolina)

Number/Names of Range(s): 3 / Dare County, Palmetto Point, and Stumpy Point

Hours of Operation: Generally, 0800-2300 daily, except Palmetto Point, which needs to be scheduled 24 hours in advance. All range coordination through FACSFACVACAPES.

Airspace:

Designation: Restricted Areas and MOAs

Description: R-5302 - blocks from surface to 14,000 ft MSL
R-5313 - blocks from surface to 17,999
R-5314 - blocks from surface to FL205
R-6606 - surface to FL510
Hattaras F MOA - 3,000 to 13,000 ft MSL
Pamlico MOA - 8,000 up to FL180

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Dare County	10	WISS: all but Minimum Altitude Lay-down and Strafe Targets	Yes (except Minimum Altitude Lay-down and Strafe Targets
Palmetto Point	1	WISS	Yes
Stumpy Point	1	WISS	Yes

Ordnance:

Types Authorized: Gun (.50 cal up to 25 mm); A-G Rockets (up to 5.0-inch); Practice Bombs (MK-76/BDU-33 and MK-106/BDU-48); General Purpose Bombs (MK-80 series up to 2,000 lbs); GBUs (GBU-10, -12, -24 and LGTR)

Live Ordnance Authorized: Yes (Gun ammunition on Navy Dare County Range)

Electronic Warfare Level: No emitters; Smokey SAMs.

Issues

Environmental:

1. Dare County:

   - Dare County Range is surrounded completely by the Alligator River National Wildlife Refuge.

   - Wetlands - the majority of the range is classified as relatively undisturbed shrub and forested wetland.

   - The Federally-listed endangered Red Cockaded woodpecker is known to nest at the range and the range is an important breeding habitat.

   - The range provides habitat to many wildlife species shy or intolerant of human presence. To minimize impact, the brush areas around the targets are cut down.

   - Fires occasionally break out around the targets, though these fires are actually beneficial to the continuation of vegetative species. Fire control measures are in place.

2. Palmetto Point: No environmental issues reported.

3. Stumpy Point: No environmental issues reported.

Land Use/Encroachment:

1. Dare County:

   - The predominant land use in the vicinity of the range is forestry and wetlands with some agricultural uses.

   - The range is closed on weekends to allow hunting per USAF negotiations with a local hunting club.

2. Palmetto Point - This range is situated in the middle of the Albemarle Sound. Surrounding land areas are relatively rural, though beginning to experience a growth in seasonal residential development.

3. Stumpy Point - This range is situated in the Pamlico Sound. The surrounding land areas are rural and sparsely populated.

***Infrastructure**:*

1. Dare County:

   - The range is on land owned by the USAF.

   - All interior roads are maintained by the North Carolina Forest Service (NCFS). They are dirt and gravel and degrade rapidly, particularly when traversed by heavy lumber trucks. During the wet season, the roads are nearly impassable.

   - NCFS will not mow beyond the initial road shoulder. As a result, fire boundary canals are completely overgrown and underbrush and grasses on the impact area are creating a real fire hazard.

2. Palmetto Point: Existing barge target needs rock to shore up target and scoring systems.

3. Stumpy Point: A new target is required to make this range usable. To date efforts to replace the target have been cost prohibitive.

***Operations/Training**:*

1. No ordnance drops are authorized on the T-72 Surrogate Tank Target (Dare County).

2. Civilian hunters are frequently found on the range areas during unauthorized times. Presence of these individuals can result in the suspension of range operations.

3. The use of laser designators has become a “hot” issue among civilians in the area.

4. There are few tactical targets.

5. The use of the range complex is expected to increase with the transfer of the F/A-18 squadrons form NAS Cecil Field to NAS Oceana.

6. The airspace is limited. The USAF has proposed increasing the ceiling on the MOA to the West to allow step-down high altitude ingress to the target area.

7. One of four East Coast range complexes that can support small-scale (up to 12 aircraft) air wing strike scenarios.

8. At FL205, range airspace (within 5 NM of target) is only minimally adequate for high-altitude bombing.

9. The VACAPES Complex is a major component of the LWTC, along with the Cherry Point and Camp Lejeune complexes.

Gulf of Mexico Complex
(Texas)

Number/Names of Range(s): 1/ McMullen County (Yankee/Dixie targets)

Hours of Operation: 0800-1730 (M-F), which expands to 0800-2000 during Daylight Savings Time; requests for weekend or night operations must be submitted two weeks in advance to NAS Kingsville Base Operations

Airspace:

Designation: Restricted Area

Description: R-6312 - surface to 12,000 ft AGL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
McMullen Range - Yankee Target	12	Acoustic: Strafe Pits	No
McMullen Range - Dixie Target	10	Acoustic: Strafe Pits	No

Ordnance:

Types Authorized: Gun (20mm); A-G Rockets (2.75-inch); and Practice Bombs (MK-76/BDU-33)

Live Ordnance Authorized: Yes (Gun ammunition)

Electronic Warfare Level: I; Smokey SAMs

Issues

Environmental:

1. Low level flight must be avoided in the areas where migratory birds are known to feed.

2. The only federally-listed endangered species inhabiting the range lands is the ocelot. However, eight candidate species may be present: the ferruginous hawk, Mexican hooded oriole, Gulf Coast hog-nosed skunk, Audubon's oriole, long-

billed curlew, reticulate collared lizard, Texas horned lizard, and Texas olive sparrow.

3. Habitat for several species of state-listed endangered and threatened plants and animals exist in the vicinity of or on the range lands, the presence of four of which have been confirmed in McMullen County, including the ocelot, Texas tortoise, reticulate collared lizard, and the Texas indigo snake.

Land Use/Encroachment:

1. The predominant land use in the vicinity of McMullen Range is ranching. The population density is sparse with an average of about 0.7 persons per sq mi.

2. The James E. Dougherty Wildlife Management Area and adjacent Choke Canyon State Park are located to the northeast of the range. The Choke Canyon State Park provides picnic areas, campgrounds, hiking trails, and boat ramps.

Infrastructure*:*

1. The roads to Yankee and Dixie targets are caliche and require a high degree of maintenance.

2. The spotting towers are substandard and need to be upgraded or replaced.

3. The EOD bomb storage area fence needs to be repaired/replaced.

4. The USAF has currently is considering a proposal to expand the land area of Yankee target.

Operational/Training*:*

1. Range operations are split between the Navy (CNET) and Texas ANG; most Navy operations take place on Dixie Target.

2. Supports only light inert ordnance expenditure.

Meridian Complex
(Mississippi)

Number/Names of Range(s): 1 / Searay Multipurpose Target

Hours of Operation: 0700-2400 (M-F); other times by request through the COMTRAWING ONE Operations Officer

Airspace:

Designation: Combination of Restricted Areas and MOAs

Description: R-4404 - blocks of altitude from surface to 14,500 ft MSL
Meridan East MOA - 8000 ft MSL to FL180

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Searay Multipurpose Target	2	None, although USAF users use a portable TOSS System at targets	No

Ordnance:

Types Authorized: Gun (20 mm only on the "Strafe Berm") and Practice Bombs (MK-76/BDU-33 only on the "Bull')

Live Ordnance Authorized: Yes (Gun ammunition)

Electronic Warfare Level: No emitters

Issues

Environmental: A small colony of federally-listed endangered red cockaded woodpeckers is established on property adjacent to the range, but no range operations are constrained at this time.

Land Use/Encroachment:

1. The range is located in a rural, sparsely populated area. Forestry is a major land use in the area with hunting clubs subleasing many parcels.

2. The range has an apparent history of trespassing by hunting club members and local landowners and some accidents have occurred (at least two prior to 1989).

Infrastructure: Additional purchase of land within the current lease area has been recommended by Southern Division Naval Facilities Engineering Command, but land has not been purchased due to lack of funding.

Operational/Training:

1. Supports only light inert ordnance expenditure.

2. Firing the M61A1 20 mm gatling gun or 2.75-inch rockets at the range can produce weapons safety footprints that extend off range.

DoN WEST COAST RANGES

Camp Pendleton Complex (R-2503)

(California)

Number/Names of Range(s): 5 / Door Gunner 1, Door Gunner 2, R-212 Tow; R-220 Whiskey Impact Area, and R-440 Zulu Impact Area

Hours of Operation: Generally, 0600-2400 daily; other times by request through MCB Camp Pendleton Range Control

Airspace:

Designation: Combination of Restricted Areas and MOAs

Description: R-2305 - blocks from surface to FL270
San Onofre High MOA - 4,000 ft MSL to 8,000 ft MSL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Door Gunner 1	1	None	No
Door Gunner 2	1	None	No
R-220 Whiskey	1	None	No
R-212 TOW	1	None	No
R-440 Zulu	10	WISS-IV	Yes

Ordnance:

Types Authorized: Gun (.50 cal up to 40 mm); A-G Rockets (up to 5.0-inch); Practice Bombs (MK-76/BDU-33 and MK-106/BDU-48); General Purpose Bombs (MK-77 and MK-80 series to 500 lbs); GBUs (GBU-10 and 12); Flares; and Chaff

Live Ordnance Authorized: Yes

Electronic Warfare Level: I (Mobile Ground RADAR Threat Emitter)

Issues

Environmental:

1. Training is planned so that impacts to the Least Tern and 14 other threatened or endangered species of plants and animals are avoided.

2. About 3,000 acres of Cleveland National Forest is within the Base Safety Zone E.

3. Training is limited on approximately 1,200 acres of Bell's Vireo habitat.

Land Use/Encroachment:

1. Interstate 5 separates MCB Camp Pendleton from the beaches limiting ingress/egress to/from beach.

2. The nearby San Onofre Nuclear Generating Station and its surrounding property and airspace are off limits for training activities.

3. There is pressure to provide off-shore leases for oil and gas exploration.

5. Live-fire training activities are restricted during high fire ignition rate conditions.

6. Projected population growth in offsite communities indicates continued urbanized growth in the land areas adjacent to MCB Camp Pendleton. Urbanized development is limited on the eastern boundary of the base by the existence of the Cleveland National Forest and rugged terrain. Development is limited on the west by the Pacific Ocean and coastal management regulations.

Infrastructure: No infrastructure issues reported

Operational/Training:

1. Multi-purpose range that supports A-G and artillery bombardment training.

2. A-G training has range scheduling priority only 6 days per month. A-G training can be conducted on other days on a not-to-interfere basis.

3. Complex provides diverse topography.

4. Provides a good Close Air Support (CAS) training environment.

5. Can be used to support air wing exercises, including high-speed (subsonic) aircraft.

6. Currently available airspace impacts the full range of training that could be provided.

7. The Camp Pendleton Complex is part of the Expeditionary Force Training Complex used for the purpose of operational training in a littoral warfare environment. The tactical training support role for the EFTC is for carrier-based strikes, over-the-beach amphibious assaults and subsequent maneuver ashore, and special operations. The EFTC also includes the assets of the Camp Pendleton, El Centro, Twentynine Palms, and Yuma complexes.

China Lake Complex
(California)

Number/Names of Range(s): 10 / Airport Lake, Baker, Charlie, Coles Flats, COSO, George, Wild Horse Mesa, Mojave B, and Superior Valley

Hours of Operation: Generally, continuous

Airspace:

Designation: Combination of Restricted Areas and MOAs

Description: R-2505 and R2524 - surface to unlimited
R-2506 - surface to 6,000 feet MSL
R-2508 - surface to 20,000 feet MSL
MOAs - 200 feet AGL to FL180

Supersonic: Yes

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Airport Lake	6	Precision TSPI	Yes (All)
Baker	8	Precision TSPI	Yes (All)
Charlie	3	Precision TSPI	No
Coles Flats	2	None at Sam Site Precision TSPI at CF23	Yes (SAM Site)
COSO	6	None	Yes (All)
George	11	Precision TSPI: all but ALAST which has IR video and Shrike which has no instrumentation	Yes (All)
Wild Horse Mesa	1	Precision TSPI	Yes
Mojave B N & S	1	None	Yes
Superior Valley	1	WISS	Yes

Ordnance:

Types Authorized: All types of ordnance, including Gun; A-G Rockets; A-G Missiles; Cruise Missiles; Practice Bombs; General Purpose Bombs; GBUs; CBUs; Flares; and Chaff.

Live Ordnance Authorized: Yes (Airport Lake, Baker [B-2 Target Center], and George [Aircraft, Aircraft Revetment, G-ZAP-0, and Renegade Tunnel])

Electronic Warfare Level: III

Issues

Environmental:

1. Possible designation of Kern County by USEPA as a severe nonattainment area for ozone will restrict airfield operations.

2. Aircrews required to avoid flight operations below 3,000 ft vertically and laterally in the airspace above the Death Valley National Monument, the Sequoia and Kings Canyon National parks, and the Domeland and John Muir Wilderness areas.

Land Use/Encroachment:

1. Coordination with the Department of the Interior's Bureau of Land Management (BLM) is required for activities conducted on public land under their jurisdiction surrounding the complex.

2. The complex is located just west of Death Valley National Park and east of the Inyo and Sequoia National Forests.

Infrastructure: No issues reported.

Operational/Training:

1. With the exception of the Superior Valley Range (a Fleet asset), the complex is a DoD MRTFB range. Range assets are sized, operated, and maintained primarily for DoD T&E missions. However, as an MRTFB range, China Lake is available to commercial and other users on a reimbursable basis.

2. Fleet use on a not-to-interfere basis with scheduled RDT&E events.

3. During Fleet use of the complex, the available instrumentation would not normally be used for "scoring," as the charge for instrumentation, which is designed for detailed ballistic, engineering, and electronic analysis, is costly.

4. Accommodates high-altitude bombing.

5. As the complex adjoins the Army's Ft. Irwin range complex, there is opportunity for joint operations.

El Centro Complex
(California)

Number/Names of Range(s): 2 / R-2510 (Shade Tree and Loom Lobby targets); R-2512 (Inkey Barley and Kitty Baggage targets)

Hours of Operation: For R-2510, and NET 0700 to NLT 2300, Monday through Saturday with other times by request through Yuma Range Scheduling; continuous for R-2512 range.

Airspace:

Designation: Combination Restricted Areas, MOAs, and ATCAA

Description: R-2510A/B - surface to FL400
R-2512 - surface to FL230
MOAs - no lower than 5,000 ft MSL up to 17,999 MSL
Kane East ATCAA - FL180 to FL400

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
R-2510 (Shade Tree)	4	WISS: Main Target Acoustic: Strafing Target	No
R-2510 (Loom Lobby)	2	WISS: Main Target Acoustic: Strafing Target	Yes
R-2512 (Inkey Barley)	1	WISS	No
R-2512 (Kitty Baggage)	1	None	No

Ordnance:

Types Authorized: Gun (20mm); A-G Rockets (up to 2.75-inch); Practice Bombs (MK-76/BDU-33 and MK-106/BDU-48), and Flares

Live Ordnance Authorized: Yes (Gun ammunition)

Electronic Warfare Level: No emitters

Issues

***Environmental**:* A state-listed Wildlife of Concern, the Flat-tailed Horned Lizard, inhabits the range complex.

Land Use/Encroachment:

1. The surrounding land uses are rural agricultural and natural desert.

2. The range areas are surrounded by public lands under the jurisidiction of BLM.

3. Coordination with BLM and other appropriate federal agencies is required for activities conducted on public land under their jurisdiction per the Federal Land Policy and Management Act (FLPMA) and/or the Engle Act of 1958 (PL 85-337).

4. Pressure exists to conduct geothermal exploration and development activities in the vicinity of R-2510.

Infrastructure: Budget constraints have limited and will continue to limit maintenance on the access roads to range/target areas.

Operational/Training:

1. Airspace altitudes available to range users are surface to 15,000 ft and 18,000 to 23,000 ft. The unavailability of the 15,000 to 18,000 ft section limits some flights and many parachute drops. This airspace section is considered available if advanced notice is given to the Los Angeles ARTCC, however, past efforts have been unsuccessful in obtaining temporary use of the corridor.

2. The complex offers substantial ramp space for aircraft parking and easy access to the El Centro range complex, as well as the Yuma range complex.

3. The El Centro Complex is part of the EFTC, which also includes the assets of the SCORE, Camp Pendleton, Twentynine Palms, and Yuma complexes.

Fallon Range Training Complex
(Nevada)

Number/Names of Range(s): 4 / B-16, B-17, B-19, and B-20

Hours of Operation: Generally, NET 0715 to NLT 2330; other times by request through NSAWC

Airspace:

Designation: Combination Restricted Areas, MOAs, ATCAAs, and ALTRVs

Description: R-4802 - surface to 8,000 ft
R-4803N - surface to 8,000 ft
R-4803S - surface to 18,000 ft
R-4804 - surface to FL180 (not including 2,000 ft AGL to 8,500 ft AGL)
R-4810 - surface to 17,000 ft
R-4812 - surface to FL180 (not including 2,000 ft AGL to 8,500 ft AGL)
R-4813 -surface to FL180
R-4816N - 1,500 ft AGL to FL180
R-4816S - 500 ft AGL to FL180
Austin 1 & 2 MOAs -200 ft AGL to FL180
Carson MOA - 500 ft AGL to FL180
Churchill High MOA - 9,000 MLS to FL180
Churchill Low MOA - 500 ft AGL to 9,000 ft MSL
Gabbs N, Central, S MOAs - 100 ft AGL up to FL180
Ranch MOAs - 500 ft AGL to 13, 000 ft MSL
Austin 1&2 ATCAAs - FL180 to FL280
Bengus ATCAA - FL190 to FL450
Gabbs N & Central ATCAAs - FL180 to FL600
Gabbs South ATCAA - FL180 to FL280
Smoky ATCAA - FL180 to FL250
Diamond ALTRV - FL180 to FL280
Duckwater ALTRV - FL180 to FL250

Supersonic: Yes, but limited to the Supersonic Operating Area located within the Gabbs North and Austin 1 MOAs.

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
B-16	2	WISS: 16-01 and -02	No
B-17	23	WISS: 17-05, -07 to -13, -15 to -18, -21 to -24 NDWS: 17-06 to –13, -15 to –18, -21 to –24 LSTSS: 17-19 Acoustic: 17-S	Yes (except 17-S)
B-19	5	WISS: 19-01, -03 to –05 Acoustic: 19-02	Yes (except 19-02)
B-20	8	WISS: 20-01 to –03 Acoustic: 20-04, -05	Yes (except 20-04 and 20-05)

Ordnance:

Types Authorized: Gun (.50 cal to 30 mm); A-G rockets (up to 5-inch); Practice Bombs (MK-76/BDU-33, MK-106/BDU-48, and BDU-45), General Purpose Bombs (MK-77 and MK-80 series up to 2,000 lbs); GBUs (GBU-12, -12, -14, and -24 and LGTR), Flares; and Chaff

Live Ordnance Authorized: Yes

Electronic Warfare Level: III (Electronic Warfare Range and TACTS)

Issues

Environmental:

1. The pace of operations makes it difficult to close the range complex to accomplish required maintenance and cleanup, which varies from as few as 21 days for B-16 to 72 days for B-17 in FY 99.

2. NAS Fallon's Draft Integrated Cultural Resources Management Plan identifies 115 prehistoric and 34 historic sites. Of these, only 21 perhistoric and 7 historic sites have been recommended for listing on the National Register of Historic Places. There has been 376 pre-contact archaeological sites predicted (based on the Carson Desert Predictive Model) to exist on NAS Fallon land holdings but cannot be included as significant sites at this time.

3. Bald eagles may be occasional transients through the complex. Other species of concern forage in the greenbelt area at the the air station.

Land Use/Encroachment:

1. Native American reservations/settlements are located within the boundaries of Fallon airspace or within proximity to those boundaries. Specifically, the Walker River Indian Reservation is situated to the south of B-16 and B-19.

2. A portion of the Toiyabe National Forest underlies Fallon airspace.

3. Coordination with BLM is required for activities conducted on public land under their jurisdiction per the Federal Land Policy and Management Act (FLPMA) and/or the Engle Act of 1958 (PL 85-337).

4. Four wilderness study areas with NAS Fallon SUA have been designated by BLM. BML manages these designated areas as if they were wilderness areas but not until Congress acts on the designations will they become wilderness areas.

5. Residential growth pressures will continue to remain high west and northwest of Fallon, near Sheckler Reservoir, and along the Hwy 50 corridor. This increases population will likely be concerned about aircraft noise impacts although the realignment of run-in lines to B-16 has reduced most noise concerns.

6. The range lands are surrounded by areas of existing mineral and mining activities and areas where the potential for future development of mineral resources exists. Existing land withdrawals have already removed land from mining availability.

Infrastructure: Infrastructure issues are addressed in *the Fallon Range Training Complex Requirements Document* (November 1998).

Operational/Training:

1. Noise sensitive areas, as identified in the range manual, must be avoided by a minimum of 3,000 ft AGL. These noise sensitive areas include the Stillwater and Humboldt Wildlife Management Areas, Stillwater and Fallon National Wildlife Refuges, Sand Mountain Recreational Area, several communities, and the Yomba Indian Reservation.

2. No ordnance drops allowed on targets 17-01 to -03, -14, -19, -25.

3. Real time claim settlements and massive outreach to central Nevada residents have greatly reduced difficulties associated with supersonic operations.

4. Very busy facility and range complex. The amount of structured activity (i.e., Navy Fighter Weapons School, FFARP, SFARP, air wing deployments, etc.)

makes it difficult for the NAS Lemoore FRS or average Fleet squadron to take advantage of the extensive training infrastructure.

5. Accommodates high-altitude bombing.

6. Insufficient land for stand-off weapons deliveries.

7. Fallon Range Training Complex has pending environmental documentation that, if approved, would allow AGM-114 (Hellfire) training on B-17 and B-20.

Navy Weapons System Training Facility Boardman Range
(Oregon)

Number/Names of Range(s): 1 / NWSTF Boardman

Hours of Operation: Generally, 0800-2330, except weekends (0800-1600) and Monday (1400-2330); Currently in caretaker status

Airspace:

Designation: Combination of Restricted Areas, MOA, and ATCAA

Description: R-5701 - 0 to 20,000 MSL
R-5706 - 3,500 to 10,000 MSL
Boardman MOA - 4,000 to 18,000 ft MSL
ATCAA - 18,000 to 20,000 ft MSL

Supersonic: No

Targets:

Range Name	Number of Targets	Instrumentation/Scoring	Laser Operations
Boardman	49	None	Yes

Ordnance:

Types Authorized: Gun (.50 cal to 40mm); A-G Rockets (up to 5-inch); Practice Bombs (MK-76/BDU33 and MK-106/BDU-48); General Purpose Bombs (MK-80 series up to 1000 lbs); and GBUs (GBU-10, -12, -16).

Live Ordnance Authorized: Yes (gun ammunition)

Electronic Warfare Level: No emitters

Issues

Environmental:

1. Archeological sites and a 10-mile stretch of the Oregon Trail are located within the NSWTF Complex; but none of these resources are within the target areas.

2. No federally-listed threatened or endangered species occur within the range.

3. There are no wetlands delineated on the range.

Land Use/Encroachment:

1. Umatilla National Wildlife Refuge and Crow Butte State Park located to the north of the range along the Columbia River.

2. The Boeing/Inland Land Farming Venture is being developed on a land parcel to the west of the range. This development is being described as "farming recreation." Encroachment issues have been discussed and negotiations are ongoing with state, local, and private entities to prevent any encroachment issues that would affect future Navy use of the range.

Infrastructure*:*

1. All range instrumentation was removed with the retirement of the A-6 aircraft.

2. Potlatch Corporation has planted trees in the East Avigation Easement corridors. They understand the Navy's Avigation Easements and are willing to work with the Navy should these trees create an encroachment issue. Currently these corridors (eastern) are unused, but being held for future use.

Operational/Training*:*

1. Only Navy A-G training range in the Northwest US. With withdrawal of TACAIR from NAS Whidbey Island, range usage has dropped dramatically; the range is in caretaker status.

2. There has been discussion of Oregon ANG and/or USAF adopting and/or using the range, but those initiatives have not yet come to fruition.

Southern California Offshore Complex (SCORE)
(California)

Number/Names of Range(s): 1 / San Clemente Island Shore Bombardment Area (SHOBA)

Hours of Operation: Generally, sunrise to sunset; other times as requested through FACSFACSD

Airspace:

Designation: Warning Area

Description: W-291 - from surface to FL800

Supersonic: Yes, outside of 20 NM from the coastline of the US

Targets:

Range Name	Number of Targets	Instrumentation /Scoring	Laser Operations
SHOBA	32	None	Yes (except AAA-01)

Ordnance:

Types Authorized: Gun (.50 cal up to 40 mm); A-G Rockets (up to 5.0-inch); Practice Bombs (MK-76/BDU-33, MK-106/BDU-48, and BDU-45); General Purpose Bombs (up to 1,000 lbs); GBUs (GBU-10, -12, and -16); Flares; and Chaff

Live Ordnance Authorized: Yes

Electronic Warfare Level: III

Issues

Environmental:

1. Hours of operations are reduced (essentially, no weekend operations) during the Logger Head Shrike breeding season (February to July). This restriction normally limits range complex usage during the breeding season to approximately 3 days per week.

2. A portion of SHOBA is within the San Clemente Island Night Lizard Management Area. Construction and operations are limited in this area.

Land Use/Encroachment: The size of the live impact area is reduced and ordnance expenditure is restricted in the live impact area during the "fire" season (May to November).

Infrastructure:

1. Many of the roads on San Clemente Island is in poor repair.

2. "Palace" Berthing Area building is in poor repair with a leaky roof and sewer backups.

Operations/Training:

1. Multi-purpose range (supports A-G, Naval Gunfire Support (NGFS) bombardment, etc.)

2. The only NGFS range on the West Coast.

3. Can support coordinated air wing strike evolutions (these strikes can be opposed by aggressor aircraft positioned in W-291).

4. The range complex supported a recent AGM-114 firing (the target was a SEPTAR south of the island). Such firings may occasionally occur on a case-by-case basis.

5. The SCORE Complex is considered part of the EFTC that has been identified for operational training in a littoral warfare environment. The tactical training support role for the EFTC is for carrier-based strikes, over-the-beach amphibious assaults and subsequent maneuver ashore, and special operations. The EFTC also includes the assets of the Camp Pendleton, El Centro, Twentynine Palms complexes.

