READY OR NOT

THE MILITARY READINESS PARADOX

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DEDICATION

This book is dedicated to: First and foremost, my wife, Stacy, for her support and patience for the last 38 years. To the countless men and women of the United States Marine Corps who have done amazing things in peace and war and with whom it has been a profound honor to serve both in uniform and in a suit since I first raised my right hand in 1984. To all our servicemembers, civilians, and contractors across the Department of Defense for their dedication to defending our country and to defending our partners, allies, and those in need around the world.

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FOREWORD

Everyone loves military readiness, and no one ever believes it is good enough. Readiness is a sacred cow and buzzword invoked to support whatever position contenders have in debates about defense programs, and thus it is also a source of political controversy, confusion, and gamesmanship. More than laymen realize or professionals like to admit, the problem of high priority and low satisfaction lies in the simplistic conceptions that most people have of how to measure and optimize readiness.

The axiomatic value of readiness was ingrained in policymakers by the history of surprise attacks that highlighted victims' unreadiness. Its importance became constant as the long Cold War faced the United States and its allies with an enemy whose peacetime strength would not allow enough time for the American tradition of slow mobilization to succeed in the event of World War III. When that old Cold War ended and the challenges to American military dominance declined the fixation on readiness relaxed. "Forever wars" were comparatively small and protracted, against weak adversaries, and lent themselves to routinized management.

Now, however, concern with readiness is back, as a new cold war takes shape and conflict with great powers pushes coping with small wars to the back burner. But as with any popular buzzword, the concept begs for clarification if it is to be properly understood, assessed, and achieved. What does readiness mean in concrete terms for a modern force of significant organizational, technological, sociological, and economic complexity in which trade-offs among aspects of capability pose difficult choices for investment and allocation of resources at the margin? Thirty years ago, I wrote a book that tried to tackle such questions (*Military Readiness: Concepts, Choices, Consequences*, 1995). It was an academic exercise in theory and policy assessment on a subject that was high on policymakers' list of priorities but low in the number of detailed analytical treatments. Barrels of ink had regularly been emptied cheering the need for readiness, criticizing political opponents for shortchanging readiness, and justifying preferred procurements and programs as solutions for insufficient readiness. Theoretical discussions of what readiness really means were in much shorter supply. At that time, several years into the post–Cold War era, however, expectations of permanent peace allowed attention to the subject among policymakers to fade. While an article analyzing the state of readiness appeared now and then in military journals, there were few book length or theoretical studies in much depth.

Times change. The priority of readiness is back. With a new cold war developing, it is time again to pin down the problems in defining and evaluating the concept and its application. The issue of readiness is as fraught as ever, with continuities and new complications. First are all the old problems. For example, while drone warfare and other technological and doctrinal innovations make the war in Ukraine different in some ways from past struggles of large armies, timeless problems of infantry attack and defense, logistics, and trade-offs between optimizing current operations and preserving assets for longer term sustainability make judgments about how to manage readiness as demanding as ever. But now, questions that remained unresolved from previous eras are further complicated by:

- The geographic widening of U.S. military involvements. During the old Cold War, military planning was almost all about Europe and Asia, where the most potent challenges to U.S. capabilities for war remain today as well. But now, despite several administrations' attempts to find a way to disengage, the Middle East persists as an equally troublesome area and makes conflicting demands for maximizing or limiting readiness in any of three theaters more tangled than in the old cold war.

- Tension between supporting never-ending limited combat involvements and preparing for war with a major power like China or Russia.
- Organizational change making supply and maintenance of U.S. forces far more dependent on civilian contractors.
- Extreme dependence on systems for command, control, and communication never yet tested in major war—the internet and attendant requirements of cybersecurity.
- Coming challenges bound to be huge but not yet tested or even known from enemy exploitation of burgeoning artificial intelligence.

Many other issues exist. Real complexity means that figuring out obstacles, opportunities, and trade-offs when improving military readiness requires rigorous analysis beyond the bromides that usually characterize discussions of the problem.

Benjamin Hull has produced an impressive work in that vein. I know of no other recent study that comes close to the range, depth, originality, and refinement of this book. He presents the problem in detail and offers ideas and metrics for grappling with it. Like all creative attempts to frame complex questions, his approach will spark discussion and second-guessing.

The buzzword quality of the term readiness reflects both the subject's importance and the tendency of policy debate to obscure and abuse its application. Policymakers are often too busy and jaded to pay attention to wonkish assessments, but the dilemmas in attempts to design perfect military readiness—and guidance for focusing on where the crucial choices between conflicting objectives are—have rarely been well understood. As we enter the second quarter of the twenty-first century, Benjamin Hull's book is the place to start.

Richard K. Betts
Adjunct Senior Fellow at the Council on Foreign Relations

PREFACE

In 2017, I landed my "dream job" at Headquarters United States Marine Corps as the systems section head of the readiness branch. You may ask why that is a dream job for anyone, but I saw it as an opportunity to come on board with an organization embarking on