6. During the fire season, night-time operations that involve the use of incendiary and illumination devices are restricted.

Twentynine Palms Complex (R-2501)
(California)

Number/Names of Range(s): 4 / North, South, East, and West

Hours of Operation: Continuous

Airspace:

Designation: Combination Restricted Areas, MOAs, and ATCAA

Description: R-2501 - surface to unlimited
Sundance MOA - 500 ft AGL to 1,000 feet MSL
Bristol MOA - 5,000 feet MSL to FL180
Bristol ATCAA - FL180 to FL220

Supersonic: Yes, when expressly approved by the Director of Operations and Training

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
North	8	None	Yes
South	1	None	Yes
East	3	WISS	Yes
West	1	Yes	Yes

Ordnance:

Types Authorized: Unlimited conventional ordnance except cluster munitions

Live Ordnance Authorized: Yes, except for WISS Bullseye on the East range

Electronic Warfare Level: I

Issues

Environmental:

1. Desert tortoise nesting sites are off-limits. Permanent study plots for the desert tortoise in the Cleghorn Pass, Emerson Lake, Lava, and Sand Hill Range Training Areas are off limits.

2. No ordnance impact zones in grids 13/00 and 13/07 (American Mine water sites).

3. Many cultural resource sites and culturally significant mines and other historic areas are located throughout the range area. Specifically, the Foxtrot Petroglyphs National Historic site in the Lava Range Training Area (Grids 97/09-00/10), Bullion archaeological study areas, Surprise Spring Archaeological Area (Grid 71/95), Ames Well (Grid 60/07), and any historic encampments are off limite to range activities.

Land Use/Encroachment:

1. Area surrounding Twentynine Palms complex is desert and sparsely populated.

2. Coordination with BLM and other appropriate federal agencies is required for activities conducted on public land under their jurisdiction per the Federal Land Policy and Management Act (FLPMA) and/or the Engle Act of 1958 (PL 85-337).

3. Ord-Rodman Critical Habitat Area is located to the northwest of the Sunshine Peak Range Training Area and may not be entered from the range.

4. Cleghorn Lakes Wilderness Area is located south of the complex near the Cleghorn Pass, Bullion, and American Mine Range Training Areas. There is absolutely no entry from the complex to this area.

5. Dry lakebeds (Emerson, Quackenbush, Galway, Deadman, Lavic, and others) are off limits to all personnel.

Infrastructure*:* No issues reported

Operations/Training*:*

1. Currently there is a moratorium on release or firing of air-to-ground submunitions (i.e., cluster munitions) due to inaccuracy and mistakes made by delivery systems.

2. Used occasionally by CNAP aircraft.

3. The Twentynine Palms Complex is part of the EFTC, which also includes the assets of the SCORE, Camp Pendleton, El Centro, and Yuma complexes.

Yuma Complex
(Arizona/California)

Number/Names of Range(s): 2 / Barry M. Goldwater and Chocolate Mountain

Hours of Operation: Generally, 0600 to 2200; other times through coordination with Yuma Range Scheduling

Airspace:

Designation: Combination Restricted Areas, MOAs, and ATCAAs

Description: R-2301W - surface to FL800
R-2507 - surface to FL400
MOAs - generally 7,000 ft MSL to 17,999 ft MSL (some have lower boundaries at 5,000 ft MSL)
Kane East ATCAA - FL180 to FL400
Imperial ATCAA - FL190 to FL400

Supersonic: Yes (R-2301W; Yuma TACTS)

Targets:

Range Name	Number of Targets	Instrumentation/ Scoring	Laser Operations
Barry M. Goldwater	2	WISS	Yes
Chocolate Mountain	29	None	Yes

Ordnance:

Types Authorized: Gun (.50 cal to 30 mm); A-G Rockets (up to 5-inch); A-G Missiles (AGM-65 and -114); Practice Bombs (MK-76/BDU-33 and MK-106/BDU-48); General Purpose Bombs (MK-77 and MK-80 series up to 2,000 lbs); CBUs (Submunitions MK-118, BLU-61, BLU-63, BLU-77, BLU-97); GBUs (GBU-1-, 12, -16, and -24 and LGTR); Flares; and Chaff

Live Ordnance Authorized: Yes

Electronic Warfare Level: III and Yuma TACTS (Mobile Ground RADAR Treat Emitters)

Issues

Environmental:

1. A-G ordnance deliveries are suspected of contributing to surface water sedimentation and contamination.

2. The presence or density of the highly flammable Minz Cholla impacts the locations available for the use of incendiary ordnance.

3. No national landmarks, monuments, National Register districts, or state register/landmark sites are located on the lands beneath the airspace associated with the Chocolate Mountain range. A non-contributing (nonsignificant) portion of the El Camino del Diablo (Devil's Highway) is found beneath R-2301W airspace. The Tinajas Altas (High Tanks) site is considered to be potential eligible for listing in the National Register of Historic Places.

4. Numerous archaeological sites are found within the complex range lands.

5. The range complex is inhabited by federal listed threatened and endangered species: lesser long-nosed bat, Sonoran proghorn, Yuma clapper rail, Southwest willow flycatcher, desert tortoise, bald eagle. There are also other Federal Species of Special Concern inhabiting the range.

Land Use/Encroachment:

1. Coordination with BLM and other appropriate federal agencies is required for activities conducted on public land under their jurisdiction per the Federal Land Policy and Management Act (FLPMA) and/or the Engle Act of 1958 (PL 85-337).

2. There are 22 Native American tribes that have cultural affiliations with the land areas comprising the range complex. The Mohawk Mountains, the Mohawk Valley, and the Gila Mountains are identified as sacred or important areas to Native Americans.

3. The complex's airspace overlies parts or all of five Arizona counties and four California counties. Lands within the complex are primarily managed by BLM with pockets of state trust land or state school land.
4. In general, the land underlying the complex's airspace is sparsely populated and undeveloped. Agriculture is the primarily land use.

5. Parks, recreation, and preservation land uses are also prominent in the complex, including:

- Seven National Wildlife Refuges (Bill Williams, Cabeza Prieta, Cibola, Havasu Lake, Imperial, Kofa, Salton Sea);
- 37 BLM designated Wilderness Areas; and
- 12 BLM designated Areas of Critical Concern.

6. A projection of future land use patterns indicates that commercial and residential development in the vicinity of the Barry M. Goldwater range will likely occur along Interstate 8. In the vicinity of the Chocolate Mountain range, no significant residential or commercial development that would affect future range operations is planned.

7. A service highway connecting Interstate 8 and the Mexican border is proposed by the Yuma Metropolitan Planning Organization. The route for this proposed connector would pass through the Barry M. Goldwater range at the western boundary. The highway would be fenced on both sides where it passes through the range.

***Infrastructure**:* Ramp space at MCAS Yuma limits aircraft parking, which in turn could potentially limit usage of the range complex.

***Operations/Training**:*

1. Flight corridor usage is limited to avoid noise impacts. For example, Charlie Bull Pass in the Cabeza Prieta NWR is limited to ten days of use per year and all other corridors are never used more than seven days in a row.

2. Extensive range complex capabilities, but there is currently no aircraft tracking (for event reconstruction) available, except on R-2301W (TACTS range); they are looking at JTCTS (fixed or mobile) as a possible solution.

3. A new target complex to support the emergent USMC Urban CAS warfare area has been constructed at Cactus West target.

4. Accommodates high-altitude bombing.

5. The Yuma Complex is part of the EFTC, which also includes the assets of the SCORE, Camp Pendleton, El Centro, and Twentynine Palms complexes.

APPENDIX E

DoN TACTS RANGE CAPABILITY SUMMARIES

Beaufort TACTS
(Georgia)

Description: The Beaufort TACTS Range is located in the Atlantic Ocean, approximately 80 nmi east of MCAS Beaufort.

Hours of Operation: Sections of the range can be independently scheduled for forty-minute blocks, Monday through Friday, 0740 to 1620 from November to February; 0740 to 1900 from March to October.

Controlling Agency: FACSFAC JAX

Airspace:

Designation: Warning Areas

Description: W-157A - surface to FL430

Exercises: Range provides aircrew training and performance evaluation in air-to-air combat, NDWS, and non-TACTS ACM.

Ordnance Delivery: Ordnance is not normally expended

Instrumentation:

- One AN/USQ-T30 36 Aircraft TACTS with a CCS
- Eleven ADDS

Cherry Point TACTS
(North Carolina)

Description: The Cherry Point TACTS is primarily an overland range that permits no-drop bombing scoring at all targets throughout the Cherry Point and Camp Lejeune complexes.

Hours of Operation: Normally available Monday through Friday, 0800 to 1800. With advance notice scheduled hours of use may be extended.

Controlling Agency: FACSFAC VACAPES/MCAS Cherry Point Approach Control

Airspace:

Designation: Restricted Areas, Warning Area, MOA

Description: R-5306A - surface to 17,999 ft MSL
W-122 - surface to unlimited

Exercises: Provides aircrew training and performance evaluation in ACM, A-G weapons delivery, EW (including Anti-Radiation Missile [ARM] training). The MAEWR collocated with TACTS, provides a mix of manned and unmanned EW threat emitters and shoulder-fired infrared (IR) threats.

Ordnance Delivery: Associated with BT-9 and BT-11

Instrumentation:

- AN/USQ-T34 TACTS
- Six ADDS (ADDS at NAS Oceana can be linked to the Cherry Point TACTS)

Key West TACTS
(Florida)

Description: Also known as the Homestead Air Combat Maneuvering Range (ACMR), the Key West TACTS Range is located over open-ocean in waters adjacent to the southwestern coast of Florida and northwest of NAS Key West. The TACTS Range is divided into two operating ranges -- north and south. These two operating areas may be combined for large operations.

Hours of Operation: Range normally available for 60-minute blocks, Monday through Friday, from 0700 to 1700.

Controlling Agency: FAA ARTCC, Miami, FL/NAS Key West

Airspace:

Designation: Warning Area, ATCAA

Description: W-174 - surface to FL700

Exercises: Provides aircrew training and performance evaluation in air-to-air combat.

Ordnance Delivery: Ordnance is not expended on the range.

Instrumentation:

- One AN/GSQ-T50 36 aircraft ACMR with a CCS
- Four ADDS

Fallon TACTS Range
(Nevada)

Description: The Fallon TACTS Range is an overland range located east of the NAS Fallon and encompasses portions of Gabbs North, Central, and South, and Austin 1 MOAs. It is subdivided into working areas to facilitate simultaneous use.

Hours of Operation: Live TACTS missions may be conducted Monday through Friday from 0715 to 1815. When an air wing is deployed to NAS Fallon, live TACTS missions may be conducted from 0715 to 2215 Monday through Friday and Saturday from 0745 to 1815.

Controlling Agency: FAA ARTCC, Oakland, CA/NAS Fallon

Airspace:

Designation: Combination Restricted Areas, MOAs, ATCAAs, and ALTRVs

Description: R-4802 - surface to 8,000 ft
R-4803N - surface to 8,000 ft
R-4803S - surface to 18,000 ft
R-4804 - surface to FL180 (not including 2,000 ft AGL to 8,500 ft AGL)
R-4810 - surface to 17,000 ft
R-4812 - surface to FL180 (not including 2,000 ft AGL to 8,500 ft AGL)
R-4813 -surface to FL180
R-4816N - 1,500 ft AGL to FL180
R-4816S - 500 ft AGL to FL180
Austin 1 & 2 MOAs -200 ft AGL to FL180
Carson MOA - 500 ft AGL to FL180
Churchill High MOA - 9,000 MLS to FL180
Churchill Low MOA - 500 ft AGL to 9,000 ft MSL
Gabbs N, Central, S MOAs - 100 ft AGL up to FL180
Ranch MOAs - 500 ft AGL to 13, 000 ft MSL
Austin 1&2 ATCAAs - FL180 to FL280
Bengus ATCAA - FL190 to FL450
Gabbs N & Central ATCAAs - FL180 to FL600
Gabbs South ATCAA - FL180 to FL280
Smoky ATCAA - FL180 to FL250
Diamond ALTRV - FL180 to FL280
Duckwater ALTRV - FL180 to FL250

Exercises: Offers the capability of recording and replay of all facets of the following missions: ACM, NDWS training, EW training, and ARM training. Adversary aircraft are arranged and/or supplied by the user.

Targets: Numerous TACTS NDWS targets available at B-17

Instrumentation:

- One AN/USQ T18 36-aircraft TACTS with ten DDS
- CCS
- The TIS master site is located at Fairview Peak, with 23 remote TIS arrayed throughout the TACTS range
- A personal-computer-based debriefing subsystem is available at the Nevada Air National Guard in Reno, NV

Oceana TACTS

(Virginia/North Carolina)

Description: The Oceana TACTS Range provides "backyard" basic and intermediate air-to-air training for Oceana-based fighter aircrews. Approximately 25 percent of available TACTS time is dedicated to USAF aircrews based at Langley Air Force Base in accordance with a joint range use Memorandum of Agreement. The TACTS Range is located approximately 60 nmi to the southeast of NAS Oceana in the Atlantic Ocean.

Hours of Operation: Available Monday through Friday from 0730 to sunset or 1800, whichever is earlier.

Controlling Agency: FACSFAC VACAPES

Airspace:

Designation: Warning Area

Description: W-72 - 5,000 ft to Unlimited

Exercises: Provides aircrew training and performance evaluation in ACM, air tactics, and NDWS.

Ordnance Delivery: No-drop targets at associated Navy Dare County Range. Adversary aircraft are arranged by the user.

Instrumentation:

- One AN/USQ-T4 36 Aircraft TACTS with a CCS
- Three DDS
- One Ground Telemetry Complex that provides the capability to monitor air-to-air, surface-to-air, and surface-to-surface instrumented missiles to determine weapon system performance

Yuma TACTS
(Arizona)

Description: The Yuma TACTS Range is located in restricted airspace R-2301W approximately 25 nmi east of the MCAS Yuma. The range provides "backyard" air-to-air weapons employment training.

Hours of Operation: Available Monday through Friday between 0800 and 1600.

Controlling Agency: FAA ARTCC Los Angeles, CA/MCAS Yuma

Airspace:

Designation: Restricted Area

Description: R-2301W - 200 ft AGL to FL800 for NDWS;
5,000 ft MSL to FL800 for ACM

(Excluded is the airspace below 16,000-feet over Moving Sands and Cactus West targets (FL210 if Moving Sands/Cactus West High are active). Also excluded is some airspace below 3,000-feet

Exercises: Provides aircrew training and performance evaluation in air-to-air combat, A-G combat, NDWS, and EW. The TACTS functions as the Integrated Air Defense System (IADS) providing the EW threats with command and control. Hardware status is returned to TACTS for display and provides input for calculating their effect on the mission including end-game results of software simulated SAM and AAA firings. The system also supports simultaneous, fully integrated training by dissimilar aircraft engaged in all aspects of tactical air warfare.

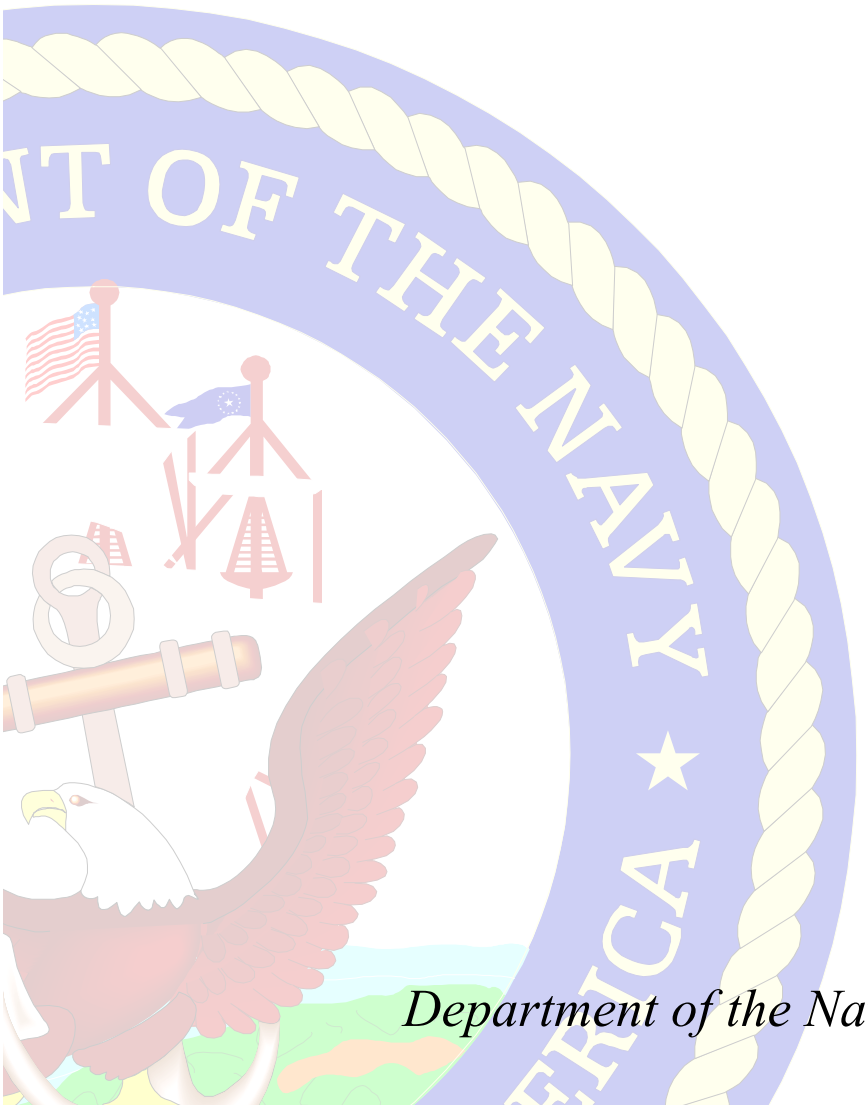
Ordnance Delivery: No ordnance deliveries (all weapons scoring is generated through validated computer simulations)

Instrumentation:

- AN/USQ-T25, 36-aircraft TACTS with CCS
- Three ADDS at MCAS Yuma, two at NAF El Centro, and two at MCAS Miramar
- One TIS Master Site located at Baker Peak, Arizona (8 remote interrogators)
- Six TACTS/Air Combat Maneuvering Instrumentation Slewable Emitter Threats
- Two Tactical Radar Threat Generators
- One Modular Threat Emitter

Appendix F

Range Utilization



Department of the Navy Range Needs Assessment:
Air-to-Ground Ranges

APPENDIX F

RANGE UTILIZATION

APPENDIX F - RANGE UTILIZATION

F.1 Development of Range Utilization Metrics

After collecting and reviewing the available range utilization data, the next step undertaken in Phase II was to develop an instrument for measuring range utilization or metric. The purpose of the range utilization metric is to enable comparison of annual use of DON air-to-ground ranges, specifically the target areas. In order to yield comparable results, it determined that the metric should meet the following criteria:

- **Be Based on Consistent Definitions** - the terms on which the metric is based should be readily understandable and allow no leeway for misinterpretation.

- **Rely on Data that is Readily Available or Collectable** - the metric should rely, to the extent feasible, on data that are already collected by range managers during normal operations to avoid imposing new or complicated future data collection requirements on range managers.

- **Be Readily Understood and Duplicated** - the metric should be easy to calculate and its results easily explainable.

F.1.1 Metrics That Have Been Used or Suggested

As shown in Table F-1, several metrics have already been used within DON and the Department of Defense (DOD) to describe range utilization. These metrics have been developed by: (1) AIRPAC; (2) CINCLANTFLT (AIRLANT); (3) CNO (N44) Range Planning Office (in describing range utilization for the *Final Environmental Impact Statement for Realignment of F/A-18 Aircraft and Operational Functions from NAS Cecil Field, Florida to Other East Coast Installations*); and (4) by the US Air Force. Each metric was examined to determine its applicability to and appropriateness for the *DON Range Needs Assessment*.

Obviously, if more specific data are available to apply to a metric, the more accurate the results of the metric. The basic increment of time used in scheduling most DON ranges is termed a "block." Range scheduling "blocks" are usually less than one hour in length, typically in 15, 20, or 30 minute increments (see Table F-2). Only those data available from the Georgia ANG for the Townsend Range provide block data usage. Those data available from the other sources are in total hours.

Based on discussions with range managers at the VACAPES, Cherry Point, and the Fallon Range Training complexes, actual time on range is recorded in the field. If any portion of a block is

Table F-1

Existing Metrics

I. TRIMS Metric:

$$\frac{\text{Hours Utilized}}{\text{Hours Available for Scheduling}}$$

For Manned Ranges, Hours Available = Hours Manned
For Unmanned Ranges, Hours Available = 24 hrs/day, 7 days/week
Hours utilized does not include range maintenance or cleanup

II. AIRLANT Metric:

$$\frac{\text{Hours Scheduled } \textit{Less} \text{ Hours Cancelled}}{\text{Published Hours Open } \textit{Less} \text{ Range Cleanup } \textit{(in some cases)}}$$

III. F/A-18 EIS Metric:

$$\frac{\text{Scheduled Hours (block)}}{\text{Published Available Hours (blocks)}}$$

IV. Air Force Metric:

$$\frac{\text{Total User Support Time (C)}}{\text{Gross Capacity (B) } \textit{Less} \text{ D } \textit{Less} \text{ E } \textit{Less} \text{ F}}$$

A Total Time Requirements of All Users
B Gross Capacity of Range = (C+D+E+F+G)
C Total User Support Time (total scheduled period+turnon+calibration+shutdown)
D Range Clearance and Maintenance
E Weather Cancellations
F Other Hours Range Not Available *(unplanned range closure)*
G Hours Range Capacity Not Reported as C, D, E, or F *(e.g., other hours range not scheduled)*

Source of Air Force metric definitions: Air Force Instruction 13-212, Chapter 5.
Italicized explanations provided for clarity based on descriptions in Air Force Instruction 12-212.

Table F-2

Scheduling Blocks Used by DON Air-to-Ground Ranges

Range	Block Used
Navy Training Complexes and Ranges	
Atlantic Fleet Weapons Training Facility - Inner Range (Puerto Rico)	15 min
Bloodsworth Island Shore Bombardment and Bombing Range (Maryland)	NA
El Centro Complex (California)	
Fallon Range Training Complex (Nevada)	30 min.
Jacksonville Complex (Florida)	
NWSTF Boardman Range (Oregon)	
Southern California Offshore Complex - SHOBA (California)	
Townsend Range (Georgia)	20 min.
Virginia Capes (VACAPES) Complex (Virginia/North Carolina)	15 min.
Marine Corps Training Complexes and Ranges	
Camp Pendleton (R-2503) (California)	4 Hours*
Camp Lejeune Complex (North Carolina)	
Cherry Point Complex (North Carolina)	20 min
Quantico Complex (Virginia)	
Twentynine Palms Complex (California)	
Yuma Complex (Arizona/California)	
Naval Air Systems Command T&E Ranges	
China Lake Complex - Superior Valley (California)	
Patuxent River Complex (Maryland/Delaware/Virginia)	
Pt. Mugu Sea Range (California)	
CNET	
Gulf of Mexico Complex (Texas)	15 min.
Meridian Complex (Mississippi)	NA

Notes:

* At Camp Pendleton, each air-to-ground user is limited to a maximum of one 4-hour block.

NA = Not Available

used, the range manager considers the entire block a "used block." For each reporting period, the time represented by the used blocks is totaled and reported. However, as these data are reviewed and compiled, the total is rounded up into hours utilized per reporting period. Consequently, the initial precision in determining range used is lost as reports are compiled. The discrepancy between actual range use and a rounded total would be greater for those ranges that have larger scheduling blocks.

The most complicated existing metric reviewed for this report is the Air Force metric. This metric is codified in Air Force Instruction 13-212 (Chapter 5). Quarterly utilization reports are required and range managers must maintain a three-year historical database on range activities. An entire block is counted as used if any part it is used. Monthly totals may be rounded up to the nearest hour. A review of the Air Force formula shows the metric to be repetitive. Its use to calculate DON range utilization would require additional data collection efforts by DON range managers.

After evaluating the four existing metrics, the project team developed a "Strawman Metric" for presentation and discussion purposes at the 23 July 1998 Range Needs Assessment Review Meeting (Table F-3). This metric was developed to take advantage of existing data sources, principally TRIMS and AIRLANT as well as information contained in the various range manuals or as reported to the project team during the data call undertaken in Phase I of the *DoN Air-to-Ground Range Needs Assessment*. It also was designed to account for and avoid penalizing ranges for user cancellations and no shows. As intended, the Strawman Metric sparked an extensive discussion at the 23 July 1998 meeting.

As a result of the discussion, a series of metrics were constructed for use in assessing DON range utilization. Each of the metrics shown in Table F-4 is based on the concept of block hours. These metrics can be generally characterized on the basis of their focus:

- The Strawman Metric and Metric #4 focus on measuring the "demand" for range use;
- Metrics #1 and #2 focus on range utilization, with various credits allowed for range shutdowns; and
- Metric #3 provides a measure of how well scheduled blocks are used.

In addition, during the July 1998 meeting, the need for secondary metrics was also discussed. The use of secondary metrics could be appropriate to describe the economic efficiency of each range and could address range operating costs as a function of annual operating budget, base operating support costs, or employment (civilian government/military/private). Another suggested secondary metric was related to potential range throughput (or level of activity for a

Table F-3

Strawman Metric
(Calculates Range Demand)

I. Numerator - Hours Scheduled

Hours Scheduled to be determined per Range Central Scheduling records

Advantages:

- Based on Consistent Definitions
- Data Readily Available
- Can be Easily Duplicated
- Accounts for all hours that range could be used (including short- term cancellations)
- Unmanned/unscored range use must be documented

II. Denominator - Hours Available for Scheduling

Published Hours of Operation (ground use not airspace)

Plus Hours Range Used By Special Notice (per Range Manual)
Less Range Cleanup
Less Weather Cancellations
Less Instrument Failures or Fouled Range

Advantages

- Based on Consistent Definitions
- Can be Easily Duplicated
- No penalty to Range for No Shows or Cancellations by a User
- Depends on Documented Schedules (if range unmanned, use must be recorded by Air Traffic Control)

Table F-4

Range Utilization Metrics Suggested at July 1998 Meeting

METRIC #1
(Calculates range utilization with credit for range controlled shutdowns)

$$\frac{\text{Used Blocks}}{\text{Available Blocks } \textit{Less} \text{ Planned Unavailable Blocks}}$$

Where the following definitions apply:

Used Block - Portion of time actually used by a unit on range (e.g., if one minute of a 20-minute block is used, the entire one block is considered used); block length may be determined by each individual range although most of the range representatives present indicated that they used 20-minute blocks.

Available Blocks - Total number of funded blocks of time that may be scheduled for use by a range user through Range Central Scheduling (times when the target is open).

Planned Unavailable Blocks - Blocks of time reserved by the range to accomplish maintenance and range cleanup and not available for scheduling or use by a range user.

METRIC #2
(Calculates range utilization with credit for shutdowns within and outside of range control)

$$\frac{\text{Used Blocks}}{\text{Available Blocks } \textit{Less} \text{ Planned Unavailable Blocks } \textit{Less} \text{ Unplanned Unavailable Blocks}}$$

Where the above definitions apply plus:

Unplanned Unavailable Blocks - Blocks of time when the range is not available to users due to circumstances out of the control of either the range or the user, including weather cancellations, fouled range, accidents, instrument failures, no shows/canceled (same day).

METRIC #3
(Calculates utilization of scheduled blocks)

$$\frac{\text{Used Block}}{\text{Scheduled Blocks}}$$

METRIC #4
(Calculates range demand but not necessarily actual usage)

$$\frac{\text{Scheduled Block}}{\text{Available Blocks } \textit{Less} \text{ Planned Unavailable Blocks } \textit{Less} \text{ Unplanned Unavailable Blocks}}$$

range) ratio of the number of users (individual squadrons) and the number of times they used the range during a range year. These types of secondary metrics are not considered in this report.

F.1.2 Applying the Metrics to the Range Utilization Data

As previously noted, readily available data on DON range utilization are contained in reports prepared by AIRPAC, AIRLANT, Georgia ANG, and other range-specific sources. More accurate block" data, delineating how blocks are scheduled or used, were not found to be readily available for each range for use or even for review in this report. Such data would provide a better picture of how a range is actually used and allow analysis of preferred user hours, appropriateness of block length, or how blocks are used within an hour.

Obtaining this level of detail would have required initiating a data call and/or visits would have had to have been made to each range scheduler and records researched. Given the time and budget, neither action was undertaken. Furthermore, subsequent conversations with several range managers (VACAPES Complex, Fallon Range Training Complex, and Cherry Point Complex) confirmed that obtaining raw block data for each range would not be feasible, particularly historic block data. For example, historic block data (pre-FY 97) for the Fallon Range Training Complex has been archived. Therefore, for the purposes of this report, range utilization was calculated for the various suggested metrics using FY 97 and 98 existing TRIMS, AIRLANT, RFMSS, Georgia ANG, and McMullen Target Monthly Flight report data based on the assumptions documented below:

- Range utilization metrics were calculated for FY 97 and 98 only.
- One reported hour of use was considered equivalent to one "block" of range use.
- Hours available for scheduling were considered to be "published hours of operation" as derived (in order of preference) by reference to each range manual or the original data collection packages submitted to each range to the CNO (N44) Range Planning Office under Phase I of the *DoN Range Needs Assessment* effort. Where these sources of published hours of operation were not available, the respective range utilization reports were consulted or range managers were contacted. The source of published hours of operation for each range is documented in Appendix A.
- Range managers were personally contacted to determine actual duration of time a range may be unavailable due to cleanup, maintenance, etc. A reported "day" was considered equal to eight hours and a reported "week" was considered equal to five days (see Appendix A for sources and/or methods used to calculate cleanup hours used for each range).

- Weather cancellations, fouled range, instrumentation failures, no shows, user cancellations were as reported by the respective range utilization reports.

- Unplanned unavailable hours were defined as including hours cancelled for weather, instrument failure, fouled range, user cancelled, and other cancelled, but not no shows.

- Planned unavailable hours included range cleanup periods only.

The calculated FY 97 and 98 range utilization rates for each range for which data are available using the formula identified for the five suggested metrics are shown in Tables F-5 through F-9. Also included is a list of the assumptions and data sources used to document utilization.

Table F-5
Basis for DON Range Utilization Calculations for FY 97

Complex/Range/Target	Published Hours	Scheduled Hours	Used Hours	Range Cleanup	Weather Cancel.	Instr. Failure/ Fouled Range	User Cancel'd	No Shows	Unacc'td Cancel.	Other Cancel.	Plan. Unavail. Blocks	Unpl. Unavail. Blocks	Availability (Sch/Pub)	No Show Rate (NoS/Sched)	Used/Avail Ratio	Used/Sched Ratio
DON Ranges																
AFWTF Inner Range	5330	2798	2207	965	0	0	591	0	0	0	965	591	52.5	0.0	41.4	78.9
Bloodsworth Range	2210	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Camp Lejeune Complex																
Camp Pendleton	1296	759	314	40	0	0	0	446	0	0	40	0	58.6	58.8	24.2	41.4
Cherry Point Complex												0				
BT-9 Target	8760	883	446	0	75	0	0	130	0	232	0	307	10.1	14.7	5.1	50.5
BT-11 Range	3422	2829	1533	132	210	0	674	412	0	0	132	884	82.7	14.6	44.8	54.2
El Centro Complex																
R-2510 - Loom Lobby Target	4992	2759	1258	0	34	0	0	1451	146	3	0	183	55.3	52.6	25.2	45.6
R-2510 - Shade Tree Target	4992	3124	1465	0	49	0	0	1458	268	12	0	329	62.6	46.7	29.3	46.9
R-2512 - Inkey Barley/Kitty Baggage Targets	8760	606	487	0	0	0	0	120	0	0	0	0	6.9	19.8	5.6	80.4
FRTC																
B-16 Range	4030	801	480	270	72	0	0	148	80	57	270	209	19.9	18.5	11.9	59.9
B-17E Range	4030	1913	1525	793	87	0	0	116	144	69	793	300	47.5	6.1	37.8	79.7
B-17W Range	4030	286	246	793	8	0	0	6	28	0	793	36	7.1	2.1	6.1	86.0
B-19 Range	4030	1427	1055	437	72	0	2	130	146	52	437	272	35.4	9.1	26.2	73.9
B-20 Range	4030	2124	1510	671	133	0	0	179	157	156	671	446	52.7	8.4	37.5	71.1
Jacksonville Complex																
Lake George Range	5824	2230	235	490	4	0	748	867	0	380	490	1132	38.3	38.9	4.0	10.5
Pinecastle Range	5824	2159	901	448	0	0	583	366	0	309	448	892	37.1	17.0	15.5	41.7
Rodman Range	5824	2503	419	490	1	0	804	1013	0	266	490	1071	43.0	40.5	7.2	16.7
NWSTF Boardman Range	4550	186	125	80	1	0	0	61	0	0	80	1	4.1	32.8	2.7	67.2
Quantico Complex																
SCORE SHOBA	643	613	481	0	15	2	0	101	14	3	0	34	95.3	16.5	74.8	78.5
Townsend Range	3061	1421	821	322	144	0	399	57	0	0	322	543	46.4	4.0	26.8	57.8
Twentynine Palms Complex																
VACAPES Complex																
Navy Dare County Range	4160	2555	1386	160	0	0	527	641	0	0	160	527	61.4	25.1	33.3	54.2
Palmetto Point Range	516	516	308	0	0	0	87	0	0	0	0	87	100.0	0.0	59.7	59.7
Stumpy Point Range	3120	425	239	0	0	0	173	13	0	0	0	173	13.6	3.1	7.7	56.2
Yuma Complex												0				
R-2301W (Goldwater) - Cactus West Target	4160	2360	1139	320	6	0	0	1176	38	0	320	44	56.7	49.8	27.4	48.3
R-2301 (Goldwater) - Moving Sands Target	4160	2500	1237	320	6	0	0	1202	58	0	320	64	60.1	48.1	29.7	49.5
R-2507 (Chocolate Mtn) - North Impact Area	8760	2326	1938	672	0	0	0	361	0	0	672	0	26.6	15.5	22.1	83.3
R-2507 (Chocolate Mtn) - South Impact Area	8760	2464	2099	672	0	0	0	374	2	0	672	2	28.1	15.2	24.0	85.2
NAVAIR Ranges																
China Lake Complex - Superior Valley Range	1642	558	207	0	8	1	0	203	80	0	0	89	34.0	36.4	12.6	37.1
CNET Ranges																
Gulf of Mexico Complex																
McMullen Co. Range - Dixie Target	2701	99	86	86	0	0	0	0	13	0	86	13	3.7	0.0	3.2	86.9
McMullen Co. Range - Yankee Target	2701	617	646	86	0	0	0	0	29	0	86	29	22.8	0.0	23.9	104.7
NAVY-WIDE TOTALS	126318	43841	24793	8247	925	3	4588	11031	1203	1539	8247	8258	34.7	25.2	19.6	56.6

Table F-6
Calculations of Utilization/Demand Metrics for FY 97

Complex/Range/Target'	Published Hours	Scheduled Hours	Used Hours	Plan. Unavail. Blocks	Unpl. Unavail. Blocks	Strawman Metric	Metric #1	Metric #2	Metric #3	Metric #4
DON Ranges										
AFWTF Inner Range	5330	2798	2207	965	591	64	51	58	79	74
Bloodsworth Range	2210	0	0	0	0	0	0	0	0	0
Camp Lejeune Complex										
Camp Pendleton	1296	759	314	40	0	60	25	25	41	60
Cherry Point Complex										
BT-9 Target	8760	883	446	0	307	10	5	5	51	10
BT-11 Range	3422	2829	1533	132	884	86	47	64	54	118
El Centro Complex										
R-2510 - Loom Lobby Target	4992	2759	1258	0	183	55	25	26	46	57
R-2510 - Shade Tree Target	4992	3124	1465	0	329	63	29	31	47	67
R-2512 - Inkey Barley/Kitty Baggage Targets	8760	606	487	0	0	7	6	6	80	7
FRTC										
B-16 Range	4030	801	480	270	209	21	13	14	60	23
B-17E Range	4030	1913	1525	793	300	59	47	52	80	65
B-17W Range	4030	286	246	793	36	9	8	8	86	9
B-19 Range	4030	1427	1055	437	272	40	29	32	74	43
B-20 Range	4030	2124	1510	671	446	63	45	52	71	73
Jacksonville Complex										
Lake George Range	5824	2230	235	490	1132	42	4	6	11	53
Pinecastle Range	5824	2159	901	448	892	40	17	20	42	48
Rodman Range	5824	2503	419	490	1071	47	8	10	17	59
NWSTF Boardman Range	4550	186	125	80	1	4	3	3	67	4
Quantico Complex										
SCORE SHOBA	643	613	481	0	34	95	75	79	78	101
Townsend Range	3061	1421	821	322	543	52	30	37	58	65
Twentynine Palms Complex										
VACAPES Complex										
Navy Dare County Range	4160	2555	1386	160	527	64	35	40	54	74
Palmetto Point Range	516	516	308	0	87	100	60	72	60	120
Stumpy Point Range	3120	425	239	0	173	14	8	8	56	14
Yuma Complex										
R-2301W (Goldwater) - Cactus West Target	4160	2360	1139	320	44	61	30	30	48	62
R-2301W (Goldwater) - Moving Sands Target	4160	2500	1237	320	64	65	32	33	49	66
R-2507 (Chocolate Mtn) - North Impact Area	8760	2326	1938	672	0	29	24	24	83	29
R-2507 (Chocolate Mtn) - South Impact Area	8760	2464	2099	672	2	30	26	26	85	30
NAVAIR Ranges										
China Lake Complex - Superior Valley Range	1642	558	207	0	89	34	13	13	37	36
CNET Ranges										
Gulf of Mexico Complex										
McMullen Co. Range - Dixie Target	2701	99	86	86	13	4	3	3	87	4
McMullen Co. Range - Yankee Target	2701	617	646	86	29	24	25	25	105	24
NAVY-WIDE TOTALS	126318	43841	24793	8247	8258	37	21	23	57	40

Table F-7
Basis for DoN Range Utilization Calculations for FY 98

Complex/Range/Target	Published Hours	Scheduled Hours	Used Hours	Range Cleanup	Weather Cancel.	Instr. Failure/ Fouled Range	User Cancel'd	No Shows	Unacc'td Cancel.	Other Cancel.	Plan. Unavail. Blocks	Unpl. Unavail. Blocks	Availability (Sch/Pub)	No Show Rate (NoS/Sched)	Used/Avail Ratio	Used/Sched Ratio
DON Ranges																
AFWTF Inner Range	5330	3034	2002	965	0	0	831	0	0	0	965	831	56.9	0.0	37.6	66.0
Bloodsworth Range	2210	0	0	0	0	0	0	0	0	0	0	0	0.0		0.0	0.0
Camp Lejeune Complex																
Camp Pendleton	1296	330	229	40	0	0	NA	104	0	0	40	0	25.5	31.5	17.7	69.4
Cherry Point Complex																
BT-9 Target	8760	352	180	0	22	0	69	105	0	1511	1511	91	4.0	29.8	2.1	51.1
BT-11 Range	3422	2992	1433	132	393	0	849	720	0	0	132	1242	87.4	24.1	41.9	47.9
El Centro Complex																
R-2510 - Loom Lobby Target	4992	3111	1385	0	5	0	NA	1670	237	0	0	242	62.3	53.7	27.7	44.5
R-2510 - Shade Tree Target	4992	3427	1476	0	6	0	NA	1837	266	0	0	272	68.6	53.6	29.6	43.1
R-2512 - Inkey Barley/Kitty Baggage Targets	8760	617	515	0	0	0	NA	101	0	0	0	0	7.0	16.4	5.9	83.5
FRTC																
B-16 Range	4030	662	365	270	47	0	NA	129	84	49	270	180	16.4	19.5	9.1	55.1
B-17E Range	4030	2017	1474	793	145	0	NA	164	139	104	793	388	50.0	8.1	36.6	73.1
B-17W Range	4030	530	466	793	25	0	NA	0	38	2	793	65	13.2	0.0	11.6	87.9
B-19 Range	4030	1381	939	437	94	0	NA	160	141	55	437	290	34.3	11.6	23.3	68.0
B-20 Range	4030	1997	1346	671	127	0	NA	191	145	180	671	452	49.6	9.6	33.4	67.4
Jacksonville Complex																
Lake George Range	5824	489	150	490	0	0	275	73	0	0	490	275	8.4	14.9	2.6	30.7
Pinecastle Range	5824	2299	701	448	0	0	1208	390	0	0	448	1208	39.5	17.0	12.0	30.5
Rodman Range	5824	1205	377	490	0	0	550	278	0	0	490	550	20.7	23.1	6.5	31.3
NWSTF Boardman Range	4550	0	0	0	0	0	NA	0	0	0	0	0	0.0	0.0	0.0	0.0
Quantico Complex																
SCORE SHOBA	1355	994	781	0	16	5	NA	67	67	0	0	88	73.4	6.7	57.6	78.6
Townsend Range	3061	1483	775	322	208	1	429	70	0	0	322	638	48.4	4.7	25.3	52.3
Twentynine Palms Complex																
VACAPES Complex																
Navy Dare County Range]	4160	2601	1276	160	431	0	499	395	0	0	160	930	62.5	15.2	30.7	49.1
Palmetto Point Range	516	47	5	0	23	0	19	0	0	0	0	42	9.1	0.0	1.0	10.6
Stumpy Point Range	3120	46	0	0	8	0	0	38	0	0	0	8	1.5	82.6	0.0	0.0
Yuma Complex																
R-2301W (Goldwater) - Cactus West Target	4160	2026	1210	320	4	1	NA	777	37	0	320	42	48.7	38.4	29.1	59.7
R-2301W (Goldwater) - Moving Sands Target	4160	2084	1281	320	0	0	NA	783	26	0	320	26	50.1	37.6	30.8	61.5
R-2507 (Chocolate Mtn) - North Impact Area	8760	2469	2100	672	0	0	NA	367	0	0	672	0	28.2	14.9	24.0	85.1
R-2507 (Chocolate Mtn) - South Impact Area	8760	2480	2112	672	0	0	NA	369	0	0	672	0	28.3	14.9	24.1	85.2
NAVAIR Ranges																
China Lake Complex - Superior Valley Range	1642	878	376	0	73	3	NA	267	104	2	0	182	53.5	30.4	22.9	42.8
CNET Ranges																
Gulf of Mexico Complex																
McMullen Co. Range - Dixie Target	2701	142	17	86	0	0	0	0	125	0	86	125	5.3	0.0	0.6	12.0
McMullen Co. Range - Yankee Target	2701	568	131	86	0	0	0	0	437	0	86	437	21.0	0.0	4.9	23.1
NAVY-WIDE TOTALS	127030	40261	23102	8167	1627	10	4729	9055	1846	1903	9678	8604	31.7	22.5	18.2	57.4

Table F-8
Calculations of Utilization/Demand Metrics for FY 98

Complex/Range/Target	Published Hours	Scheduled Hours	Used Hours	Plan. Unavail. Blocks	Unpl. Unavail. Blocks	Strawman Metric	Metric #1	Metric #2	Metric #3	Metric #4
DON Ranges										
AFWTF Inner Range	5330	3034	2002	965	831	70	46	57	66	86
Bloodsworth Range	2210	0	0	0	0	0	0	0	0	0
Camp Lejeune Complex										
Camp Pendleton	1296	330	229	40	0	26	18	18	69	26
Cherry Point Complex										
BT-9 Target	8760	352	180	1511	91	5	2	3	51	5
BT-11 Range	3422	2992	1433	132	1242	91	44	70	48	146
El Centro Complex										
R-2510 - Loom Lobby Target	4992	3111	1385	0	242	62	28	29	45	65
R-2510 - Shade Tree Target	4992	3427	1476	0	272	69	30	31	43	73
R-2512 - Inkey Barley/Kitty Baggage Target	8760	617	515	0	0	7	6	6	83	7
FRTC										
B-16 Range	4030	662	365	270	180	18	10	10	55	18
B-17E Range	4030	2017	1474	793	388	62	46	52	73	71
B-17W Range	4030	530	466	793	65	16	14	15	88	17
B-19 Range	4030	1381	939	437	290	38	26	28	68	42
B-20 Range	4030	1997	1346	671	452	59	40	46	67	69
Jacksonville Complex										
Lake George Range	5824	489	150	490	275	9	3	3	31	10
Pinecastle Range	5824	2299	701	448	1208	43	13	17	30	55
Rodman Range	5824	1205	377	490	550	23	7	8	31	25
NWSTF Boardman Range	4550	0	0	0	0	0	0	0	0	0
Quantico Complex										
SCORE SHOBA	1355	994	781	0	88	73	58	62	79	78
Townsend Range	3061	1483	775	322	638	54	28	37	52	71
Twentynine Palms Complex										
VACAPES Complex										
Navy Dare County Range	4160	2601	1276	160	930	65	32	42	49	85
Palmetto Point Range	516	47	5	0	42	9	1	1	11	10
Stumpy Point Range	3120	46	0	0	8	1	0	0	0	1
Yuma Complex										
R-2301W (Goldwater) - Cactus West Targe	4160	2026	1210	320	42	53	32	32	60	53
R-2301W (Goldwater) - Moving Sands Targ	4160	2084	1281	320	26	54	33	34	61	55
R-2507 (Chocolate Mtn) - North Impact Are	8760	2469	2100	672	0	31	26	26	85	31
R-2507 (Chocolate Mtn) - South Impact Are	8760	2480	2112	672	0	31	26	26	85	31
NAVAIR Ranges										
China Lake Complex - Superior Valley Range	1642	878	376	0	182	53	23	26	43	60
CNET Ranges										
Gulf of Mexico Complex										
McMullen Co. Range - Dixie Target	2701	142	17	86	125	5	1	1	12	6
McMullen Co. Range - Yankee Target	2701	568	131	86	437	22	5	6	23	26
NAVY-WIDE TOTALS	127030	40261	23102	9678	8604	34	20	21	57	37

Table F-9
Data Sources and Assumptions for Complexes/Ranges

Published Hours:

AFWTF	Manual for Use of the Atlantic Fleet Weapons Training Facility, Naval Station Roosevelt Roads, PR, AFWTF 3120.1L, undated.
Bloodsworth	Data Collection Package for Bloodsworth Island, NAB Little Creek, Norfolk, VA, 17 March 1998.
Camp Pendleton	Per 20 January 1999 telephone conversation with Terry Finch, air-to-ground use of the Camp Pendleton range has priority for scheduling for six 18-hour days per month.
Cherry Point	Target Facilities and Operation Areas, MCAS Cherry Point, NC, AirStaO P3570.2N, 16 April 1997. In FY 1998, BT-9 closed for 3 quarters for installation of WISS tower.
El Centro	"Range Regulations for the Use of Aircraft Targets, Restricted Areas and Military Operating Areas/Air Traffic Control Assigned Airspace (MOA/ATCAA) Scheduled by MCAS Yuma, AZ," AirStaO 3710.6H, 31 March 1995.
Fallon	"Fallon Range Users Manual," NSAWCINST 3752.1, 5 August 1997 and undated Data Collection Package for Fallon Received from John Smith.
Jacksonville	Data Collection Package for Jacksonville Complex, 25 November 1997 and 11 June 1998 corrections.
Boardman	Data Collection Package for NWSTF Boardman, 12 December 1997 and 7 April 1998 corrections.
Townsend	Data Collection Package for Townsend Range, 3 March 1998 and 20 May 1998 corrections.
SHOBA	Range is only used when manned; manned hours for 1997 and 1998 from TRIMS reports. Published annual hours of operation are 4992.
VACAPES	"Navy Dare Bombing Range Complex Operations Manual," NASOCEANAINST 3710.19, undated and corrected Data Collection Package for VACAPES Complex, 2 April 1998. Palmetto Point used upon request, therefore, published hours were assumed to be equivalent to hours scheduled.
Yuma	Range Regulations for the Use of Aircraft Targets, Restricted Areas and Military Operating Areas/Air Traffic Control Assigned Airspace (MOA/ATCAA) Scheduled by MCAS Yuma, AZ," AirStaO 3710.6H, 31 March 1995.
China Lake	"R-2508 Restricted Area Complex User's Handbook," 1 May 1997, and Data Collection Package for for China Lake, May 1998.
McMullen	"Operation Procedures for McMullen Target Complex," NASKINGSINST 13160.1A, Code 30000, 12 September 1997, and Data Collection Package for McMullen Complex, 18 May 1998.

Scheduled/Used Hours/Weather Cancellations/Instrument Failures/User Cancelled/No Shows/Other:

AFWTF	CINCLANTFLT Training Quarterly Utilization Report FY 1997, undated.
Bloodsworth	NAB Little Creek Schedules, undated.
Camp Pendleton	"Targets and Ranges Information Management System (TRIMS) Fiscal Year 1997 Analysis Report," prepared by High Technology Solutions, Inc., undated.
Cherry Point	CINCLANTFLT Training Quarterly Utilization Report FY 1997, undated.
El Centro	"Targets and Ranges Information Management System (TRIMS) Fiscal Year 1997 Analysis Report," prepared by High Technology Solutions, Inc., undated.
Fallon	"Targets and Ranges Information Management System (TRIMS) Fiscal Year 1997 Analysis Report," prepared by High Technology Solutions, Inc., undated.
Jacksonville	CINCLANTFLT Training Quarterly Utilization Report FY 1997, undated.
Boardman	"Targets and Ranges Information Management System (TRIMS) Fiscal Year 1997 Analysis Report," prepared by High Technology Solutions, Inc., undated.
Townsend	Townsend Range Utilization Report, Georgia Air Guard, 13 July 1998.
SHOBA	"Targets and Ranges Information Management System (TRIMS) Fiscal Year 1997 Analysis Report," prepared by High Technology Solutions, Inc., undated.
VACAPES	CINCLANTFLT Training Quarterly Utilization Report FY 1997, undated.
Yuma	"Targets and Ranges Information Management System (TRIMS) Fiscal Year 1997 Analysis Report," prepared by High Technology Solutions, Inc., undated.

Scheduled/Used Hours (Continued)

China Lake	"Targets and Ranges Information Management System (TRIMS) Fiscal Year 1997 Analysis Report," prepared by High Technology Solutions, Inc., undated.
McMullen	"McMullen Target Monthly Flight Reports, NAS Kingsville, 29 September 1999. FY 1997 data for January -October 1997; FY 1998 data for October 1997-August 1998.

Range Cleanup Hours:

AFWTF	Personal Communication with AFTWFT personnel, in 1997 cleanup conducted for a period of 9 weeks, 3 days during all operating hours Sun-Sat.
Bloodsworth	No cleanup period reported.
Camp Pendleton	No cleanup period reported.
Cherry Point	Data Collection Package reports no cleanup period for BT-9; 2 week annual cleanup for BT-11 (10 operating days).
El Centro	No cleanup period reported.
Fallon	Cleanup periods for FY 98 as reported in 28 February 1998 memorandum from J.R. Worthington, Deputy Commander, Naval Strike Warfare Center.
Jacksonville	Data Collection Package reports quarterly cleanup as needed; assumed 4-seven day cleanup periods for each range in complex.
Boardman	Data Collection Package reports two cleanups per year; assumed a total of 10 operating days for cleanup annually.
Townsend	Range manager reports 6-week cleanup period and annual Christmas closure for one week; assumed cleanup/closure period of 42 operating days.
SHOBA	No cleanup period reported.
VACAPES	No cleanup period reported for Palmetto and Stumpy point ranges. Dare County cleanup period reported as two times per year; assumed 2 cleanup periods for a total of 12 operating days.
Yuma	Quarterly sweeps reported; assumed 28 day cleanup period for Chocolate Mountains ranges and 20 day cleanup period for Barry M. Goldwater ranges.
China Lake	No cleanup period reported.
McMullen	Range manager reports one operating day per month for maintenance.

Planned Unavailable Hours:

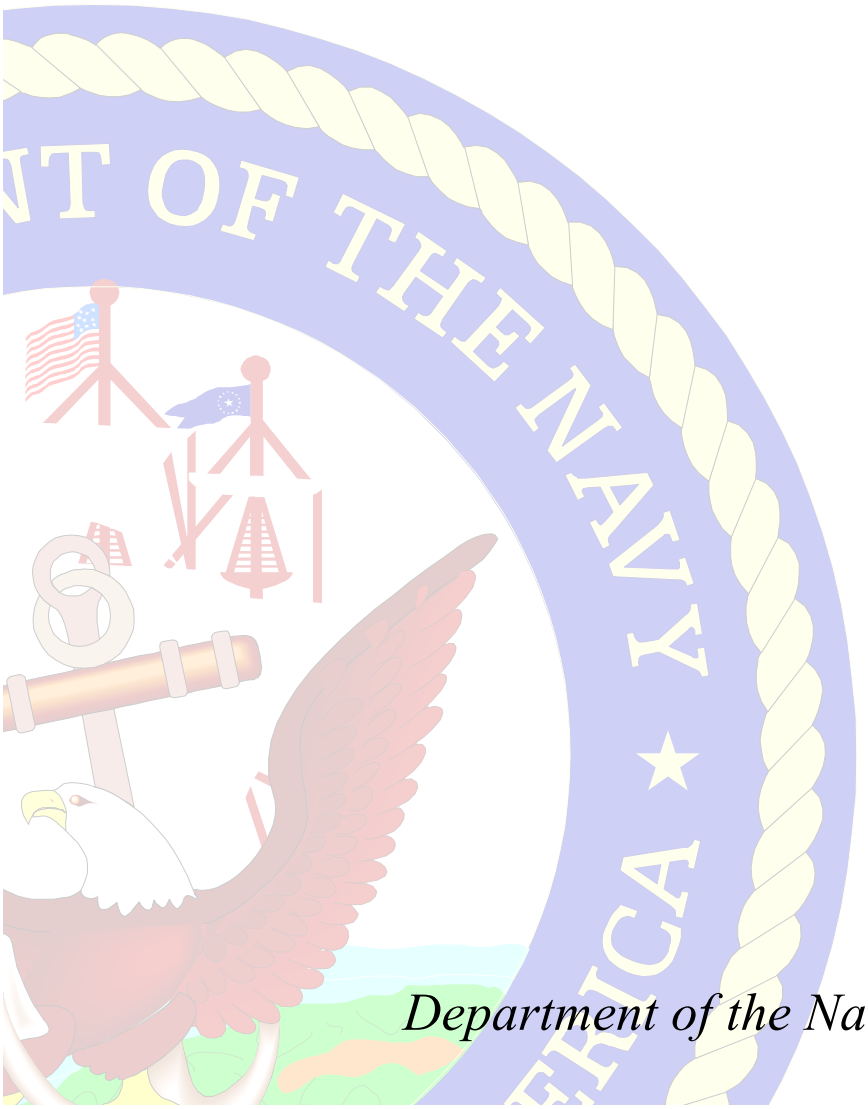
Includes Range Cleanup Hours only.

Unplanned Unavailable Hours:

Includes hours identified as cancelled for weather, instrument failure, fouled range, user cancelled, unaccounted cancelled, and other cancelled. These hours **do not** include No Shows.

Appendix G

Decision-Maker's Planning Tool



Department of the Navy Range Needs Assessment: Air-to-Ground Ranges

APPENDIX G

DECISION-MAKER'S PLANNING TOOL

APPENDIX G - DECISION-MAKER'S PLANNING TOOL

The Decision-Maker's Planning Tool has been developed for the purpose of formulating and defending decisions for the future use of air-to-ground ranges. Accordingly, this tool takes advantage of and provides a methodology for integrating the data contained in this report. Underlying the development of the tool are the following assumptions:

- As long as there are platforms that deliver air-to-ground ordnance, there will be a need for air-to-ground training and the facilities to support that training.
- Continued evolution of air-to-ground weapon systems (platforms and weapons) will result in employment tactics that demand more SUA, longer stand-off ranges, and better targets.
- DoN will continue to make recommendations and decisions about the size and location of their aircraft inventory and about the size, location, and quality of their air-to-ground range facilities.

This Appendix contains the Decision-Maker's Planning Tool, which consists of a Decision Tree, data tables, and worksheets. This tool is designed to aid Navy and Marine Corps leadership in making informed decisions about air-to-ground range facilities and SUA. The Tool may also be used to evaluate aircraft basing strategies. Examples of how the Decision Tree, data tables, and worksheets might be applied are included in this appendix.

Appendix G provides instructions, and worksheets that may be removed from this report for convenience. To this end, this Appendix includes those data tables from the body of this report that would be most useful to a user. All tables, figures, and worksheets are provided at the end of this appendix.

G.1 Components of the Decision-Maker's Planning Tool

G.1.1 Decision Tree

The Decision-Makers Planning Tool Decision Tree is presented in Figure G-1. The tree serves as a roadmap for decision-makers in determining the most appropriate data tables and worksheets that are applicable for answering different types of range issues. There are three entry points into the Tree, with each point corresponding to a general issue category. The entry points and general issue categories are listed below:

Point A **Aircraft Basing Issues** - Enter Point A to determine, based upon air-to-ground range facility capabilities, the potential impact to required aircrew training that would result from locating specific aircraft platform types at specific Navy and Marine Corps Air Stations.

Point B **Aircrew Training Requirements Issues** - Enter Point B to determine specific air-to-ground range facility and SUA requirements associated with specific aircraft platform type.

Point C **Air-to-Ground Range Facility Issues** - Enter Point C to determine the specific capabilities or intrinsic value of a specific air-to-ground range.

G.1.2 Data Tables

The *DoN Range Needs Assessment* contains a total of 30 data tables; these tables are listed in Table G-1 (a master table located in Attachment 1 to this Appendix G). Of these tables, 18 are found in the body of the assessment and the remainder in Appendices B, C, F, and G. A brief description of each of these tables is presented below.

- **Definitions of Special Use Airspace and Airspace for Special Military Use**- Table 1-1 provides a brief description of each of the designated types of airspace.

- **DoN Air-to-Ground Ranges** - Table 1-2 provides a list of all Navy and Marine Corps tactical training ranges, T&E ranges, and CNET ranges, organized by state and range complex.

- **Electronic Warfare Levels and Descriptions** - Table 2-1 provides a brief description of each of the four levels of EW, as described in the *Tactical Training Range Roadmap* (July 1995).

- **Comparison of Available (Range) Utilization Data** - Table 3-1 provides a comparison of the types of range utilization data reported by TRIMS, AIRLANT, the Georgia ANG, RFMSS, and McMullen Range Complex.

- **FY 97 and FY 98 DoN Range Utilization Calculations by Metric** - Table 3-2 provides a comparison of DoN air-to-ground range utilization for FY 97 and FY 98 when computed under two different metrics (the demand metric and utilization metric).

- **Use of DoN Ranges by General User Category (%)** - Table 3-3 provides a breakdown, by user (Navy, Marine Corps, Air Force, Army, and Other) and percentage, of how the DoN air-to-ground ranges were used in 1997 and 1998.

Planning Tool Decision Tree

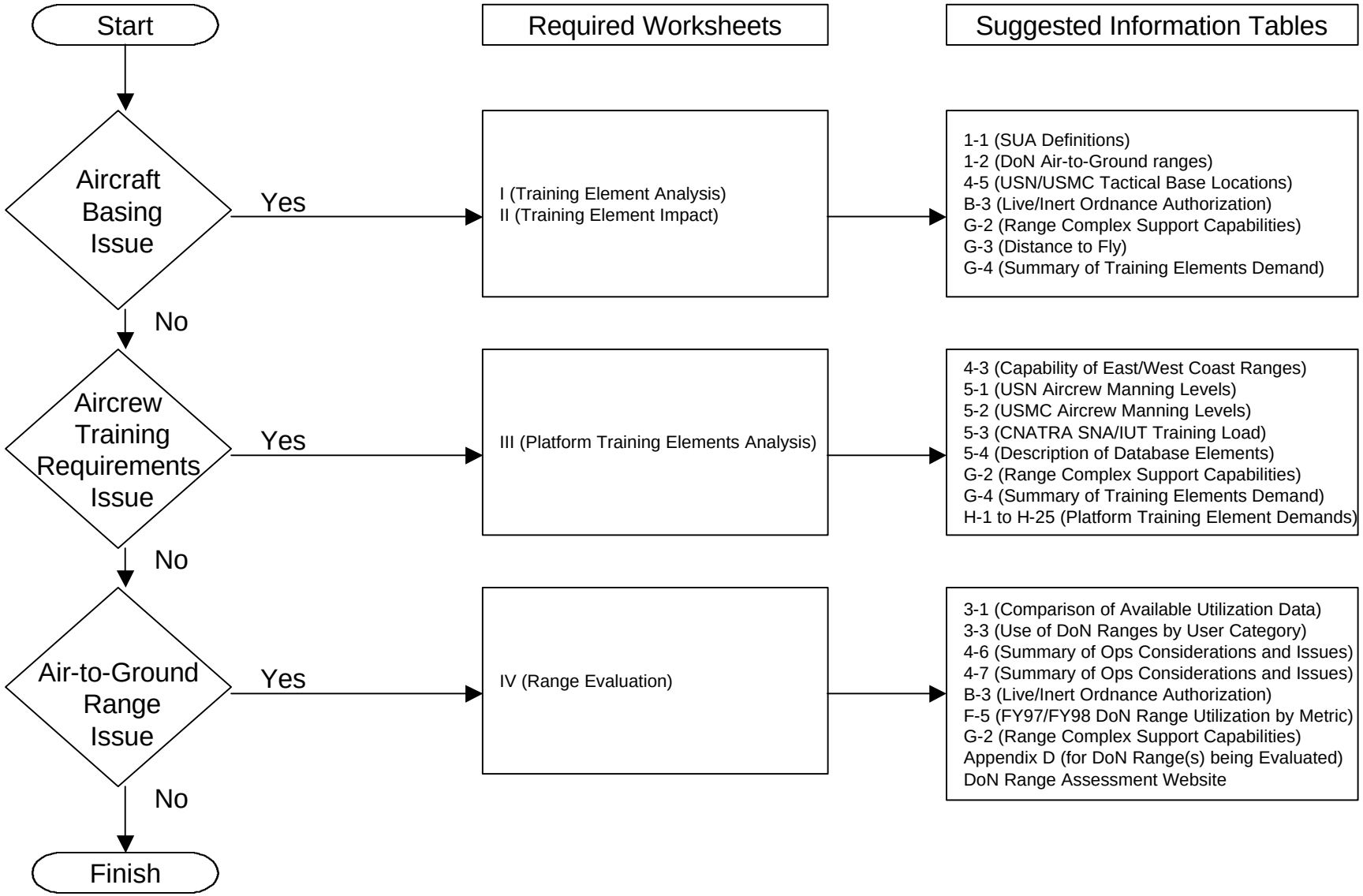


Figure G-1

- **Training Elements** - Table 4-1 provides a description of the training elements used to measure air-to-ground range capabilities and the demands placed upon the ranges to support required aircrew training.

- **Range Complex Training Support Capabilities** - Table 4-2 provides a summary of the capability of each DoN air-to-ground range complex to support each of the training elements.

- **Capability of East Coast and West Coast Ranges to Support all Training Elements** - Table 4-3 compares the number of East Coast and West Coast complexes that can support each of the training elements.

- **Summary of Training Support Capabilities of DoN Air-to-Ground Ranges for Critical Training Requirements** - Table 4-4 provides a listing, by range complex name, of those range complexes that can support the six critical training requirements (overland supersonic flight, live ordnance expenditure, chaff expenditure, stand-off weapons employment, EW training, and integrated CVW training exercises).

- **Summary of Distance to Fly to 'Find' Critical Training Elements** - Table 4-5 provides a summary, for each Navy and Marine Corps tactical aircraft base location, of which of the six critical training elements are available within 100 NM, between 101 and 200 NM, and beyond 200 NM.

- **Summary of Operational Considerations and Issues at DoN Ranges** - Table 4-6 provides a summary of the key operational considerations, encroachment and environmental issues, and infrastructure issues attendant to each of the DoN air-to-ground range complexes (considerations and issues are summarized from information provided in Appendix D).

- **Aircrew Manning Levels Per Squadron** - Table 5-1 provides a listing of the number of pilots, NFOs, and formed crews that would be assigned to a typical Navy squadron (aircraft platform type) under the M+1 manning criteria and the number of pilots, NFOs, and formed crews normally assigned to a Marine Corps squadron (aircraft platform type).

- **CNATRA SNA and IUT Training Load** - Table 5-2 provides a summary of the number of T-45 platform SNA and IUT air-to-ground events that must be completed during any typical 12-month period.

- **Description of the Database Elements** - Table 5-3 provides a description of each of the 33 elements used to define each of the 521 Navy and Marine Corps training events that require air-to-ground range facility support.

- **Summary of Range Facility Demands** - Table 5-4 provides a summary, by aircraft platform type, of which of the 20 training elements are required and the total 12-month demand (in hours) for overland air-to-ground range facility support.

- **Analysis of the Summary of Air-to-Ground Range Facility Demands** - Table 5-5 provides an analysis of Table 5-4.

- **Generic CVW Range Facility Demands** - Table 5-6 provides a summary of the demand for training element support for a 'typical' CVW, composed of (1) E-2C squadron, (1) F-14 squadron, (3) F/A-18 squadrons, (1) CVW EA-6B squadron, (1) S-3B Squadron, and (1) SH-60F/HH-60 squadron.

- **Ordnance Database Categories for DoN Range Website** - Table B-1 provides a list of the categories and specific ordnance types that are available in the DoN Range Internet website database.

- **Air-to-Ground Ordnance by Weight of Projectile and Weight of Explosive** - Table B-2 provides a comparison of projectile weight and explosive weight for a selective list of ordnance types.

- **Live/Inert Ordnance Authorization –Range or Range Complex by Target** - Table B-3 provides a list, by range complex and range, of the types of live ordnance and inert ordnance that are authorized for expenditure.

- **Database Information Available for Complexes and Ranges** - Table C-1 provides a summary of the types of information (Range Description, Airspace, MTRs, Targets/Ordnance, Emitters, Towers, Operations/Administration Buildings, Range Users, Infrastructure Issues, and Environmental Issues) available to the DoN Range Internet website user.

- **Existing Metrics** - Table F-1 provides a definition of four metrics (TRIMS, AIRLANT, F/A-18 EIS, and US Air Force) that have been used to measure range utilization.

- **Scheduling Blocks Used by DoN Air-to-Ground Ranges** - Table F-2 provides a sample of the "blocks" of time used by Navy, Marine Corps, and CNET ranges for scheduling and reporting.

- **Demand Metric** - Table F-3 provides a description of the Demand Metric that was developed during Phase II of the *DoN Air-to-Ground Range Needs Assessment* in an effort to develop a common methodology for reporting air-to-ground range utilization.

- **Range Utilization Metrics Suggested at July 1998 Meeting** - Table F-4 provides a description of four alternative metrics that were suggested as potential methodologies for reporting air-to-ground range utilization.

- **FY 97 and FY 98 DoN Range Utilization Calculations by Suggested Metric** - Table F-5 provides a comparison of the utilization rates, for each DoN range, that result when each of five metrics are applied to available FY 97 and FY 98 range scheduling and usage data.

- **Range Complex Training Support Capabilities** - Table G-2 provides a summary analysis of the ability of each DoN range complex to support each of the training elements.

- **Distance to Fly from USN/USMC Airfields to Nearest DoN Range that Supports Required Air-to-Ground Training Elements** - Table G-3 provides a summary analysis of the shortest distance that must be flown from each of the 26 Navy and Marine Corps airfields to a DoN air-to-ground range that supports each of the required training elements.

- **Summary of Training Elements Demand by Platform Type** - Table G-4 provides the 12-month demand for range time (in hours) for each aircraft platform type for each required training element.

G.1.3 Worksheets

Appendix G contains a total of four worksheets (which are found in Attachment 2 to this Appendix G). A brief description of the applicability and intended use for each of the worksheets is provided below.

G.1.3.1 Training Element Analysis Worksheet

The *Training Element Analysis Worksheet (Worksheet I)* should be used for comparing and analyzing alternative basing strategies for specific aircraft platform types. The completed worksheet will indicate the distance that must be flown to find each of the training elements required by the specific platform, when that platform is operating from either of two airfield locations. To complete this worksheet, the user will require Tables G-3 and G-4.

G.1.3.2 Training Elements Impact Analysis

The *Training Elements Impact Analysis Worksheet (Worksheet II),* in conjunction with the *Training Element Analysis Worksheet (Worksheet I)*, should be used for quantifying the impact of alternative basing strategies for specific aircraft platform types. The worksheet measures the

impact to aircrew training of distances that must be flown to find air-to-ground range complexes that support required training elements. The completed worksheet will provide an objective determination of the pro's and con's of basing alternatives. To complete this worksheet, the user will require a completed *Training Element Analysis Worksheet (Worksheet I)*. Table G-3, used to complete the *Training Element Analysis Worksheet (Worksheet I)*, reports the distance from airfields to range complexes in blocks of mileage (0-100 NM, 101-200 NM, 201-300 NM, 301-400 NM, 401-500 NM, and ≥ 500 NM). The blocks of mileage approach is not specific enough to support the objective or quantitative results desired by a training elements impact analysis. To support this level of detail, the user will also require Flight Information Publication (FLIP) and/or Area Chart materials for measuring air miles from each alternative base location to the nearest range complex where a required training element can be supported.

G.1.3.3 Platform Training Elements Analysis Worksheet

The *Platform Training Elements Analysis Worksheet (Worksheet III)* should be used for determining the demand for overland air-to-ground range time by one or more specific aircraft platform types for one or more required training elements. The completed worksheet will provide a quantitative measure of the 12-month demand (in hours) for each of the selected training elements. To complete this worksheet, the user will require Table G-4, at a minimum.

G.1.3.4 Range Evaluation Worksheet

The *Range Evaluation Worksheet (Worksheet IV)* should be used for analyzing any given range or range complex. The completed worksheet will provide: a comprehensive look at the selected facility's current capabilities; historical utilization data; distribution of use among categories of users; and a summary of the operational considerations, encroachment/environmental issues, and infrastructure issues associated with the facility. To complete this worksheet, the user will require Table 3-2, Table 3-3, Table 4-6, Table B-3, Appendix D, and Table G-2.

G.2 Applying the Planning Tool - Example Scenarios

Example scenarios have been provided to show how the Decision-Maker's Planning Tool may be applied.

G.2.1 Example 1 - Aircraft Basing Decision

SCENARIO: ***Assess impacts to aircrew air-to-ground training if some or all F/A-18 aircraft were relocated from NAS Oceana, Virginia to MCAS Beaufort, South Carolina.***

The suggested process to arrive at a decision would include the following steps:

Step 1 Determine Decision Tree entry point.

A review of Figure G-1 shows that Point A would be the Decision Tree entry point. Supporting data required to complete the analysis would include:

- *Training Element Analysis Worksheet I*;
- *Training Element Impact Analysis Worksheet II;*
- Table G-3 (Distance to Fly from Navy/Marine Corps Airfields to Nearest DoN Range that Supports Required Air-to-Ground Training Elements); and
- Table G-4 (Summary of Training Elements Demand by Platform Type).

Step 2 Identify training elements required by the F/A-18 aircraft.

From the data shown in Table G-4, it can be seen that the F/A-18 requires all training elements except EW I and IV, air-to-air guns, and air-to-air missiles. This information is used to complete *Training Element Analysis Worksheet I* (see Figure G-2).

Step 3 Determine maximum distances that must be traveled from NAS Oceana and MCAS Beaufort to "find" the required training elements identified in Step 2.

Data from Table G-3 are used to determine maximum distances that must be flown from NAS Oceana and MCAS Beaufort to obtain each of the required training elements. The appropriate mileage is entered in each required training element cell in *Training Element Impact Analysis Worksheet II* as shown in Figure G-3.

Figure G-2

Completed Worksheet I
(Aircraft Basing Scenario - Training Element Analysis for F/A-18 Aircraft)

Training Element[1]	Maximum Distance to Fly to Find Required Training Element	
	From NAS Oceana	From MCAS Beaufort
EW I	Not Required	Not Required
EW II	100	300
EW III	100	300
EW IV	Not Required	Not Required
Live Ordnance Expenditure	100	300
Chaff Expenditure	100	300
Flares Expenditure	100	300
High-Altitude Airspace	100	300
TACTS	200	300
Air-to-Ground Guns Expenditure	100	100
Air-to-Air Guns Expenditure	Not Required	Not Required
Stand-off Weapons Expenditure	100	500
Air-to-Ground Missiles Expenditure	100	500
PGM Expenditure	100	100
Air-to-Air Missiles Expenditure	Not Required	Not Required
Laser-Safe Range	100	100
Range Scoring	100	100
Cluster Weapons Expenditure	100	500
Air-to-Ground Rockets Expenditure	100	100
Practice Bomb Expenditure	100	100
General Purpose Bomb Expenditure	100	100
Overland Supersonic Flight	100	500
Night-time Operations	100	100

Notes:
1. Bold text denotes critical training element.

Step 4 Compare distances that must be traveled from NAS Oceana and MCAS Beaufort to "find" required training elements and determine training impacts.

If aircraft were moved from NAS Oceana to MCAS Beaufort, a total of ten F/A-18 required training elements would be affected as shown in Figure G-3.

Figure G-3

Completed Worksheet II
(Aircraft Basing Scenario - Relocation of F/A-18 Aircraft)

Training Elements Impacted by Move from NAS Oceana to MCAS Beaufort	Maximum Flying Distance (NM) to Find Required Training Element (From Table G-3)		Impact (Approximate Round-Trip Mileage Obtained from FLIP IFR Enroute High Altitude Chart H-4)
	From Oceana	From Beaufort	
EW II Live Ordnance Expenditure Chaff Expenditure Flares Expenditure High-Altitude Airspace TACTS	100	300	From MCAS Beaufort, aircrews must transit approximately 300 additional NM (round-trip) to accomplish these training elements. The additional flight time (and fuel) required will result in approximately *15 minutes of lost training time* on each training event that provides a completion for any of these training elements.
EW III Stand-Off Weapons Expenditure Air-to-Ground Missiles Expenditure Cluster Weapons Expenditure Overland Supersonic Flight	100	500	From MCAS Beaufort, aircrews must transit approximately 600 additional NM (round trip) to accomplish these training elements. The additional flight time (and fuel) required precludes completing this training and returning to MCAS Beaufort without refueling. Normally, the aircraft would refuel after completing the training and before returning to MCAS Beaufort. If airborne refueling is not available (which is typically the case during the early phases of IDTC), two sorties (one to accomplish the training and one for the return flight to MCAS Beaufort) would be required for each training event that provides a completion for any of these training elements.
TACTS	200	300	From MCAS Beaufort, aircrews must transit approximately 300 additional NM (round-trip) to accomplish this training element. The additional flight time (and fuel) required will result in approximately *15 minutes of lost training time* on each training event that provides a completion for the TACTS training element.

G.2.2 Example 2 - CVW Air-to-Ground Training Requirements During IDTC

SCENARIO: ***Determine the number of hours of overland high-altitude and stand-off weapons training required by a typical CVW during a 12-month period and assess the ability of the range complex infrastructure to support these training elements.***

The suggested process to arrive at a decision would include the following steps:

Step 1 Determine the entry point on the decision tree.

The Decision Tree entry point (Figure G-1) would be at Point B. Supporting documentation required to complete the analysis would include:

- *Platform Training Elements Analysis Worksheet III*;
- Table 5-6 (Generic CVW Range Facility Demands); and
- Table G-4 (Summary of Training Element Demand by Platform Type).

Step 2 Determine which platforms assigned to a typical CVW require support in the high-altitude and stand-off weapons training elements.

Using Table 5-6, it can be seen that all platforms assigned to a typical CVW, except the E-2C and S-3B, require one or both of the training elements. This information can then be used to complete *CVW Platform Training Elements Analysis Worksheet III* as shown in Figure G-4.

Figure G-4

Completed Worksheet III
(CVW Training Scenario - Platform Training Elements Analysis)

Squadron/Platform	Required Time for Training Elements During 12-Month Period	
	High-Altitude Airspace	Stand-Off Weapons Expenditure
F-14	371.0	105.0
F/A-18	265.4	106.1
F/A-18	265.4	106.1
F/A-18	264.4	106.1
EA-6B (CVW)	524.7	81.0
SH-60F/HH-60	0.0	25.0
12-Month Total	1,691.9	529.3

Step 3 Determine the annual range time associated with each CVW platform's requirements for high-altitude and stand-off weapons training demand.

Information from Table G-4 is used to populate *CVW Platform Training Elements Analysis Worksheet III* shown in Figure G-4.

Step 4 Assess the ability of DoN range infrastructure to support CVW training demand for the high-altitude airspace and stand-off weapons training elements.

These two training elements are associated with current and emerging tactics development and refinement. Importantly, training associated with both PGM (including laser-guided munitions) and air-to-ground missile employment tactics require a range that can simultaneously support both high-altitude airspace and stand-off weapons training. From Table G-2, it can be seen that four and seven ranges on the East and West coasts, respectively, can support one or both of the required training elements.

In summary, although the combined "capacity" of the four East Coast ranges is barely adequate to accommodate the high-altitude training support demand of a single CVW during the 12-month period, only one East Coast range (Patuxent River) is capable of supporting both high-altitude and stand-off weapons (actual and simulated release) training. Fleet use of the Patuxent River Complex is limited currently to a not-to-interfere basis with T&E range activities. Even under these limitations, Patuxent River has the theoretical capacity to accommodate the 12-month demand for training support generated by a single CVW (529.3 hours). However, it is doubtful that Patuxent River could accommodate the total demand for simultaneous training support generated by two or more CVWs during any 12-month period.

On the West Coast, the combined "capacity" of the seven ranges that support high-altitude training will accommodate easily the training demand of a single CVW. In fact, the combined capacity of these ranges would be able to accommodate the high-altitude training support demand generated by multiple CVWs during any 12-month period. Four West Coast ranges (China Lake, SCORE/SHOBA, Twentynine Palms, and Yuma) are capable of supporting both high-altitude and stand-off weapons training. One of these ranges (China Lake) is a T&E range like Patuxent River, which limits Fleet use to a not-to-interfere basis with T&E range activities. The capacity of the three remaining training ranges plus the not-to-interfere capacity of China Lake offer the theoretical capacity to accommodate the demand for simultaneous training support generated by multiple CVWs during any 12-month period.

G.2.3 Example 3 - Determine the Significance of an Existing Air-to-Ground Range Facility

SCENARIO: ***Provide an assessment of the value of the Pinecastle Range (Jacksonville Complex).***

The suggested process to arrive at a decision would include the following steps:

Step 1 Determine the entry point in the Decision Tree.

The entry point in the Decision Tree (Figure G-1) would be at Point C. Supporting documentation required to complete the analysis would include:

- *Range Evaluation Worksheet IV*;
- Table 3-3 (Use of DoN ranges by General User Category);
- Table 4-6 (Summary of Operational Considerations and Issues at DoN Ranges);
- Table B-3 (Live/Inert Ordnance Authorization - Range or Range Complex by Target);
- Appendix D (DoN Range Capabilities and Issues Summaries - Jacksonville Complex);
- Table F-5 (FY 97 and FY 98 DoN Range Utilization Calculations by Metric); and
- Table G-2 (Range Complex Training Support Capabilities);

Step 2 Determine range complex capabilities.

Using Table B-3, Table G-2, and Appendix D (Jacksonville Complex), several important facts about Pinecastle Range can be identified, specifically the training elements that can be supported and ordnance authorized for expenditure. This information is then entered into the appropriate sections of the *Range Evaluation Worksheet IV* as shown in Figure G-5.

Figure G-5

Completed Worksheet IV
(Pinecastle Range Scenario)

Training Elements (Critical Bolded)	Y/N	Comments
EW I	N	
EW II	N	
EW III	N	
EW IV	N	
Live Ordnance	Y	A-G Guns (5.56 MM to 30 MM); A-G Rockets; GP Bombs (MK-82, -83, -84); GBU-12
Chaff	N	
Flare	N	
High-Altitude Bombing	Y	Up to 23,000 feet
TACTS	N	
Air-to-Ground Guns	Y	5.56 MM to 30 MM
Air-to-Air Guns	N	
Stand-off Weapons	N	
Air-to-Ground Missiles	N	
Precision Guided Munitions	Y	GBUs (-10, -12, -16, -24) and LGTR
Air-to-Air Missiles	N	
Laser	Y	
Scored	Y	WISS at all targets except Inert Ordnance Runway/Convoy, SAM Site and Strafe Target; Accoustic Scoring at Strafe Target
Cluster Weapons	N	
Air-to-Ground Rockets	Y	2.75 inch and 5.0 inch
Practice Bombs	Y	MK-76/BDU-33 and MK-106/BDU-48
General Purpose Bombs	Y	MK-81, -82, -83, and -84
Supersonic Flight	N	
Night-Time	Y	Can be scheduled until approximately 11:00 PM

Utilization % (Demand Metric):		Range Users by General Category (%)									
		Navy		Marine Corps		Air Force		Army		Other	
FY 97	40.0	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
FY 98	43.0	79.5	97.8	3.7	2.2	2.8	0.0	0.0	0.0	14.1	0.0

Operational Considerations	Encroachment/Environmental Issues	Infrastructure Issues
• Supports 3 of 6 critical training elements (Live Ordnance, High Altitude, and Night Time) • Airspace available (up to 23,000 MSL) barely supports High Altitude; does not support Stand-off Weapons • Supports limited PGM operations • Can accommodate small-scale (up to 12 aircraft) strikes	• Surrounded by the Ocala National Forest; aircraft and ordnance-related noise are a hindrance to forest users • US Forest Service restricts use of ordnance during high fire threat conditions • Range provides habitat for threatened and endangered species	• Special Use permit expires in December 2000; EIS in process to extend use for another 20 years • Erosion is having some detrimental effects on the bases of the spotting towers

Step 3 Determine range utilization rate and range users.

The FY 97 and 98 range utilization rates and range users by general category for the Pinecastle Range are found in Tables F-5 and 3-3, respectively. This information is then entered into the *Range Evaluation Worksheet IV* (Figure G-5).

Step 4 Determine operational considerations and encroachment/environmental issues associated with the range.

From Table 4-6 and Appendix D (Jacksonville Complex) are determined the operational considerations, encroachment issues, environmental issues, and infrastructure issues associated with the Pinecastle Range. This information is also entered into the appropriate sections of the *Range Evaluation Worksheet IV* (Figure G-5).

Step 6 Assess the overall value of the range, including, but not limited to, current use and potential for future use.

Some observations can be made from the data shown in Figure G-5:

- **Current Operational Setting** - Pinecastle is a "backyard" range that was used extensively in the past by Navy tactical aircraft (A-7s, F/A-18s, and S-3s) operating out of NAS Cecil Field, Florida. BRAC decision-making relocated F/A-18 aircraft from NAS Cecil Field to other East Coast air stations. Today, aircraft located at NAS Jacksonville and NS Mayport have some requirements that are satisfied by the Pinecastle Range. Pinecastle is also a range that has been and will continue to be used extensively by tactical aircraft embarked in CVBGs operating in the nearby Warning Areas (W-157, W-158, W-159, and W-497).

- **Current Range Capabilities** - The current infrastructure at Pinecastle offers only a limited real-world training environment. The value of the available high altitude airspace is reduced significantly because of the lack of sufficient lateral airspace and range area to support stand-off weapons training. Similarly, the lack of EW training support and the inability to expend chaff reduces the quality of the training that can be accomplished at Pinecastle. Pinecastle is, however, capable of supporting live ordnance expenditure (MK-82s) and it has a location that is advantageous to tactical aircraft embarked in CVBGs operating in the nearby Warning Areas (W-157 and W-158). Thus, a real opportunity exists at Pinecastle to support the operations and training requirements of those Carrier Battlegroups. The importance of this capability and capacity has been demonstrated repeatedly. In fact, without Pinecastle, the next closest DoN range complex that could support

W-157 and W-158 Carrier Battlegroup operations is Cherry Point, which is fully 300 NM north of Jacksonville and is limited to expenditure of MK-81s.

- **Future Operational Setting** - In spite of the limitations of the existing infrastructure and SUA, Pinecastle's strategic location warrants continued operation to satisfy increasing demands for widely-dispersed ashore facilities to participate in joint training exercises, like Joint Task Force Exercises (JTFEX). The full potential of Pinecastle will be realized if improvements can be effected to the existing infrastructure and SUA. The following improvements, if implemented at Pinecastle, would allow Pinecastle to support all six of the critical training elements and increase significantly the utility of the range:

  - ***add the capability to support EW III training -*** There may be some resistance from the FAA due to the potential for side-band interference to commercial and general aviation avionics generated by the EW equipment.

  - ***add the ability to support Chaff expenditure -*** It should be recognaized that Chaff may not fall within the bounds of the Pinecastle Range for various reasons, including weather, aircraft tactics, etc. Several recent studies on the impact of chaff release on the environment agree that the deposition of Chaff does not pose any significant risks to humans or plants or animals (US Air Force, 1997; General Accounting Office, 1998; Naval Research Laboratory, 1999). There should, therefore, be no significant impact on the Ocala National Forest. However, Chaff expenditure could be interpreted as litter by some individuals and the Federal Aviation Administration could view Chaff expenditure as representing a potential impact to the National Airspace System because of the density of commercial and general aviation traffic in north-central Florida.

  - ***add the ability to support stand-off weapons training -*** This action would require DoN to acquire and/or control additional real estate and SUA. Stand-off weapons training requires aircraft to be able to operate at altitudes of at least 20,000 ft AGL and conduct weapons release profiles with weapons release or simulated weapons release at least 15 NM from the target. It would be possible to accommodate these requirements by combining all of the existing Jacksonville Complex Restricted Areas (R-2906, R-2907, and R-2910) and the Palatka 1 and 2 MOAs into a single restricted area (with SUA extending from surface to FL230) and designating 180 degrees for the run-in heading for stand-off weapons expenditure. This proposal would have to be further evaluated in the light of the existing encroachment and environmental issues associated with the Pinecastle Range.

ATTACHMENT 1

TABLES

Table G-1

Master List of Tables Presented in the *DoN Air-to-Ground Range Needs Assessment*

Table	Description	Page
1-1	Definitions of Special Use Airspace and Airspace for Special Military Use	1-7
1-2	DoN Air-to-Ground Ranges	1-8
2-1	Electronic Warfare Levels and Descriptions	2-4
3-1	Comparison of Available (Range) Utilization Data	3-4
3-2	FY 97 and FY 98 DoN Range Utilization Calculations by Metric	3-10
3-3	Use of DoN Ranges by General User Category (%)	3-13
4-1	Description of Training Elements	4-6
4-2	Range Complex Training Support Capabilities	4-9
4-3	Capability of East Coast and West Coast Ranges to Support All Training Elements	4-12
4-4	Summary of Training Support Capabilities of DoN Air-to-Ground Ranges for Critical Training Requirements	4-13
4-5	Summary of Distance to Fly to “Find” Critical Training Elements	4-20
4-6	Summary of Operational Considerations and Issues at DoN Ranges	4-25
5-1	Aircrew Manning Levels Per Squadron	5-5
5-2	CNATRA SNA and IUT Training Load	5-5
5-3	Description of Database Elements	5-10
5-4	Summary of Range Facility Demands	5-12
5-5	Analysis of the Summary of Air-to-Ground Range Facility Demands	5-14
5-6	Generic CVW Range Facility Demand	5-18
B-1	Ordnance Database Categories For DoN Range Website	B-1
B-2	Air-to-Ground Ordnance by Weight of Projectile and Weight of Explosives	B-5
B-3	Live/Inert Ordnance Authorization - Range or Range Complex by Target	B-6
C-1	Database Information Available for Complexes and Ranges	C-3
F-1	Existing Metrics	F-3
F-2	Scheduling Blocks Used by DoN Air-to-Ground Ranges	F-4
F-3	Demand Metric	F-6
F-4	Range Utilization Metrics Suggested at the July 1998 DoN Range Needs Assessment Meeting	F-7
F-5	FY 97 and FY 98 DoN Range Utilization Calculations by Suggested Metric	F-10
G-2	Range Complex Training Support Capabilities (same as Table 4-2)	G-20
G-3	Distance to Fly from USN/USMC Airfields to Nearest DoN Range that Supports Required Air-to-Ground Training Elements	G-22
G-4	Summary of Training Element Demand by Platform Type	G-28
H-1 to H-25	Range Facility Demands (by Aircraft Platform Type)	H-1

Table G-2

Range Complex Training Support Capabilities

DoN Training Range Complex	Training Elements																						
	EW I	EW II[1]	EW III[1]	EW IV[1]	Live Ordnance[2]	Chaff	Flares	High-Altitude Airspace	TACTS	Air-to-Ground Guns	Air-to-Air Guns	Stand-off Weapons	Air-to-Ground Missiles	Precision-Guided Munitions	Air-to-Air Missiles	Laser-Safe Range[4]	Scored	Cluster Weapons	Air-to-Ground Rockets	Practice Bombs	General Purpose Bombs	Overland Supersonic Flight	Night-Time Operations
East Coast Ranges and Complexes																							
AFWTF Inner Range					●		●	●		⌖	●			●		●	●	⌖	⌖	●	⌖		●
Bloodsworth Island					●					⌖				⌖		⌖			●	●	⌖		
Camp Lejeune	●	●								⌖				●		●			●	●	●		●
Cherry Point	●	●			●	●	●	●	●	⌖				⌖		⌖	●		●	●	⌖		●
Jacksonville					●			●		⌖				⌖		⌖	●		⌖	●	⌖		●
Patuxent River	●	●	●			●	●	●		⌖	●	●	●	●		●	●	●	●	●	●	●	●
Quantico					●		●			⌖				⌖		⌖			●	●	⌖		●
Townsend	●									⌖				●		●	●		●	●	●		●
VACAPES	●							●	●	⌖						●	●		●	●	●		●
Gulf of Mexico (McMullen)	●									⌖							●		●	●			
Meridian (Searay)	●									⌖										●			●

Notes:
⌖ Indicates live ordnance of this type is authorized.
1. Range facilities that reported EW support greater than EW I were assumed to provide all EW levels up to and including their reported EW level.
2. Live Ordnance refers to heavy and light dropped ordnance (e.g., general purpose bombs, GBUs, etc.) and not gun ammunition.
3. With the exception of the Superior Valley Range (a Fleet asset), the China Lake Complex supports Fleet training on a not-to-interfere basis with scheduled RDT&E events; operated as a Navy Working Capital Fund site.
4. Laser operations must be authorized for the specific weapon to be employed.

Table G-2

Range Complex Training Support Capabilities

DoN Training Range Complex	Training Elements																						
	EW I	EW II[1]	EW III[1]	EW IV[1]	Live Ordnance[2]	Chaff	Flares	High-Altitude Airspace	TACTS	Air-to-Ground Guns	Air-to-Air Guns	Stand-off Weapons	Air-to-Ground Missiles	Precision-Guided Munitions	Air-to-Air Missiles	Laser-Safe Range[4]	Scored	Cluster Weapons	Air-to-Ground Rockets	Practice Bombs	General Purpose Bombs	Overland Supersonic Flight	Night-Time Operations
West Coast Ranges and Complexes																							
Camp Pendleton	●				●	●	●	●		⌖				●		●	●		⌖	●	⌖		●
China Lake[3]	●	●	●		●	●	●	●		⌖	⌖	⌖	⌖	⌖	⌖	⌖	●	⌖	⌖	●	⌖	●	●
El Centro							●	●		⌖						●	●		●	●			●
Fallon Range Training Complex	●	●	●		●	●	●	●	●	⌖				⌖		⌖	●		⌖	●	⌖	●	●
NWSTF Boardman										⌖				●		●			⌖	●	●		●
SCORE/SHOBA	●	●	●		●	●	●	●		⌖		⌖		⌖		⌖			⌖	●	⌖	●	●
Twentynine Palms	●				●	●	●	●		⌖		⌖	⌖	⌖		⌖	●		⌖	●	⌖	●	●
Yuma	●	●	●		●	●	●	●	●	⌖	●	⌖	⌖	⌖		⌖	●	⌖	⌖	●	⌖	●	●

Notes:
⌖ Indicates live ordnance of this type is authorized.
1. Range facilities that reported EW support greater than EW I were assumed to provide all EW levels up to and including their reported EW level.
2. Live Ordnance refers to heavy and light dropped ordnance (e.g., general purpose bombs, GBUs, etc.) and not gun ammunition.
3. With the exception of the Superior Valley Range (a Fleet asset), the China Lake Complex supports Fleet training on a not-to-interfere basis with scheduled RDT&E events; operated as a Navy Working Capital Fund site.
4. Laser operations must be authorized for the specific weapon to be employed.

Table G-3

Distance To Fly From USN/USMC Airfields To Nearest DON Range That Supports Required Air-To-Ground Training Element

State	Navy/USMC Fleet and Reserve Airfields	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flare Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-Time Operations
Arizona	MCAS Yuma	Yuma	Yuma	Yuma		Yuma	Yuma	Yuma El Centro	Yuma El Centro	Yuma	Yuma El Centro	Yuma	Yuma	Yuma	Yuma	China Lake	Yuma El Centro	Yuma El Centro	Yuma	Yuma El Centro	Yuma El Centro	Yuma	Yuma	Yuma
California	MCB Camp Pendleton	Camp Pendleton 29 Palms	SHOBA	SHOBA		Camp Pendleton 29 Palms	Camp Pendleton 29 Palms	Camp Pendleton El Centro 29 Palms	Camp Pendleton El Centro 29 Palms	Yuma	Camp Pendleton El Centro 29 Palms	Yuma	29 Palms	29 Palms	Camp Pendleton 29 Palms	China Lake	Camp Pendleton El Centro 29 Pallms	Camp Pendleton El Centro 29 Palms	China Lake Yuma	Camp Pendleton El Centro 29 Palms	Camp Pendleton El Centro 29 Palms	Camp Pendleton 29 Palms	29 Palms	Camp Pendleton El Centro 29 Palms
California	NAF EL Centro	Yuma	Yuma	Yuma		Yuma	Yuma	El Centro Yuma	El Centro Yuma	Yuma	El Centro Yuma	Yuma	Yuma	Yuma	Yuma	China Lake	El Centro Yuma	El Centro Yuma	Yuma	El Centro Yuma	El Centro Yuma	Yuma	Yuma	El Centro Yuma
California	NAS Lemoore	China Lake	China Lake	China Lake		China Lake	China Lake	China Lake	China Lake	FRTC	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake	China Lake
California	MCAS Miramar	Camp Pendleton SHOBA	SHOBA	SHOBA		Camp Pendleton SHOBA	Camp Pendleton SHOBA	Camp Pendleton El Centro SHOBA	Camp Pendleton El Centro	Yuma	Camp Pendleton El Centro SHOBA	China Lake Yuma	SHOBA	China Lake 29 Palms Yuma	Camp Pendleton SHOBA	China Lake	Camp Pendleton El Centro SHOBA	Camp Pendleton El Centro	China Lake Yuma	Camp Pendleton El Centro SHOBA	Camp Pendleton El Centro SHOBA	Camp Pendleton SHOBA	SHOBA	Camp Pendleton El Centro
California	NAS North Island	Camp Pendleton SHOBA	SHOBA	SHOBA		Camp Pendleton SHOBA	Camp Pendleton SHOBA	Camp Pendleton El Centro SHOBA	Camp Pendleton El Centro	Yuma	Camp Pendleton El Centro SHOBA	China Lake Yuma	SHOBA	China Lake 29 Palms Yuma	Camp Pendleton SHOBA	China Lake	Camp Pendleton El Centro SHOBA	Camp Pendleton El Centro	China Lake Yuma	Camp Pendleton El Centro SHOBA	Camp Pendleton El Centro SHOBA	Camp Pendleton SHOBA	SHOBA	Camp Pendleton El Centro

= 0 – 100 NM = 101 – 200 NM = 201 – 300 NM = 301 – 400 NM = 401 – 500 NM = >500 NM

Table G-3

Distance To Fly From USN/USMC Airfields To Nearest DON Range That Supports Required Air-To-Ground Training Element

State	Navy/USMC Fleet and Reserve Airfields	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flare Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-Time Operations
California	MCAGCC 29 Palms	29 Palms Camp Pendleton Yuma	Yuma	Yuma		29 Palms Camp Pendleton Yuma	29 Palms Camp Pendleton Yuma	29 Palms Camp Pendleton Yuma	29 Palms Camp Pendleton Yuma	Yuma	29 Palms Camp Pendleton Yuma	Yuma	29 Palms	29 Palms	29 Palms Camp Pendleton Yuma	China Lake	29 Palms Camp Pendleton Yuma	29 Palms Camp Pendleton Yuma	China Lake Yuma	29 Palms Camp Pendleton Yuma	29 Palms Camp Pendleton Yuma	29 Palms Camp Pendleton	29 Palms	29 Palms, Camp Pendleton Yuma
California	NAS Point Mugu	SHOBA	SHOBA	SHOBA		SHOBA	SHOBA	SHOBA	SHOBA	Yuma	SHOBA	China Lake Yuma	SHOBA	29 Palms	SHOBA	China Lake	SHOBA	Camp Pendleton El Centro 29 Palms	China Lake Yuma	SHOBA	SHOBA	SHOBA	SHOBA	SHOBA
Florida	NAS Jacksonville	Townsend	Camp Lejeune Cherry Point	Patuxent River		Jack'nville	Cherry Point	Cherry Point	Jack'nville	Cherry Point	Jackn'ville	AFWTF Patuxent River	Patuxent River	Patuxent River	Jack'nville	China Lake	Jack'nville	Jack'nville	AFWTF Patuxent River	Jack'nville	Jack'nville	Jack'nville	Patuxent River	Jack'nville
Florida	NAF Key West	Camp Lejeune Cherry Point Meridian Patuxent River Townsend VACAPES	Camp Lejeune Cherry Point Patuxent River	Patuxent River		Jack'nville	Cherry Point Patuxent River	AFWTF Cherry Point Patuxent River Quantico	Jack'nville	Cherry Point VACAPES	Jack'nville	AFWTF Patuxent River	Patuxent River	Patuxent River	Jack'nville	China Lake	Jack'nville	Jack'nville	AFWTF Patuxent River	Jack'nville	Jack'nville	Jack'nville	Patuxent River	Jack'nville
Florida	NAS Mayport	Townsend	Camp Lejeune Cherry Point	Patuxent River		Jack'nville	Cherry Point	Cherry Point	Jack'nville	Cherry Point	Jack'nville	AFWTF Patuxent River	Patuxent River	Patuxent River	Jack'nville	China Lake	Jack'nville	Jack'nville	AFWTF Patuxent River	Jack'nville	Jack'nville	Jack'nville	Patuxent River	Jack'nville

= 0 – 100 NM = 101 – 200 NM = 201 – 300 NM = 301 – 400 NM = 401 – 500 NM = >500 NM

Table G-3

Distance To Fly From USN/USMC Airfields To Nearest DON Range That Supports Required Air-To-Ground Training Element

State	Navy/USMC Fleet and Reserve Airfields	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flare Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-Time Operations
Florida	NAS Pensacola and NAS Whiting Field	Meridian	Cherry Point Camp Lejeune Patuxent River	Patuxent River		Jack'nville	Cherry Point Patuxent River	AFWTF Cherry Point Patuxent River Quantico	Jack'nville	Cherry Point VACAPES	Meridian	AFWTF Patuxent River	Patuxent River	Patuxent River	Jack'nville Townsend	China Lake	Jack'nville Townsend	Jack'nville Townsend	AFWTF Patuxent River	Jack'nville Townsend	Meridian	Jack'nville Townsend	Patuxent River	Meridian
Georgia	NAS Atlanta	Townsend Meridian	Cherry Point Camp Lejeune	Patuxent River		Jack'nville	Cherry Point	Cherry Point	Jack'nville	Cherry Point	Townsend Meridian	AFWTF Patuxent River	Patuxent River	Patuxent River	Townsend	China Lake	Townsend	Townsend	AFWTF Patuxent River	Townsend	Townsend Meridian	Townsend	Patuxent River	Townsend Meridian
Louisiana	NAS JRB New Orleans	Meridian	Camp Lejeune Cherry Point Patuxent River	Patuxent River		AFWTF Bl'dsworth Cherry Point Jack'nville Quantico	Cherry Point Patuxent River	AFWTF Cherry Point Patuxent River Quantico	AFWTF Cherry Point Jack'nville Patuxent River VACAPES	Cherry Point VACAPES	Meridian	AFWTF Patuxent River	Patuxent River	Patuxent River	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend	China Lake	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend VACAPES	AFWTF Cherry Point Jack'nville Patuxent River Townsend VACAPES	AFWTF, Patuxent River	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend VACAPES	Meridian	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend VACAPES	Patuxent River	Meridian
Maine	NAS Brunswick	Camp Lejeune Cherry Point Meridian, Patuxent River Townsend VACPES	Camp Lejuene Cherry Point Patuxent River	Patuxent River		AFWTF Bl'dsworth Cherry Point Jack'nville Quantico	Cherry Point Patuxent River	AFWTF Cherry Point Patuxent River Quantico	AFWTF Cherry Point, Jack'nville Patuxent River VACAPES	Cherry Point VACAPES	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Meridian Townsend VACAPES	AFWTF Patuxent River	Patuxent River	Patuxent River	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend VACAPES	China Lake	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend VACAPES	AFWTF Cherry Point Jacks'ville Patuxent River Townsend VACAPES	AFWTF Patuxent River	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend VACAPES	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Meridian Townsend VACAPES	AFWTF Bl'dsworth Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Townsend VACAPES	Patuxent River	AFWTF Camp Lejeune Cherry Point Jack'nville Patuxent River Quantico Meridian Townsend VACAPES

= 0 – 100 NM = 101 – 200 NM = 201 – 300 NM = 301 – 400 NM = 401 – 500 NM = >500 NM

Table G-3

Distance To Fly From USN/USMC Airfields To Nearest DON Range That Supports Required Air-To-Ground Training Element

State	Navy/USMC Fleet and Reserve Airfields	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flare Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-Time Operations
Mississippi	NAS Meridian	Meridian	Camp Lejeune Cherry Point Patuxent River	Patuxent River		Jack'nville	Cherry Point Patuxent River	AFWTF Cherry Point Patuxent River Quantico	Jack'nville	Cherry Point VACAPES	Meridian	AFWTF Patuxent River	Patuxent River	Patuxent River	Jack'nville Townsend	China Lake	Jack'nville Townsend	Jack'nville Townsend	AFWTF Patuxent River	Jack'nville Townsend	Meridian	Jack'nville Townsend	Patuxent River	Meridian
Nevada	NAS Fallon	FRTC	FRTC	FRTC		FRTC	FRTC	FRTC	FRTC	FRTC	FRTC	China Lake Yuma	29 Palms	29 Palms	FRTC	China Lake	FRTC	FRTC	China Lake	FRTC	FRTC	FRTC	FRTC	FRTC
North Carolina	MCAS Cherry Point	Camp Lejeune Cherry Point VACAPES	Camp Lejeune Cherry Point	Patuxent River		Cherry Point	Cherry Point	Cherry Point	Cherry Point VACAPES	Cherry Point VACAPES	Camp Lejeune Cherry Point VACAPES	Patuxent River	Patuxent River	Patuxent River	Camp Lejeune Cherry Point VACAPES	China Lake	Camp Lejeune Cherry Point VACAPES	Cherry Point VACAPES	Patuxent River	Camp Lejeune Cherry Point VACAPES	Camp Lejeune Cherry Point VACAPES	Camp Lejeune Cherry Point VACAPES	Patuxent River	Camp Lejeune Cherry Point VACAPES
North Carolina	MCAS New River	Camp Lejeune Cherry Point VACAPES	Camp Lejeune Cherry Point	Patuxent River		Cherry Point	Cherry Point	Cherry Point VACAPES	Cherry Point VACAPES	Cherry Point VACAPES	Camp Lejeune Cherry Point VACAPES	Patuxent River	Patuxent River	Patuxent River	Camp Lejeune Cherry Point VACAPES	China Lake	Camp Lejeune Cherry Point VACAPES	Cherry Point VACAPES	Patuxent River	Camp Lejeune Cherry Point VACAPES	Camp Lejeune Cherry Point VACAPES	Camp Lejeune Cherry Point VACAPES	Patuxent River	Camp Lejeune Cherry Point VACAPES
Pennsylvania	NAS JRB Willow Grove	Patuxent River	Patuxent River	Patuxent River		Bl'dsworth Quantico	Patuxent River	Patuxent River	Patuxent River	Cherry Point VACAPES	Bl'dsworth Patuxent River Quantico	Patuxent River	Patuxent River	Patuxent River	Bl'dsworth Patuxent River Quantico	China Lake	Bl'dsworth Patuxent River Quantico	Patuxent River	Patuxent River	Bl'dsworth Patuxent River Quantico	Bl'dsworth Patuxent River Quantico	Bl'dsworth Patuxent River Quantico	Patuxent River	Patuxent River Quantico

= 0 – 100 NM = 101 – 200 NM = 201 – 300 NM = 301 – 400 NM = 401 – 500 NM = >500 NM

Table G-3

Distance To Fly From USN/USMC Airfields To Nearest DON Range That Supports Required Air-To-Ground Training Element

State	Navy/USMC Fleet and Reserve Airfields	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flare Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-Time Operations
South Carolina	MCAS Beaufort	Townsend	Camp Lejeune Cherry Point	Patuxent River		Cherry Point Jack'nville	Cherry Point	Cherry Point	Jack'nville Cherry Point	Cherry Point	Townsend	Patuxent River	Patuxent River	Patuxent River	Townsend	China Lake	Townsend	Townsend	Patuxent River	Townsend	Townsend	Townsend	Patuxent River	Townsend
Texas	NAS Kingsville	Gulf of Mexico	China Lake FRTC SHOBA Yuma	China Lake FRTC SHOBA YUMA		Camp Pendleton China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	FRTC Yuma	Gulf of Mexico	China Lake Yuma	China Lake SHOBA 29 Palms Yuma	China Lake 29 Palms Yuma	Camp Pendleton China Lake FRTC Boardman SHOBA 29 Palms	China Lake	Camp Pendleton China Lake El Centro FRTC Boardman SHOBA 29 Palms Yuma	Gulf of Mexico	China Lake Yuma	Gulf of Mexico	Gulf of Mexico	Camp Pendleton China Lake FRTC Boardman SHOBA 29 Palms Yuma	China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC Boardman SHOBA 29 Palms Yuma
Texas	NAS Corpus Christi	Gulf of Mexico	China Lake FRTC SHOBA Yuma	China Lake FRTC SHOBA Yuma		Camp Pendleton China Lake FRTC SHOBA 29 Palms, Yuma	Camp Pendleton China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	FRTC Yuma	Gulf of Mexico	China Lake Yuma	China Lake , SHOBA 29 Palms Yuma	China Lake 29 Palms Yuma	Camp Pendleton China Lake FRTC Boardman SHOBA 29 Palms	China Lake,	Camp Pendleton China Lake El Centro FRTC Boardman SHOBA 29 Palms Yuma	Gulf of Mexico	China Lake Yuma	Gulf of Mexico	Gulf of Mexico	Camp Pendleton China Lake FRTC Boardman SHOBA 29 Palms Yuma	China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC Boardman SHOBA 29 Palms Yuma

= 0 – 100 NM = 101 – 200 NM = 201 – 300 NM = 301 – 400 NM = 401 – 500 NM = >500 NM

Table G-3

Distance To Fly From USN/USMC Airfields To Nearest DON Range That Supports Required Air-To-Ground Training Element

State	Navy/USMC Fleet and Reserve Airfields	EW I	EW II	EW III	EW IV	Live Ordnance Expenditure	Chaff Expenditure	Flare Expenditure	High-Altitude Airspace	TACTS	Air-to-Ground Guns Expenditure	Air-to-Air Guns Expenditure	Stand-off Weapons Expenditure	Air-to-Ground Missile Expenditure	PGM Expenditure	Air-to-Air Missiles Expenditure	Laser Safe Range	Range Scoring	Cluster Weapons Expenditure	Air-to-Ground Rocket Expenditure	Practice Bomb Expenditure	General Purpose Bomb Expenditure	Overland Supersonic Flight	Night-Time Operations
Texas	NAS JRB Fort Worth	Gulf of Mexico	China Lake FRTC SHOBA Yuma	China Lake FRTC SHOBA Yuma		Camp Pendleton China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	FRTC Yuma	Gulf of Mexico	China Lake Yuma	China Lake SHOBA 29 Palms Yuma	China Lake 29 Palms Yuma	Camp Pendleton China Lake FRTC Boardman SHOBA 29 Palms Yuma	China Lake	Camp Pendleton China Lake El Centro FRTC Boardman SHOBA 29 Palms Yuma	Gulf of Mexico	China Lake Yuma	Gulf of Mexico	Gulf of Mexico	Camp Pendleto China Lake FRTC Boardman SHOBA 29 Palms Yuma	China Lake FRTC SHOBA 29 Palms Yuma	Meridian
Virginia	NAS Oceana	VACAPES Patuxent River	Patuxent River	Patuxent River		Bl'dsworth	Patuxent River	Patuxent River VACAPES	Patuxent River VACAPES	VACAPES	Bl'dsworth Patuxent River VACAPES	Patuxent River	Patuxent River	Patuxent River	Bl'dsworth Patuxent River VACAPES	China Lake	Bl'dsworth Patuxent River VACAPES	Patuxent River VACAPES	Patuxent River	Bl'dsworth Patuxent River VACAPES	Bl'dsworth Patuxent River VACAPES	Bl'dsworth Patuxent River VACAPES	Patuxent River	Patuxent River VACAPES
Virginia	MCAF Quantico	Patuxent River	Patuxent River	Patuxent River		Quantico Bl'dsworth	Patuxent River	Patuxent River Quantico	Patuxent River	Cherry Point VACAPES	Bl'dsworth Patuxent River Quantico	Patuxent River	Patuxent River	Patuxent River	Bl'dswort Patuxent River Quantico	China Lake	Quantico Bl'dsworth Patuxent River	Patuxent River	Patuxent River	Bl'dsworth Patuxent River Quantico	Bl'dsworth Patuxent River Quantico	Bl'dsworth Patuxent River Quantico	Patuxent River	Patuxent River Quantico
Washington	NAS Whidbey Island	Camp Pendleton China Lake FRTC Gulf of Mexico SHOBA 29 Palms Yuma	China Lake FRTC SHOBA Yuma	China Lake FRTC SHOBA Yuma		Camp Pendleton China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	Camp Pendleton China Lake El Centro FRTC SHOBA 29 Palms Yuma	FRTC Yuma	Boardman	China Lake Yuma	SHOBA 29 Palms Yuma	China Lake 29 Palms Yuma	Boardman	China Lake	Boardman	Camp Pendleton China Lake El Centro FRTC Gulf of Mexico 29 Palms Yuma	China Lake Yuma	Boardman	Boardman	Boardman	China Lake FRTC SHOBA 29 Palms Yuma	Boardman

= 0 – 100 NM = 101 – 200 NM = 201 – 300 NM = 301 – 400 NM = 401 – 500 NM = >500 NM

Table G-4

Summary of Training Element Demand By Platform Type

Service/Platform	Total Range Time EW 1	Total Range Time EW 2	Total Range Time EW 3	Total Range Time EW 4	Total Range Time Live Ordnance	Total Range Time Chaff	Total Range Time Flare	Total Range Time High Altitude	Total Range Time TACTS	Total Range Time A-G Guns	Total Range Time A-A Guns	Total Range Time Stand-off Weapons	Total Range Time A to G Missile	Total Range Time PGM	Total Range Time A-A Missiles	Total Range Time Laser	Total Range Time Scored	Total Range Time Cluster Weapons	Total Range Time A to G Rocket	Total Range Time Practice Bomb	Total Range Time GP Bomb	Total Range Time Supersonic Flight	Total Range Time at Night
Navy																							
E-2C	0.0	225.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA-6B (CVW)	0.0	272.7	63.0	108.0	0.0	216.0	108.0	524.7	0.0	0.0	0.0	81.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5
EA-6B (Expeditionary)	0.0	85.5	0.0	0.0	0.0	0.0	0.0	54.0	0.0	0.0	0.0	54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135.5
EP-3E	0.0	0.0	0.0	144.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F-14	14.0	7.0	22.4	16.8	53.9	230.1	274.9	371.0	162.4	14.0	0.0	105.0	0.0	40.6	0.0	159.6	340.7	4.2	0.0	273.5	205.1	200.2	149.8
F/A-18	0.0	10.2	15.3	0.0	72.5	371.0	368.2	265.4	14.0	25.5	0.0	106.1	11.6	57.4	0.0	95.1	590.6	2.8	2.8	534.7	527.1	487.3	29.7
H-46	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0
MH-53E	0.0	0.0	0.0	0.0	0.0	29.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P-3C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.0	0.0	0.0	0.0	144.0	144.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.0
S-3B	0.0	0.0	0.0	44.2	6.8	52.7	44.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	210.2	8.5	0.0	149.6	18.1	0.0	68.0
SH-60B	0.0	9.6	0.0	0.0	0.0	9.6	9.6	36.0	0.0	0.0	0.0	36.0	36.0	0.0	0.0	36.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-60F/HH-60	0.0	0.0	0.0	205.0	267.0	205.0	205.0	0.0	265.0	299.0	0.0	25.0	25.0	0.0	0.0	145.0	299.0	0.0	0.0	0.0	0.0	0.0	437.0
UH-3	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
UAV	0.0	0.0	0.0	0.0	21.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marine Corps																							
AH-1W	0.0	20.2	97.1	88.0	155.8	188.8	188.8	0.0	298.8	82.5	0.0	0.0	91.7	0.0	0.0	330.0	82.5	0.0	117.3	0.0	0.0	0.0	146.7
AV-8B	56.3	0.0	0.0	0.0	431.3	663.9	1017.7	0.0	480.0	318.8	0.0	0.0	25.0	50.0	0.0	81.3	337.9	50.0	0.0	456.7	212.5	0.0	218.9
CH-46	0.0	35.0	14.0	0.0	28.0	35.0	35.0	0.0	0.0	28.0	0.0	0.0	0.0	0.0	0.0	35.0	28.0	0.0	0.0	0.0	0.0	0.0	167.6
CH-53	0.0	28.6	14.3	0.0	28.6	42.9	42.9	0.0	0.0	28.6	0.0	0.0	0.0	0.0	0.0	0.0	28.6	0.0	0.0	0.0	0.0	0.0	465.6
EA-6B	0.0	294.0	357.0	0.0	0.0	283.5	199.5	0.0	84.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	199.5
F/A-18	57.0	53.8	63.3	0.0	576.3	1097.1	1078.1	434.1	390.2	95.0	19.0	196.3	155.1	193.1	3.2	243.8	275.5	0.0	247.0	262.8	133.0	402.9	994.6
UH-1N	0.0	16.8	0.0	0.0	219.0	82.8	82.8	0.0	16.8	174.0	0.0	0.0	0.0	0.0	0.0	0.0	162.0	0.0	111.0	0.0	0.0	0.0	285.0
CNATRA																							
T-45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1020.8	0.0	0.0	1020.8	0.0	0.0	0.0
FRS																							
F-14	75.0	247.6	131.3	0.0	243.9	378.9	378.9	0.0	37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	202.5	0.0	0.0	296.3	303.9	0.0	0.0
F-18 A/B/C/D	0.0	0.0	0.0	0.0	151.6	277.0	0.0	562.5	0.0	101.3	0.0	81.0	0.0	81.0	0.0	81.0	1055.6	0.0	0.0	978.3	226.7	0.0	228.8
S-3B	0.0	94.4	0.0	0.0	75.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	226.5	75.5	0.0	151.0	75.5	0.0	94.4

ATTACHMENT 2

WORKSHEETS

INSTRUCTIONS FOR COMPLETING THE DECISION-MAKER'S PLANNING TOOL WORKSHEETS

The four Decision-maker's Planning Tool worksheets and instructions for using those worksheets are provided on the following pages. Each of the four worksheets consists of one page of instructions and two sheets (or pages) for the worksheet:

- Each instruction page contains a list of required (or recommended) references, step-by-step instructions for completing the worksheet, and a Chapter 6 example of what the completed worksheet will look like.

- Sheet 1 of each worksheet contains reference numbers in applicable cells that correspond to the instructions for completing the worksheet. These sheets should be used as a reference when completing the actual worksheet (Sheet 2).

- Sheet 2 of each worksheet should be reproduced as necessary for use during required analyses.

INSTRUCTIONS

WORKSHEET I - TRAINING ELEMENT ANALYSIS

Required or Recommended References:

1. Table G-3
2. Table G-4

Step-by-step instructions:

① Insert the name of the aircraft platform type that is the focus of the analysis.

② Insert the name of the first airfield that is being considered for aircraft basing.

③ Insert the name of the second airfield that is being considered for aircraft basing.

④ Locate the name of the platform type in Table G-4. Identify any training elements that are not required (0.0 hours in Table G-4). Enter "Not Required" in the corresponding training element cell beneath each airfield.

⑤ Locate in Table G-3 the name of the first airfield being considered for aircraft basing. Moving across the corresponding row in Table G-3, identify the upper limit of the range-of-miles color-code for each required training element. For example, if the range-of-miles color-code is light green (0-100 NM), the upper limit of the range-of-miles color code is "100." Enter in the worksheet cell beneath the first airfield being considered for aircraft basing the corresponding upper limit mileage for each required training element.

⑥ Repeat Step ⑤ for the second airfield being considered for aircraft basing.

WORKSHEET I - TRAINING ELEMENT ANALYSIS

for (Enter Aircraft Platform Type Here)

Required Training Elements	Maximum Distance to Fly to Find Required Training Element (from Table G-3)	
	From (Enter Airfield Name)	From (Enter Airfield Name)
EW I	④, ⑤	④, ⑥
EW II		
EW III		
EW IV		
Live Ordnance Expenditure		
Chaff Expenditure		
Flares Expenditure		
High-Altitude Airspace		
TACTS		
Air-to-Ground Guns Expenditure		
Air-to-Air Guns Expenditure		
Stand-Off Weapons		
Air-to-Ground Missiles		
Precision-Guided Munitions		
Air-to-Air Missiles		
Laser-Safe Range		
Range Scoring		
Cluster Weapons Expenditure		
Air-to-Ground Rockets Expenditure		
Practice Bomb Expenditure		
General Purpose Bomb Expenditure		
Overland Supersonic Flight		
Night-time Operations		

Notes:

1. Bold type denotes critical training element.
2. For each training element required by the aircraft platform type, enter the mileage in each airfield column that corresponds with the upper limit of the range of miles color-code indicated in Table G-3. For example, if the distance from a given airfield to a training element is color-coded light green (0-100 NM), enter “100.” If the distance is color-coded ≥500 NM, enter “≥500.” If the training element is not required, enter “Not Required.”

EXAMPLE

WORKSHEET I - TRAINING ELEMENT ANALYSIS

for (①)

Required Training Elements	Maximum Distance to Fly to Find Required Training Element (from Table G-3)	
	From (②)	From (③)
EW I	④, ⑤	④, ⑥
EW II		
EW III		
EW IV		
Live Ordnance Expenditure		
Chaff Expenditure		
Flares Expenditure		
High-Altitude Airspace		
TACTS		
Air-to-Ground Guns Expenditure		
Air-to-Air Guns Expenditure		
Stand-Off Weapons		
Air-to-Ground Missiles		
Precision-Guided Munitions		
Air-to-Air Missiles		
Laser-Safe Range		
Range Scoring		
Cluster Weapons Expenditure		
Air-to-Ground Rockets Expenditure		
Practice Bomb Expenditure		
General Purpose Bomb Expenditure		
Overland Supersonic Flight		
Night-time Operations		

Notes:

1. Bold type denotes critical training element.
2. For each training element required by the aircraft platform type, enter the mileage in each airfield column that corresponds with the upper limit of the range of miles color-code indicated in Table G-3. For example, if the distance from a given airfield to a training element is color-coded light green (0-100 NM), enter “100.” If the distance is color-coded ≥500 NM, enter “≥500.” If the training element is not required, enter “Not Required.”

INSTRUCTIONS

WORKSHEET II - TRAINING ELEMENT IMPACT ANALYSIS

Required or Recommended References:

1. A completed *Training Element Analysis Worksheet (Worksheet I)*
2. FLIP Enroute High Altitude Chart(s)
3. FLIP IFR Enroute Low Altitude Chart(s)
4. Area Chart(s)

Step-by-step instructions:

① Insert the name of the aircraft platform type that is the focus of the analysis.

② Insert the name of the first airfield that is being considered for aircraft basing.

③ Insert the name of the second airfield that is being considered for aircraft basing.

④ Enter the reference source used for determining approximate air miles from the airfields being considered for basing and the range complex(es) that will support the required training elements. The reference source will determine how exact the range determinations are. Because air mile approximations to ± 50 NM will normally suffice, the FLIP Enroute High Altitude charts will, in most cases, provide sufficient detail for this worksheet. If the user desires a greater level of detail, the user may elect to use the FLIP IFR Enroute Low Altitude Chart(s), Area Chart(s), or some other navigation chart.

⑤ From the completed *Training Element Analysis Worksheet (Worksheet I)*, identify the first required training element that has a different upper limit mileage associated with each of the airfields that are being considered for basing. Enter the name of that required training element in this cell.

⑥ Enter in the first worksheet cell beneath the first airfield being considered for basing the upper limit mileage (from the *Training Element Analysis Worksheet [Worksheet I]*) for the training element identified in Step ⑤ above.

⑦ Enter in the first worksheet cell beneath the second airfield being considered for basing the upper limit mileage (from the *Training Element Analysis Worksheet [Worksheet I*]) for the training element identified in Step ⑤ above.

⑧ Use this space for entering the results of your analysis.

⑨ Repeat Steps ⑤, ⑥, ⑦, and ⑧ for each of the remaining required training elements.

EXAMPLE

WORKSHEET II - TRAINING ELEMENT IMPACTS ANALYSIS

of Moving (①) from (②) to (③)

Training Elements Impacted by the Move from (②) to (③)	Maximum Flying Distance (NM) to Find Required Training Element (from Table G-3)		Impact (Approximate round-trip mileage obtained from (④)
	From (②)	From (③)	
⑤	⑥	⑦	⑧
⑨			
⑨			
⑨			
⑨			
⑨			

WORKSHEET II - TRAINING ELEMENT IMPACTS ANALYSIS
of Moving (Enter Platform Name)
from (Enter Airfield Name) to (Enter Airfield Name)

Training Elements Impacted by the Move from (*Airfield Name*) to (*Airfield Name*)	Maximum Flying Distance (NM) to Find Required Training Element (from Table G-3)		Impact (Approximate round-trip mileage obtained from (*Enter Reference Source*)
	From (*Airfield*)	From (*Airfield*)	
(*Enter Training Element)*	(Enter Miles)	(Enter Miles)	(*Enter Discussion of Impact*)
(*Enter Training Element)*	(Enter Miles)	(Enter Miles)	(*Enter Discussion of Impact*)
(*Enter Training Element)*	(Enter Miles)	(Enter Miles)	(*Enter Discussion of Impact*)
(*Enter Training Element)*	(Enter Miles)	(Enter Miles)	(*Enter Discussion of Impact*)
(*Enter Training Element)*	(Enter Miles)	(Enter Miles)	(*Enter Discussion of Impact*)
(*Enter Training Element)*	(Enter Miles)	(Enter Miles)	(*Enter Discussion of Impact*)

INSTRUCTIONS

WORKSHEET III - PLATFORM TRAINING ELEMENTS ANALYSIS

Required or Recommended References:

1. Table5-6
2. Table G-4

Step-by-step instructions:

① Insert the name of the aircraft platform type or types that are the focus of the analysis.

② Insert in each cell the name of one training element to be analyzed.

③ Insert the name of the first aircraft platform type that is the focus of the analysis.

④ Locate the name of the aircraft platform type in Table G-4. Moving across the corresponding row in Table G-4, identify the time (in hours) associated with the first training element to be analyzed. Enter the time, even if it is "0.0".

⑤ Repeat Step ④ above for each of the remaining training elements to be analyzed.

⑥ Insert the name of the second aircraft platform type that is the focus of the analysis.

⑦ Repeat Step ④ for the second aircraft platform type.

⑧ Repeat Step ⑤ for the second aircraft platform type.

⑨ Repeat Steps ⑥, ⑦, and ⑧ for each of the remaining aircraft platform types that are the focus of the analysis.

⑩ Add the total number of hours required for each training element and enter that number in each of the corresponding cells in the row titled "12-Month Total."

EXAMPLE

WORKSHEET III - PLATFORM TRAINING ELEMENT ANALYSIS for (①)

Squadron/ Platform	Range Time Required for Training Elements During 12-Month Period[1] (from Table G-4)					
	②	②	②	②	②	②
③	④	⑤	⑤	⑤	⑤	⑤
⑥	⑦	⑧	⑧	⑧	⑧	⑧
⑨						
⑨						
⑨						
⑨						
⑨						
⑨						
⑨						
⑨						
12-Month Total	⑩	⑩	⑩	⑩	⑩	⑩

Notes:

1. In each cell under the Training Element(s) being analyzed, enter for each platform type the total range time (hours) required for a 12-month period (from Table G-4).

WORKSHEET III - PLATFORM TRAINING ELEMENT ANALYSIS for (Enter the Names of Aircraft Platform Types to be Analyzed)

Squadron/ Platform	Range Time Required for Training Elements during 12-Month Period[1] (from Table G-4)					
	(Training Element Name)	(Training Element Name)	(Training Element Name)	(Training Element Name)	(Training Element Name)	(Training Element Name)
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
Platform Type(s)						
12-Month Total						

Notes:

1. In each cell under the Training Element(s) being analyzed, enter for each platform type the total range time (hours) required for a 12-month period (from Table G-4).

INSTRUCTIONS

WORKSHEET IV - RANGE EVALUATION

Required or Recommended References:

1. Table 3-3
2. Table 4-6
3. Table B-3
4. Appendix D (section applicable to the range or range complex being evaluated)
5. Table F-5
6. Table G-2
7. DoN Range Internet Website

Step-by-step instructions:

① Insert the name of the air-to-ground range or range complex that is being evaluated.

② Locate the associated range and/or complex in Appendix D and Table G-2. Determine if the range or range complex can support the EW I training element. Enter "Y" for yes or "N" for no.

③ Insert any comments from Appendix D that are applicable to the EW I training element. Additional range or range complex-related information may be available on the DoN Range Internet Website.

④ Repeat Step ② for each of the remaining training elements.

⑤ Repeat Step 3 for each of the remaining training elements. The following guidelines will assist in completing the "Comments" section:

- Table B-3 will indicate specific types of ordnance (live and inert) authorized at each range;
- Appendix D and the Website will indicate if live ordnance is authorized and the general categories of authorized ordnance;
- Appendix D and the Website will also provide specific information about the SUA associated with each range complex, range and range complex hours of operation, availability and types of weapons scoring equipment, and points of contact for range and range complex scheduling; and
- The High-Altitude training element requires SUA that extends upward to at least 20,000 feet AGL.

⑥ Enter the name of the metric (from Table 3-2) selected for reporting range or range complex utilization.

⑦ In the first "Year" row, enter the first year for which utilization data will be reported (ex: "FY 97".) In the second "Year" row, enter the second year for which utilization data will be reported (ex: "FY 98".)

INSTRUCTIONS

WORKSHEET IV - RANGE EVALUATION (Continued)

⑧ Enter the corresponding utilization percentage(s) from Table 3-2 that correspond with the metric selected in Step ⑥ and the year(s) selected in Step ⑦.

⑨ For each Range User, enter in the top cell of the left hand column the year that corresponds with the first year identified in Step ⑦. In the bottom cell of the left hand column, enter the percentage (from Table 3-3) that corresponds with the user and the year.

For each Range User, enter in the top cell of the right hand column the year that corresponds with the second year identified in Step ⑦. In the bottom cell of the right hand column, enter the percentage (from Table 3-3) that corresponds with the user and the year.

⑩ From Table 4-6, Appendix D, and the Website, identify operational considerations, encroachment and environmental issues, and infrastructure issues that are applicable to the range or range complex being evaluated. Enter selected comments in the spaces provided.

EXAMPLE

WORKSHEET IV - RANGE EVALUATION for (①)

Training Elements (Bold indicates Critical)	Y/N	Comments
EW I	②	③
EW II	④	⑤
EW III	④	
EW IV	④	
Live Ordnance Expenditure	④	
Chaff Expenditure	④	
Flares Expenditure	④	
High-Altitude Airspace	④	
TACTS	④	
Air-to-Ground Guns Expenditure	④	
Air-to-Air Guns Expenditure	④	
Stand-Off Weapons Expenditure	④	
Air-to-Ground Missiles Expenditure	④	
PGMs Expenditure	④	
Air-to-Air Missiles Expenditure	④	
Laser-Safe Range	④	
Range Scoring	④	
Cluster Weapons Expenditure	④	
Air-to-Ground Rockets Expenditure	④	
Practice Bombs Expenditure	④	
General Purpose Bombs Expenditure	④	
Overland Supersonic Flight	④	
Night-Time Operations	④	

Utilization (⑥):			Range Users by General Category (%)									
Year (⑦)	⑧		Navy		Marine Corps		Air Force		Army		Other	
Year (⑦)	⑧		(⑨)	(⑨)	(⑨)	(⑨)	(⑨)	(⑨)	(⑨)	(⑨)	(⑨)	(⑨)
			⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨

Operational Considerations	Encroachment/Environmental Issues	Infrastructure Issues
⑩	⑩	⑩

WORKSHEET IV - RANGE EVALUATION for (Enter Range Name)

Training Elements ((Bold indicates Critical)	Y/N	Comments
EW I		
EW II		
EW III		
EW IV		
Live Ordnance Expenditure		
Chaff Expenditure		
Flares Expenditure		
High-Altitude Airspace		
TACTS		
Air-to-Ground Guns Expenditure		
Air-to-Air Guns Expenditure		
Stand-Off Weapons Expenditure		
Air-to-Ground Missiles Expenditure		
PGMs Expenditure		
Air-to-Air Missiles Expenditure		
Laser-Safe Range		
Range Scoring		
Cluster Weapons Expenditure		
Air-to-Ground Rockets Expenditure		
Practice Bombs Expenditure		
General Purpose Bombs Expenditure		
Overland Supersonic Flight		
Night-Time Operations		

Utilization *(Indicate Metric Used)*:			Range Users by General Category (%)									
Year (_____)			Navy		Marine Corps		Air Force		Army		Other	
Year (_____)			*(Year)*	*(Year)*	*(Year)*	*(Year)*	*(Year)*	*(Year)*	*(Year)*	*(Year)*	*(Year)*	*(Year)*

Operational Considerations	Encroachment/Environmental Issues	Infrastructure Issues
Enter applicable comments(see Table 4-6 and Appendix D for information documented in this report)	*Enter applicable comments (see Table 4-6 and Appendix D for information documented in this report)*	*Enter applicable comments (See Table 4-6 and Appendix D for information documented in this report)*

Appendix H

Air-to-Ground Training Database by Aircraft Platform

APPENDIX H

AIR-TO-GROUND TRAINING DATABASE BY AIRCRAFT PLATFORM

Note

The data in Appendix H was derived from the following published sources:

- *Draft Joint Commander, Air Forces, US Atlantic Fleet (CNAL)/Commander, Air Forces, US Pacific Fleet (CNAP) Squadron Training and Readiness (T&R) Instruction* (Fall 1999).
- Volumes I and II of the *Marine Corps T&R Manual* (March 1999).
- Selected *Air Wing Training Manuals* (F-14 and F/A-18).

In addition, training requirements for Chief of Naval Air Training (CNATRA) were provided by CNATRA (N3144) and CNAL and CNAP provided training requirements for the Fleet Readiness Squadron (FRS).

In addition, discussion were held with CNAL, CNAP, NSAWC, and Marine Corps Headquarters representatives, who provided interpretation guidance. These data are subject to changes as the source documents are modified and/or as implementation of the training requirements change.

Table H-1

Summary of Training Element Demand By Platform Type

Service/Platform	Total Range Time EW 1	Total Range Time EW 2	Total Range Time EW 3	Total Range Time EW 4	Total Range Time Live Ordnance	Total Range Time Chaff	Total Range Time Flare	Total Range Time High Altitude	Total Range Time TACTS	Total Range Time A-G Guns	Total Range Time A-A Guns	Total Range Time Stand-off Weapon	Total Range Time A to G Missile	Total Range Time PGM Bomb	Total Range Time A-A Missiles	Total Range Time Laser	Total Range Time Scored	Total Range Time Cluster Weapons	Total Range Time A to G Rocket	Total Range Time Practice Bomb	Total Range Time GP Bomb	Total Range Time Supersonic Flight	Total Range Time at Night
Navy																							
E-2C	0.0	225.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EA-6B (CVW)	0.0	272.7	63.0	108.0	0.0	216.0	108.0	524.7	0.0	0.0	0.0	81.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5
EA-6B (Expeditionary)	0.0	85.5	0.0	0.0	0.0	0.0	0.0	54.0	0.0	0.0	0.0	54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	135.5
EP-3E	0.0	0.0	0.0	144.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F-14	14.0	7.0	22.4	16.8	53.9	230.1	274.9	371.0	162.4	14.0	0.0	105.0	0.0	40.6	0.0	159.6	340.7	4.2	0.0	273.5	205.1	200.2	149.8
F/A-18	0.0	10.2	15.3	0.0	72.5	371.0	368.2	265.4	14.0	25.5	0.0	106.1	11.6	57.4	0.0	95.1	590.6	2.8	2.8	534.7	527.1	487.3	29.7
H-46	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0
MH-53E	0.0	0.0	0.0	0.0	0.0	29.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P-3C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.0	0.0	0.0	0.0	144.0	144.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	144.0
S-3B	0.0	0.0	0.0	44.2	6.8	52.7	44.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	210.2	8.5	0.0	149.6	18.1	0.0	68.0
SH-60B	0.0	9.6	0.0	0.0	0.0	9.6	9.6	36.0	0.0	0.0	0.0	36.0	36.0	0.0	0.0	36.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0
SH-60F/HH-60	0.0	0.0	0.0	205.0	267.0	205.0	205.0	0.0	265.0	299.0	0.0	25.0	25.0	0.0	0.0	145.0	299.0	0.0	0.0	0.0	0.0	0.0	437.0
UH-3	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
UAV	0.0	0.0	0.0	0.0	21.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marine Corps																							
AH-1W	0.0	20.2	97.1	88.0	155.8	188.8	188.8	0.0	298.8	82.5	0.0	0.0	91.7	0.0	0.0	330.0	82.5	0.0	117.3	0.0	0.0	0.0	146.7
AV-8B	56.3	0.0	0.0	0.0	431.3	663.9	1017.7	0.0	480.0	318.8	0.0	0.0	25.0	50.0	0.0	81.3	337.9	50.0	0.0	456.7	212.5	0.0	218.9
CH-46	0.0	35.0	14.0	0.0	28.0	35.0	35.0	0.0	0.0	28.0	0.0	0.0	0.0	0.0	0.0	35.0	28.0	0.0	0.0	0.0	0.0	0.0	167.6
CH-53	0.0	28.6	14.3	0.0	28.6	42.9	42.9	0.0	0.0	28.6	0.0	0.0	0.0	0.0	0.0	0.0	28.6	0.0	0.0	0.0	0.0	0.0	465.6
EA-6B	0.0	294.0	357.0	0.0	0.0	283.5	199.5	0.0	84.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	199.5
F/A-18	57.0	53.8	63.3	0.0	576.3	1097.1	1078.1	434.1	390.2	95.0	19.0	196.3	155.1	193.1	3.2	243.8	275.5	0.0	247.0	262.8	133.0	402.9	994.6
UH-1N	0.0	16.8	0.0	0.0	219.0	82.8	82.8	0.0	16.8	174.0	0.0	0.0	0.0	0.0	0.0	0.0	162.0	0.0	111.0	0.0	0.0	0.0	285.0
CNATRA																							
T-45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1020.8	0.0	0.0	1020.8	0.0	0.0	0.0
FRS																							
F-14	75.0	247.6	131.3	0.0	243.9	378.9	378.9	0.0	37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	202.5	0.0	0.0	296.3	303.9	0.0	0.0
F-18 A/B/C/D	0.0	0.0	0.0	0.0	151.6	277.0	0.0	562.5	0.0	101.3	0.0	81.0	0.0	81.0	0.0	81.0	1055.6	0.0	0.0	978.3	226.7	0.0	228.8
S-3B	0.0	94.4	0.0	0.0	75.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	226.5	75.5	0.0	151.0	75.5	0.0	94.4

Table H-2

E-2C Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No.Reflies/Repeats/Each Event	Number of Aircraft/Event	Total Requirement/Each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A-to-G Missile	Range Time PGM	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A-to-G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
2	C2W 4	15	60	6.0	1	90	1.5	135.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	STW 3	15	180	2.0	1	30	1.5	45.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 1	15	120	3.0	1	45	1.0	45.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 2	15	120	3.0	1	45	1.0	45.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	270.0

Table H-3

EA-6B (CVW) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AAW 2	18	90	4.0	1	72	1.5	108.0	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	MSLX	18	360	1.0	1	18	2.0	36.0	No	No	Yes	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	
1	STW 7	18	360	1.0	1	18	1.5	27.0	No	No	No	Yes	No	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
1	STW 8	18	360	1.0	1	18	1.5	27.0	No	No	No	Yes	No	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
1	STW 9	18	360	1.0	1	18	1.5	27.0	No	No	No	Yes	No	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
1	STW 10	18	360	1.0	2	9	1.5	13.5	No	No	Yes	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	STW 11	18	360	1.0	2	9	1.5	13.5	No	No	Yes	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	C2W 6	18	180	2.0	4	9	1.5	13.5	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	C2W 7	18	180	2.0	4	9	1.5	13.5	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	STW 4	18	180	2.0	1	36	0.5	18.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	STW 5	18	360	1.0	1	18	0.5	9.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	STW 6	18	360	1.0	1	18	1.0	18.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	C2W 5	18	120	3.0	2	27	0.5	13.5	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	STW 3	18	120	3.0	1	54	0.5	27.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 1	18	60	6.0	1	108	0.5	54.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 2	18	120	3.0	1	54	0.5	27.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 3	18	120	3.0	2	27	0.8	21.6	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 4	18	120	3.0	2	27	0.8	21.6	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 1	18	360	1.0	1	18	1.0	18.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 2	18	360	1.0	1	18	1.0	18.0	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	524.7

Table H-4

EA-6B (Expeditionary) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	STW 7	18	360	1.0	1	18	1.5	27.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
1	STW 8	18	360	1.0	1	18	1.5	27.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	STW 9	18	360	1.0	1	18	1.5	27.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
1	STW 10	18	360	1.0	1	18	2.0	36.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	STW 11	18	360	1.0	1	18	2.0	36.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	C2W 6	18	270	1.3	4	6	1.5	9.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	C2W 7	18	270	1.3	4	6	1.5	9.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	STW 4	18	180	2.0	1	36	0.5	18.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	STW 5	18	360	1.0	1	18	0.5	9.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	STW 6	18	360	1.0	1	18	1.2	21.6	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	C2W 5	18	120	3.0	2	27	0.5	13.5	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	STW 3	18	240	1.5	1	27	0.5	13.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 1	18	60	6.0	1	108	0.5	54.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 2	18	120	3.0	1	54	0.5	27.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 3	18	120	3.0	2	27	1.0	27.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	C2W 4	18	120	3.0	2	27	1.0	27.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 1	18	360	1.0	1	18	1.0	18.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 2	18	360	1.0	1	18	1.0	18.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	417.6

Table H-5

EP-3 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Refiles/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
3	C2W 1	9	360	1.0	1	9	8.0	72.0	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	C2W 2	9	360	1.0	1	9	8.0	72.0	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	144.0

Table H-6

F-14 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	STW 24	14	540	0.7	1	9.3	0.8	7.5	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
2	AAW 16	14	90	4.0	4	14	0.5	7.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
2	AAW 17	14	90	4.0	4	14	0.5	7.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
2	AAW 18	14	90	4.0	4	14	0.5	7.0	No	Yes	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
2	AMW 3	14	180	2.0	1	28	0.8	22.4	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
2	ASU 2	14	360	1.0	1	14	0.4	5.6	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
2	FAC 4	14	180	2.0	1	28	0.8	22.4	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
2	FAC 5	14	180	2.0	1	28	0.8	22.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
2	FAC 6	14	180	2.0	1	28	0.8	22.4	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
2	INT 4	14	180	2.0	1	28	0.5	14.0	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
2	STW 20	14	120	3.0	4	11	0.8	8.4	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	
2	STW 21	14	360	1.0	1	14	0.5	7.0	No	No	No	No	Yes	No	No	Yes	No	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	Yes	
2	STW 22	14	60	6.0	2	42	0.8	33.6	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	No	No	Yes	
3	AAW 12	14	90	4.0	4	14	0.5	7.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
3	AMW 1	14	90	4.0	1	56	0.5	28.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
3	AMW 2	14	180	2.0	1	28	0.8	22.4	No	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
3	FAC 2	14	90	4.0	1	56	0.8	44.8	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
3	FAC 3	14	180	2.0	1	28	0.8	22.4	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
3	STW 13	14	60	6.0	1	84	0.5	42.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	Yes	No	No	
3	STW 14	14	90	4.0	1	56	0.5	28.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	Yes	No	No	
3	STW 15	14	90	4.0	1	56	0.5	28.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	Yes	No	No	
3	STW 17	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	Yes	No	
3	STW 18	14	90	4.0	1	56	0.3	16.8	No	No	No	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 6	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 7	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 8	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 9	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 10	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 11	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	FAC 1	14	360	1.0	1	14	1.5	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
4	STW 2	14	180	2.0	1	28	1.0	28.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 4	14	90	4.0	2	28	0.5	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	
4	STW 5	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	
4	STW 6	14	60	6.0	2	42	0.5	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	
4	STW 7	14	90	4.0	2	28	0.5	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	
4	STW 8	14	90	4.0	2	28	0.3	8.4	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
4	STW 10	14	360	1.0	1	14	1.5	21.0	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	
4	STW 11	14	120	3.0	2	21	0.3	6.3	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
4	STW 12	14	360	1.0	1	14	0.3	4.2	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	732.0

Table H-7

F/A-18 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period Pilot L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AMW 02	17	60	6.0	2	51	0.5	25.5	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	Yes	
1	STW 06	17	120	3.0	2	26	0.5	12.8	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
1	STW 34	17	540	0.7	2	6	0.5	2.8	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	
2	AAW 01	17	60	6.0	2	51	1.0	51.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No
2	AAW 02	17	60	6.0	2	51	1.0	51.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No
2	STW 01	17	60	6.0	2	51	1.5	76.5	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
2	STW 03	17	30	12.0	2	102	0.5	51.0	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
2	STW 23	17	60	6.0	2	51	0.3	15.3	No	No	Yes	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	STW 26	17	1095	0.3	2	3	0.5	1.4	No	No	No	No	Yes	No	No	Yes	No	No	No	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No	
2	STW 27	17	30	12.0	2	102	0.5	51.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	Yes	No	Yes	No	No	No	No	No	No	No	
2	STW 52-0	17	540	0.7	2	6	0.5	2.8	No	No	No	No	No	Yes	No	Yes	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
2	STW 52-10	17	540	0.7	4	3	0.5	1.4	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	Yes	
2	STW 52-11	17	540	0.7	4	3	0.5	1.4	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
2	STW 52-12	17	540	0.7	4	3	0.5	1.4	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
2	STW 52-13	17	540	0.7	4	3	0.5	1.4	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	Yes	No	
2	STW 52-14	17	540	0.7	4	3	0.5	1.4	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	
2	STW 52-15	17	540	0.7	8	1	0.5	0.7	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	Yes	No	
2	STW 52-16	17	540	0.7	8	1	0.5	0.7	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	No	Yes	Yes	No	No	No	No	Yes	No	
2	STW 52-9	17	540	0.7	2	6	0.5	2.8	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
3	AAW 03	17	30	12.0	2	102	0.5	51.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
3	AAW 08	17	30	12.0	2	102	2.5	255.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
3	AMW 01	17	60	6.0	2	51	0.5	25.5	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
3	STW 02	17	30	12.0	2	102	1.5	153.0	No	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
3	STW 08	17	180	2.0	2	17	0.3	5.1	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	STW 09	17	90	4.0	2	34	0.3	10.2	No	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	
3	STW 22	17	120	3.0	2	26	0.3	7.7	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	
3	STW 24	17	60	6.0	2	51	0.5	25.5	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
3	STW 28	17	90	4.0	2	34	0.3	10.2	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	
3	STW 29	17	90	4.0	2	34	0.3	10.2	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
3	STW 30	17	90	4.0	2	34	0.3	10.2	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
3	STW 33	17	540	0.7	2	6	0.5	2.8	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	
4	AAW 04	17	60	6.0	2	51	0.5	25.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 05	17	60	6.0	2	51	0.5	25.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	AAW 06	17	60	6.0	2	51	0.5	25.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
4	STW 04	17	30	12.0	2	102	1.5	153.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
4	STW 05	17	90	4.0	2	34	0.5	17.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	
4	STW 07	17	90	4.0	2	34	1.5	51.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
4	STW 31	17	180	2.0	2	17	0.3	5.1	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	
4	STW 35	17	360	1.0	2	9	0.5	4.3	No	No	No	No	Yes	No	No	Yes	No	No	No	Yes	No	Yes	No	Yes	No	No	No	No	Yes	No	No	1225.7

Table H-8

H-46 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	FSO 13	25	360	1.0	1	25	0.5	12.5	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	12.5

Table H-9

MH-53 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	MOB 15	20	365	1.0	1	20	1.5	29.6	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	MOB 13	20	180	2.0	1	40	1.5	60.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	89.6

Table H-10

P-3 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
3	ASU 1	12	120	3.0	1	36	4.0	144.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	144.0

Table H-11

S-3 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	C2W 7	17	360	1.0	1	17	0.5	8.5	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	ASU 16	17	360	1.0	1	17	0.5	8.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No	No	No	
2	C2W 5	17	120	3.0	1	51	0.2	10.2	No	No	No	Yes	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	ASU 5	17	90	4.0	1	68	0.5	34.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
4	ASU 6	17	90	4.0	1	68	0.5	34.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
4	ASU 7	17	90	4.0	1	68	0.5	34.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
4	ASU 8	17	90	4.0	1	68	0.2	13.6	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
4	ASU 9	17	90	4.0	1	68	0.5	34.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
4	ASU 10	17	90	4.0	1	68	0.5	34.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
4	ASU 11	17	270	1.3	1	23	0.5	11.3	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	
4	ASU 12	17	270	1.3	1	23	0.3	6.8	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	
4	C2W 1	17	90	4.0	1	68	0.5	34.0	No	No	No	Yes	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	262.9

Table H-12

SH-60B Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	ASU 20	12	360	1.0	1	12	0.8	9.6	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	ASU 8	12	360	2.0	1	24	1.5	36.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	No	45.6

Table H-13

SH-60F/HH-60 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
2	NSW 4	10	180	2.0	1	20	1.5	30.0	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	
2	NSW 5	10	120	2.0	1	20	1.5	30.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	FSO 6	10	90	4.0	1	40	0.8	32.0	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
3	NSW 1	10	90	4.0	1	40	1.5	60.0	No	No	No	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	
3	STW 8	10	90	4.0	1	40	0.8	32.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	
3	STW 9	10	180	2.0	1	20	1.5	30.0	No	No	No	Yes	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	STW 10	10	360	1.0	1	10	2.5	25.0	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	Yes	
4	STW 1	10	45	8.0	1	80	0.5	40.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 2	10	45	8.0	1	80	0.5	40.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	STW 3	10	45	8.0	1	80	0.5	40.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 4	10	45	8.0	1	80	0.5	40.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	STW 5	10	45	8.0	2	40	1.0	40.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	STW 6	10	45	8.0	2	40	1.5	60.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	STW 7	10	45	8.0	1	80	1.5	120.0	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes	619.0

Table H-14

UH-3 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	FSO 8	2	360	1.0	1	2	1.5	3.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	3.0

Table H-15

UAV Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AMW 2	6	180	2.0	1	12.0	1.0	12.0	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	INT 6	6	180	2.0	1	12.0	0.5	6.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	ASU 1	6	360	1.0	1	6.0	1.0	6.0	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
2	INT 5	6	360	1.0	1	6.0	0.5	3.0	No	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	INT 3	6	90	4.0	1	24.0	1.0	24.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	51.0

Table H-16

AH-1W Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AHC 340	22	360	1.0	2	11	1.5	16.5	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	
1	ANSQ 311	22	360	1.0	1	22	1.5	33.0	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	ANSQ 312	22	360	1.0	2	11	1.0	11.0	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	ANSQ 313	22	360	1.0	2	11	1.5	16.5	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	
1	ANSQ 314	22	180	2.0	2	22	1.5	33.0	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	
1	DL 372	22	360	1.0	3	7	1.0	7.3	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	
1	EW 301	22	1080	0.3	1	7	1.0	7.3	No	No	Yes	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	FAC 350	22	360	1.0	2	11	1.0	11.0	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	
1	FAC 351	22	360	1.0	2	11	1.0	11.0	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	
1	FAC 352	22	360	1.0	2	11	1.0	11.0	No	No	No	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	Yes	
1	FAC 353	22	360	1.0	2	11	1.0	11.0	No	No	No	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	
1	OAS 321	22	360	1.0	2	11	1.5	16.5	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	
1	OAS 322	22	1080	0.3	2	4	1.0	3.7	No	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No	Yes	
1	OAS 323	22	180	2.0	2	22	1.5	33.0	No	No	Yes	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	
1	OAS 324	22	180	2.0	2	22	1.5	33.0	No	No	No	Yes	No	Yes	Yes	No	Yes	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No	No	
1	OAS 325	22	180	2.0	2	22	1.5	33.0	No	No	No	Yes	No	Yes	Yes	No	Yes	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No	No	
1	SL 362	22	360	1.0	2	11	1.0	11.0	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	
3	CAS 251	22	360	1.0	2	11	1.5	16.5	No	Yes	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	
3	REC 221	22	360	1.0	2	11	1.0	11.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	CAS 252	22	360	1.0	2	11	1.5	16.5	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes	
3	CRX 271	22	360	1.0	2	11	1.5	16.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	
3	ESC 240	22	360	1.0	2	11	1.0	11.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	ESC 241	22	360	1.0	2	11	1.0	11.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	ESC 242	22	360	1.0	2	11	1.0	11.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	FAC 260	22	360	1.0	1	22	1.0	22.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	FAC 261	22	360	1.0	1	22	1.0	22.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	
3	SWD 231	22	360	1.0	2	11	1.0	11.0	No	No	No	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	No	No	No	No	
3	SWD 232	22	360	1.0	2	11	1.0	11.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	Yes	No	No	Yes	Yes	No	No	No	No	No	No	
3	SWD 234	22	360	1.0	2	11	1.0	11.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	
4	AG 161	22	360	1.0	2	11	0.5	5.5	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
4	AG 163	22	360	1.0	2	11	1.0	11.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	
4	AG 164	22	360	1.0	2	11	1.0	11.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	
4	TAC 170	22	360	1.0	2	11	1.5	16.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	TERF 140	22	360	1.0	1	22	1.0	22.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	TERF 141	22	360	1.0	1	22	1.0	22.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	TERF 142	22	360	1.0	1	22	1.5	33.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	590.3

Table H-17

AV-8B Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AA 330	25	360	1.0	2	13	0.8	10.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	AA 331	25	90	4.0	2	50	0.8	40.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	AA 332	25	90	4.0	2	50	0.8	40.0	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	AA 333	25	90	4.0	2	50	0.8	40.0	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	AA 341	25	90	4.0	1	100	0.8	80.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	AA 342	25	90	4.0	2	50	0.8	40.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	ESC 320	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
1	OAS 310	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
1	OAS 311	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	
1	OAS 312	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
1	OAS 313	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	Yes	No	Yes	Yes	No	No	Yes	No	No	No	
1	OAS 314	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
1	OAS 315	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	
1	OAS 316	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes	
1	OAS 350	25	90	4.0	4	25	0.5	12.5	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	No	
1	OAS 351	25	90	4.0	4	25	0.5	12.5	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
1	OAS 352	25	90	4.0	4	25	0.5	12.5	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	
1	OAS 353	25	90	4.0	4	25	0.5	12.5	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
1	OAS 354	25	90	4.0	4	25	0.5	12.5	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes	
3	AA 264	25	360	1.0	2	13	0.8	10.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	AA 265	25	360	1.0	2	13	0.8	10.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	AA 266	25	360	1.0	2	13	0.8	10.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	AA 267	25	90	4.0	1	100	0.8	80.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	AA 268	25	90	4.0	2	50	0.8	40.0	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	AA 269	25	90	4.0	2	50	0.8	40.0	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	AG 215	25	360	1.0	2	13	0.5	6.3	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
3	AG 216	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
3	AG 217	25	90	4.0	1	100	0.5	50.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	AG 218	25	360	1.0	2	13	0.5	6.3	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	Yes	No	No	Yes	No	No	Yes	
3	AG 219	25	90	4.0	2	50	0.5	25.0	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	Yes	No	No	Yes	No	No	Yes	
3	ESC 242	25	90	4.0	2	50	0.5	25.0	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	
3	EW 229	25	90	4.0	2	50	0.5	25.0	Yes	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	LAT 224	25	360	1.0	2	13	0.5	6.3	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	LAT 226	25	90	4.0	2	50	0.5	25.0	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
3	NS 280	25	360	1.0	2	13	0.5	6.3	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	
3	NS 281	25	90	4.0	2	50	0.5	25.0	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	
3	NS 282	25	90	4.0	2	50	0.5	25.0	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	
3	NS 283	25	90	4.0	2	50	0.5	25.0	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes	
3	NS 284	25	360	1.0	2	13	0.5	6.3	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
3	NS 285	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
3	OAS 236	25	90	4.0	2	50	0.5	25.0	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
3	OAS 237	25	90	4.0	2	50	0.5	25.0	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	

Table H-18

CH-46 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AG 321	14	360	1.0	1	14	1.0	14.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes	
1	DM 341	14	360	1.0	2	7	1.0	7.0	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	
1	EW 331	14	360	1.0	1	14	1.0	14.0	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	HIE 362	14	360	1.0	1	14	0.8	11.2	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	MAT 351	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	NVG 311	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	NVG 313	14	360	1.0	3	5	1.0	4.7	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	NVG 314	14	360	1.0	2	7	1.0	7.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	TAC 371	14	360	1.0	2	7	1.0	7.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	TAC 372	14	360	1.0	2	7	1.0	7.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	TAC 374	14	360	1.0	2	7	1.0	7.0	No	No	Yes	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	TAC 375	14	360	1.0	2	7	1.0	7.0	No	No	Yes	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	AG 281	14	360	1.0	1	14	1.0	14.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	
3	CAL 211	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	CAL 212	14	360	1.0	2	7	1.0	7.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	CAL 213	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	EXT 221	14	360	1.0	1	14	1.5	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	NVG 251	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	NVG 252	14	360	1.0	2	7	1.0	7.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	NVG 253	14	360	1.0	2	7	1.0	7.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	NVG 254	14	360	1.0	3	5	1.0	4.7	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	NVG 255	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	NVG 256	14	360	1.0	2	7	1.0	7.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	NVG 257	14	360	1.0	2	7	1.0	7.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	CAL 142	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	NAV 133	14	360	1.0	1	14	1.0	14.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	258.5

Table H-19

CH-53 Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AR 360	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	AR 361	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	AR 362	19	180	2.0	1	38	1.0	38.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	CAL 320	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	CAL 321	19	180	2.0	2	19	1.5	28.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	DM 350	19	360	1.0	2	10	1.5	14.3	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	EXT 341	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	EXT 342	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	EXT 343	19	180	2.0	1	38	1.5	57.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	TAC 380	19	360	1.0	2	10	1.5	14.3	No	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
1	TAC 381	19	360	1.0	2	10	1.5	14.3	No	No	Yes	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	
1	TERF 330	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	TERF 331	19	180	2.0	2	19	1.5	28.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	CAL 220	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	CAL 222	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	CAL 223	19	180	2.0	2	19	1.5	28.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	EXT 240	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	EXT 241	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	EXT 242	19	180	2.0	1	38	1.0	38.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	TAC 280	19	360	1.0	2	10	1.5	14.3	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	TAC 281	19	360	1.0	2	10	1.5	14.3	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	TERF 230	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	TERF 231	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	TERF 232	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	TERF 233	19	360	1.0	1	19	1.5	28.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	TERF 234	19	180	2.0	2	19	1.5	28.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	CAL 161	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	CAL 162	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	CAL 163	19	360	1.0	1	19	1.5	28.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	TERF 180	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	TERF 181	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	679.3

Table H-20

EA-6B (Marines) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AR 300	21	360	1.0	1	21	1.0	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	DAS 350	21	360	1.0	2	11	1.0	10.5	No	No	Yes	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	DAS 351	21	360	1.0	2	11	1.0	10.5	No	No	Yes	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	DEFTAC 310	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	DEFTAC 311	21	360	1.0	1	21	1.0	21.0	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	DEFTAC 312	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	DEFTAC 313	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	ES 340	21	360	1.0	2	11	1.0	10.5	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	ES 341	21	360	1.0	2	11	1.0	10.5	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	FP 370	21	360	1.0	1	21	1.0	21.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	LAT 321	21	360	1.0	1	21	1.0	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	LAT 322	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	LAT 323	21	180	2.0	2	21	1.0	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	RSEAD 362	21	180	2.0	1	42	1.0	42.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	RSEAD 363	21	180	2.0	1	42	1.0	42.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	RSEAD 364	21	360	1.0	1	21	1.0	21.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	RSEAD 365	21	360	1.0	1	21	1.0	21.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	AR 206	21	360	1.0	1	21	1.0	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	DAS 253	21	180	2.0	2	21	1.0	21.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	DAS 254	21	180	2.0	2	21	1.0	21.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	ES 242	21	360	1.0	1	21	1.0	21.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	ES 243	21	360	1.0	1	21	1.0	21.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	FAM 211	21	180	2.0	1	42	1.0	42.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	FEP 272	21	360	1.0	1	21	1.0	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	FORM 220	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	FORM 221	21	180	2.0	2	21	1.0	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	HARM 233	21	90	4.0	1	84	1.0	84.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	HARM 234	21	90	4.0	1	84	1.0	84.0	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	RSEAD 262	21	180	2.0	1	42	1.0	42.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	RSEAD 263	21	180	2.0	1	42	1.0	42.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	ACM 146	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	ACM 147	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	ACM 148	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	ACM 149	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	AR 144	21	360	1.0	2	11	2.0	21.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	AR 145	21	360	1.0	2	11	1.0	10.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	EW 174	21	360	1.0	1	21	2.0	42.0	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	EW 175	21	360	1.0	1	21	2.0	42.0	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	EW 176	21	360	1.0	1	21	2.0	42.0	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	EW 177	21	360	1.0	1	21	2.0	42.0	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	EW 178	21	360	1.0	1	21	2.0	42.0	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	1008.0

Table H-21
F/A-18 (Marines) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each E	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapo	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Fligh	Range Time at Night	Total Platform Overland Range Hours
1	AA 310	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 311	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 312	19	180	2.0	2	19	1.0	19.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 313	19	180	2.0	2	19	1.0	19.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 314	19	180	2.0	2	19	1.0	19.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 315	19	90	4.0	2	38	0.8	30.4	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 316	19	360	1.0	4	5	1.0	4.8	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	
1	AA 317	19	180	2.0	4	10	1.0	9.5	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 318	19	180	2.0	4	10	1.0	9.5	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 319	19	180	2.0	2	19	1.0	19.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 320	19	360	1.0	2	10	1.0	9.5	No	Yes	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AA 321	19	90	4.0	4	19	1.0	19.0	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	AS 330	19	180	2.0	1	38	1.0	38.0	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes	Yes	No	No	Yes	No	No	Yes	
1	AS 331	19	360	1.0	1	19	1.0	19.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
1	AS 332	19	180	2.0	2	19	1.0	19.0	No	No	No	No	No	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes	No	No	Yes	No	No	Yes	
1	AS 333	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
1	ASWD 360	19	360	1.0	1	19	0.5	9.5	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	
1	ASWD 361	19	360	1.0	1	19	0.5	9.5	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No	No	
1	ASWD 362	19	1080	0.3	2	3	1.0	3.2	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	
1	CACC 390	19	180	2.0	1	38	1.0	38.0	Yes	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	
1	CACC 391	19	360	1.0	1	19	1.0	19.0	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	
1	CACC 392	19	360	1.0	1	19	1.0	19.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	CACC 393	19	360	1.0	1	19	1.0	19.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	CACC 394	19	360	1.0	1	19	1.0	19.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	
1	CACC 395	19	180	2.0	1	38	1.0	38.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	
1	CACC 396	19	60	6.0	1	114	1.0	114.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	
1	CACC 397	19	360	1.0	1	19	1.0	19.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	
1	CACC 398	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	CACC 399	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	CAS 340	19	180	2.0	2	19	1.0	19.0	No	Yes	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	Yes	No	Yes	
1	CAS 341	19	180	2.0	2	19	1.0	19.0	No	No	Yes	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	Yes	No	Yes	
1	DAS 350	19	180	2.0	2	19	1.0	19.0	No	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	Yes	No	Yes	
1	DAS 351	19	180	2.0	4	10	1.0	9.5	No	No	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
1	DAS 352	19	180	2.0	4	10	1.0	9.5	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes	
1	LAT 308	19	360	1.0	2	10	0.8	7.6	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	LAT 309	19	180	2.0	2	19	0.8	15.2	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	NS 380	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	NS 381	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	
1	NS 382	19	360	1.0	1	19	1.0	19.0	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
1	NS 383	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
1	NS 384	19	360	1.0	2	10	1.0	9.5	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	

Table H-22

UH-1N Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Refiles/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
1	AG 370	12	180	2.0	1	24	1.0	24.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
1	AG 371	12	180	2.0	2	12	1.0	12.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	
1	ANSQ 310	12	180	2.0	1	24	1.5	36.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	ANSQ 311	12	180	2.0	2	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	ANSQ 312	12	180	2.0	2	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	DM 350	12	360	1.0	2	6	0.8	4.8	No	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	DM 351	12	360	1.0	1	12	0.8	9.6	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	ESC 340	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	
1	ESC 341	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	
1	FAC 360	12	360	1.0	2	6	1.5	9.0	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	
1	FAC 361	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	
1	FAC 362	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	
1	HIE 320	12	360	1.0	1	12	0.5	6.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
1	HIE 321	12	360	1.0	1	12	0.5	6.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	TAC 380	12	180	2.0	1	24	1.0	24.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
1	TAC 381	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	
1	TAC 382	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	
3	AG 231	12	180	2.0	1	24	1.0	24.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	No	
3	AG 232	12	180	2.0	1	24	1.0	24.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	
3	AG 233	12	180	2.0	2	12	1.0	12.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	
3	AG 234	12	180	2.0	2	12	1.0	12.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	
3	CAL 200	12	360	1.0	2	6	1.0	6.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	CAL 201	12	360	1.0	1	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	ESC 250	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	
3	ESC 251	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	Yes	
3	EW 241	12	360	1.0	1	12	1.0	12.0	No	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	FAC 281	12	360	1.0	1	12	1.0	12.0	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	FAC 282	12	360	1.0	1	12	1.0	12.0	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	
3	NS 271	12	180	2.0	1	24	1.0	24.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	TAC 290	12	180	2.0	2	12	1.0	12.0	No	No	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	
3	TAC 291	12	180	2.0	2	12	1.0	12.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes	
3	TNAV 220	12	360	1.0	1	12	1.5	18.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
3	TNAV 221	12	360	1.0	2	6	1.5	9.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
3	TNAV 222	12	180	2.0	2	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	AG 161	12	360	1.0	2	6	1.0	6.0	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	
4	CAL 170	12	360	1.0	1	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	CAL 171	12	360	1.0	1	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	CAL 172	12	360	1.0	1	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	
4	TERF 140	12	360	1.0	1	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
4	TERF 141	12	360	1.0	1	12	1.0	12.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	482.4

Table H-23

T-45 (CNATRA) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
	S-1	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	S-2	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	S-3	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	S-4	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	S-5	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	S-6	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	S-7	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	S-8	301	360	1.0	2	151	0.8	120.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	I-1	36	360	1.0	2	18	0.8	14.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	I-2	36	360	1.0	2	18	0.8	14.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	I-3	36	360	1.0	2	18	0.8	14.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
	I-4	36	360	1.0	2	18	0.8	14.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	1020.8

Table H-24

F-14 (FRS) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
F	SXBF 010	45	360	1.0	2	23	1.0	22.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	SXBF 020	120	360	1.0	2	60	1.0	60.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	SXBF 030	120	360	1.0	2	60	1.0	60.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	SXBF 040	90	360	1.0	2	45	1.0	45.0	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
F	SXBF 050	150	360	1.0	2	75	1.0	75.0	Yes	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
F	SXBF 060	90	360	1.0	2	45	0.5	22.5	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
F	SXBF 070	150	360	1.0	2	75	1.25	93.8	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	
F	SXBF 080	90	360	1.0	2	45	1.25	56.3	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
F	SXBF 090	150	360	1.0	2	75	1.25	93.8	No	No	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	
F	SXBF 100	150	360	1.0	2	75	0.5	37.5	No	No	Yes	No	No	Yes	Yes	No	Yes	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	528.8

Table H-25

F/A 18 A-B-C-D (FRS) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
F	FSTK 181	151	360	1.0	3	50	1.2	60.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
F	FSTK 182	167	360	1.0	3	56	1.0	55.7	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 183	137	360	1.0	3	46	1.0	45.7	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 184	137	360	1.0	3	46	1.0	45.7	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 185	151	360	1.0	3	50	1.2	60.4	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
F	FSTK 186	151	360	1.0	3	50	1.0	50.3	No	No	No	No	Yes	No	No	No	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 187	137	360	1.0	3	46	1.0	45.7	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 188	167	360	1.0	3	56	1.0	55.7	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 189	151	360	1.0	2	76	1.0	75.5	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 190	151	360	1.0	3	50	1.0	50.3	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	
F	FSTK 192	153	360	1.0	3	51	1.0	51.0	No	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 193	151	360	1.0	2	76	1.0	75.5	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 280	167	360	1.0	3	56	1.2	66.8	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
F	FSTK 281	137	360	1.0	3	46	1.2	54.8	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
F	FSTK 282	137	360	1.0	3	46	1.2	54.8	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	Yes	No	No	
F	FSTK 283	151	360	1.0	4	38	1.2	45.3	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	FSTK 284	137	360	1.0	1	137	1.0	137.0	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
F	FSTK 285	137	360	1.0	1	137	1.0	137.0	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
F	FSTK 314	27	360	1.0	1	27	1.0	27.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes	No	No	No	No	No	Yes	
F	FSTK 321	27	360	1.0	1	27	1.0	27.0	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
F	FSTK 322	27	360	1.0	1	27	1.0	27.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes	No	No	Yes	No	No	No	
F	FSTK 323	27	360	1.0	1	27	1.0	27.0	No	No	No	No	No	No	No	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes	No	No	Yes	No	No	No	
F	FSTK 325	27	360	1.0	1	27	1.0	27.0	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	
F	FSTK 326	27	360	1.0	1	27	1.0	27.0	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	Yes	1302.5

Table H-26

S-3B (FRS) Range Facility Demands

T Level	T&R Event	Completion Factor	Currency Period L1	No. of Reflies/Repeats for each event	Number of Aircraft/Event	Total Requirement for each Event	Time on Range	Total Range Time Overland	Range Time EW 1	Range Time EW 2	Range Time EW 3	Range Time EW 4	Range Time Live Ordnance	Range Time Chaff	Range Time Flare	Range Time High Altitude	Range Time TACTS	Range Time A-G Guns	Range Time A-A Guns	Range Time Stand-off Weapons	Range Time A to G Missile	Range Time PGM Bomb	Range Time A-A Missiles	Range Time Laser	Range Time Scored	Range Time Cluster Weapons	Range Time A to G Rocket	Range Time Practice Bomb	Range Time GP Bomb	Range Time Supersonic Flight	Range Time at Night	Total Platform Overland Range Hours
F	ORD-1	151	360	1.0	2	76	1.0	75.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	ORD-2	151	360	1.0	2	76	1.0	75.5	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	
F	ORD-3	151	360	1.0	2	76	1.0	75.5	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	Yes	No	No	
F	T-3	151	360	1.0	2	76	1.25	94.4	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	226.5

Appendix I

Straightline Distance Between DoN Airfields and DOD Ranges

APPENDIX I

STRAIGHTLINE DISTANCE BETWEEN DoN AIRFIELDS AND DOD RANGES

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Arizona	MCAS Yuma	El Centro Complex Yuma Complex - Goldwater Yuma Complex - Choc. Mtn	Camp Pendleton Twentynine Palms Complex	Gulf of Mexico Complex SHOBA	China Lake Complex Pt. Mugu Sea Range		AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex FRTC Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex
California	MCB Camp Pendleton	El Centro Complex Pt. Mugu Sea Range	China Lake Complex Yuma Complex - Goldwater Yuma Complex - Choc. Mtn			FRTC	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex
	NAF El Centro Complex	Yuma Complex - Goldwater Yuma Complex - Choc. Mtn	Camp Pendleton Pt. Mugu Sea Range SHOBA Twentynine Palms Complex	China Lake Complex		FRTC	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex
	NAS Lemoore		China Lake Complex Pt. Mugu Sea Range	Camp Pendleton FRTC SHOBA Twentynine Palms Complex	El Centro Complex Yuma Complex – Choc. Mtn	Yuma Complex - Goldwater	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
California (continued)	MCAS Miramar	Camp Pendleton El Centro Complex SHOBA	China Lake Complex Pt. Mugu Sea Range Twentynine Palms Complex Yuma Complex – Goldwater Yuma Complex – Choc. Mtn			FRTC	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex
	NAS North Island	Camp Pendleton El Centro Complex SHOBA	China Lake Complex Pt. Mugu Sea Range Twentynine Palms Complex Yuma Complex – Goldwater Yuma Complex – Choc. Mtn			FRTC	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex
	NAS Pt. Mugu	SHOBA	Camp Pendleton El Centro Complex Twentynine Palms Complex	China Lake Complex Yuma Complex – Goldwater Yuma Complex – Choc. Mtn		FRTC	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex
	MCAGCC Twentynine Palms	Camp Pendleton Yuma Complex – Choc. Mtn	China Lake Complex El Centro Complex Pt. Mugu Sea Range SHOBA Yuma Complex – Goldwater		FRTC		AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex NSWTF Boardman Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Florida	NAS Jacksonville		Townsend Range			Camp Lejeune Complex Cherry Point Complex Meridian Complex	AFWTF Inner Range Bloodsworth Island Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Twentynine Palms Complex VACAPES Complex Yuma Complex
	NAS Key West				Jacksonville Complex		AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Meridian Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Townsend Range Twentynine Palms Complex VACAPES Complex Yuma Complex
	NAS Mayport	Jacksonville Complex	Townsend Range			Camp Lejeune Complex Cherry Point Complex Meridian Complex	AFWTF Inner Range Bloodsworth Island Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Twentynine Palms Complex VACAPES Complex Yuma Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Florida (continued)	NAS Whiting Field			Meridian Complex	Townsend Range Jacksonville Complex	Gulf of Mexico Complex	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Twentynine Palms Complex VACAPES Complex Yuma Complex
Georgia	NAS Atlanta		Meridian Complex Townsend Range	Meridian Complex	Jacksonville Complex	Camp Lejeune Complex Cherry Point Complex	AFWTF Inner Range Bloodsworth Island Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Twentynine Palms Complex VACAPES Complex Yuma Complex
Louisiana	NAS JRB New Orleans			Meridian Complex			AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Townsend Range Twentynine Palms Complex VACAPES Complex Yuma Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Maryland	NAF Washington, DC	Bloodsworth Island Patuxent River Complex Quantico Complex		Camp Lejeune Complex Cherry Point Complex VACAPES Complex			AFWTF Inner Range Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Range Meridian Complex NWSTF Boardman Pt. Mugu Sea Range SHOBA Townsend Range Twentynine Palms Complex Yuma Complex
Maine	NAS Brunswick						AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Townsend Range Twentynine Palms Complex VACAPES Complex Yuma Complex
Mississippi	NAS Meridian	Searay				Townsend Range Jacksonville Complex	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Twentynine Palms Complex VACAPES Complex Yuma Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Nevada	NAS Fallon				Twentynine Palms Complex	Camp Pendleton China Lake Complex El Centro Complex NWSTF Boardman Pt. Mugu Sea Range SHOBA Yuma Complex – Choc. Mtn	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Cherry Point Complex Gulf of Mexico Complex Jacksonville Complex Meridian Complex Patuxent River Complex Quantico Complex Townsend Range VACAPES Complex Yuma Complex – Goldwater
North Carolina	MCAS Cherry Point	Cherry Point Complex Camp Lejeune Complex VACAPES Complex	Patuxent River Complex (R-6609)	Bloodsworth Island Patuxent River Complex (R-4005) Quantico Complex	Townsend Range	Jacksonville Complex	AFWTF Inner Range Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Meridian Complex NWSTF Boardman Pt. Mugu Sea Range SHOBA Twentynine Palms Complex Yuma Complex
	MCAS New River	Cherry Point Complex Camp Lejeune Complex VACAPES Complex		Bloodsworth Island Patuxent River Complex Quantico Complex Townsend Range		Jacksonville Complex	AFWTF Inner Range Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Meridian Complex NWSTF Boardman Pt. Mugu Sea Range SHOBA Twentynine Palms Complex Yuma Complex
Pennsylvania	NAS JRB Willow Grove		Bloodsworth Island Patuxent River Complex Quantico Complex		Camp Lejeune Complex Cherry Point Complex VACAPES Complex		AFWTF Inner Range Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex NWSTF Boardman Pt. Mugu Sea Range SHOBA Townsend Range Twentynine Palms Complex Yuma Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
South Carolina	MCAS Beaufort	Townsend Range		Camp Lejeune Complex Cherry Point Complex Jacksonville Complex	VACAPES Complex	Bloodsworth Island Patuxent River Complex	AFWTF Inner Range Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Meridian Complex NWSTF Boardman Pt. Mugu Sea Range Quantico Complex SHOBA Twentynine Palms Complex Yuma Complex
Texas	NAS Corpus Christi and NAS Kingsville	Gulf of Mexico Complex					AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Jacksonville Complex Meridian Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Complex Townsend Range Twentynine Palms VACAPES Complex Yuma Complex
	NAS JRB Ft. Worth				Gulf of Mexico Complex	Meridian Complex	AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Jacksonville Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Complex Townsend Range Twentynine Palms VACAPES Complex Yuma Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Virginia	NAS Oceana	Bloodsworth Island Patuxent River Complex VACAPES Complex	Camp Lejeune Complex Cherry Point Complex Quantico Complex			Townsend Range	AFWTF Inner Range Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex NWSTF Boardman Pt. Mugu Sea Range SHOBA Twentynine Palms Complex Yuma Complex
	MCAF Quantico	Bloodsworth Island Patuxent River Complex		Camp Lejeune Complex Cherry Point Complex VACAPES Complex		Townsend Range	AFWTF Inner Range Camp Pendleton China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex NWSTF Boardman Pt. Mugu Sea Range SHOBA Twentynine Palms Complex Yuma Complex
Washington	NAS Whidbey Island			Boardman Range			AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Complex Townsend Range Twentynine Palms Complex VACAPES Complex Yuma Complex

Straightline Distances Between Navy and Marine Corps Airfields and Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Navy/USMC Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Puerto Rico	NAS Roosevelt Roads	AFWTF Inner Range					Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Complex Townsend Range Twentynine Palms Complex VACAPES Complex Yuma Complex
Cuba	NS Guantanamo Bay						AFWTF Inner Range Bloodsworth Island Camp Lejeune Complex Camp Pendleton Cherry Point Complex China Lake Complex El Centro Complex FRTC Gulf of Mexico Complex Jacksonville Complex Meridian Complex NWSTF Boardman Patuxent River Complex Pt. Mugu Sea Range Quantico Complex SHOBA Complex Townsend Range Twentynine Palms Complex VACAPES Complex Yuma Complex

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Arizona	MCAS Yuma	AF Goldwater Range		Nellis Air Warfare Center		Holloman ECR McGregor Range Utah TTR	AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Homestead CMA Mountain Home ECR Melrose ECR - Cannon AFB Poinsett ER - Shaw AFB Tyndall ACMA
California	MCB Camp Pendleton			AF Goldwater Range Nellis Air Warfare Center			AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
	NAF El Centro		AF Goldwater Range	Nellis Air Warfare Center			AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co. ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
California (continued)	NAS Lemoore			Nellis Air Warfare Center		AF Goldwater Range Mountain Home ECR Utah TTR	AF DTC - Eglin AFB Alaska ACMA Avon Park Bombing Range Homestead CMA Tyndall ACMA Gulfport CRTC Alpena CRTC Dare Co ECR Holloman ECR McGregor Range Melrose ECR - Cannon AFB Poinsett ER - Shaw AFB Hardwood Range
	MCAS Miramar			AF Goldwater Range Nellis Air Warfare Center			AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co. ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA Melrose ECR - Cannon AFB Mountain Home ECR Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
	NAS North Island			AF Goldwater Range Nellis Air Warfare Center			AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co. ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
California (continued)	NAS Pt. Mugu				AF Goldwater Range Nellis Air Warfare Center		AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
	MCAGCC Twentynine Palms		Nellis Air Warfare Center	AF Goldwater Range		Utah TTR	AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Poinsett ER - Shaw AFB Tyndall ACMA
Florida	NAS Jacksonville	Avon Park Bombing Range		Poinsett ER - Shaw AFB	AF DTC - Eglin AFB Tyndall ACMA	Gulfport CRTC Homestead CMA	AF Goldwater Range Alaska ACMA Alpena CRTC Dare Co ECR Hardwood Range Holloman ECR McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Florida (continued)	NAS Key West	Homestead CMA		Avon Park Bombing Range AFB			AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
	NAS Mayport	Avon Park Bombing Range		Poinsett ER - Shaw AFB	AF DTC - Eglin AFB Tyndall ACMA	Gulfport CTRC Homestead CMA	AF Goldwater Range Alaska ACMA Alpena CRTC Dare Co ECR Hardwood Range Holloman ECR McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Utah TTR
	NAS Whiting Field	AF DTC - Eglin AFB	Gulfport CRTC		Avon Park Bombing Range Tyndall ACMA	Poinsett ER - Shaw AFB	AF Goldwater Range Alaska ACMA Alpena CRTC Dare Co ECR Hardwood Range Homestead CMA Holloman ECR McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Utah TTR
Georgia	NAS Atlanta			AF DTC - Eglin AFB Poinsett ER - Shaw AFB Tyndall ACMA	Gulfport CRTC	Avon Park Bombing Range Dare Co ECR	AF Goldwater Range Alaska ACMA Alpena CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Louisiana	NAS JRB New Orleans		AF DTC - Eglin AFB Gulfport CRTC Tyndall ACMA				AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Utah TTR
Maryland	NAF Washington, DC			Dare Co ECR	Poinsett ER - Shaw AFB		AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Tyndall ACMA Utah TTR
Maine	NAS Brunswick						AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Mississippi	NAS Meridian	Gulfport CRTC		AF DTC - Eglin AFB Tyndall ACMA		Poinsett ER - Shaw AFB	AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Hardwood Range Holloman ECR Homestead CMA Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Utah TTR
Nevada	NAS Fallon		Nellis Air Warfare Center	Mountain Home ECR Utah TTR			AF Goldwater Range AF DTC - Eglin AFB Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Poinsett ER - Shaw AFB Tyndall ACMA
North Carolina	MCAS Cherry Point	Dare Co ECR		Poinsett ER - Shaw AFB			AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Tyndall ACMA Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
North Carolina (continued)	MCAS New River		Dare Co ECR Poinsett ER - Shaw AFB				AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Tyndall ACMA Utah TTR
Pennsylvania	NAS JRB Willow Grove				Dare Co ECR		AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
South Carolina	MCAS Beaufort		Poinsett ER - Shaw AFB		Avon Park Bombing Range Dare Co ECR	AF DTC - Eglin AFB Tyndall ACMA	AF Goldwater Range Alaska ACMA Alpena CRTC Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Texas	NAS Corpus Christi						AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
	NAS Kingsville						AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
	NAS JRB Ft. Worth					Gulfport CRTC	AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Tyndall ACMA Nellis Air Warfare Center Poinsett ER - Shaw AFB Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Virginia	NAS Oceana	Dare Co ECR			Poinsett ER - Shaw AFB		AF DTC - Eglin AFB AF Goldwater Range Alpena CRTC Alaska ACMA Avon Park Bombing Range Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Tyndall ACMA Utah TTR
	MCAF Quantico			Dare Co ECR	Poinsett ER - Shaw AFB		AF DTC - Eglin AFB AF Goldwater Range Alpena CRTC Alaska ACMA Avon Park Bombing Range Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Tyndall ACMA Utah TTR
Washington	NAS Whidbey Island					Mountain Home ECR	AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR

Straightline Distances Between Navy and USMC Airfields and Air Force/Army Ranges

Navy/Marine Corps Fleet and Reserve Airfields		Distance Between Airfield and Air Force/Army Ranges (nm)					
		0-100	101-200	201-300	301-400	401-500	Greater than 500
Puerto Rico	NAS Roosevelt Roads						AF DTC - Eglin AFB AF Goldwater Range Alaska ACMA Alpena CRTC Avon Park Bombing Range Gulfport CRTC Dare Co ECR Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR
Cuba	NS Guantanamo Bay						AF DTC - Eglin AFB AF Goldwater Range Alpena CRTC Alaska ACMA Avon Park Bombing Range Dare Co ECR Gulfport CRTC Hardwood Range Holloman ECR Homestead CMA McGregor Range Melrose ECR - Cannon AFB Mountain Home ECR Nellis Air Warfare Center Poinsett ER - Shaw AFB Tyndall ACMA Utah TTR

Notes:

ACM - Air Combat Area
ACMA - Air Combat Maneuver Area
AFB - Air Force Base
CRTC - Combat Training Readiness Center
DTC - Development Test Center
ECR Electronic Combat Range
TTR - Test and Training Range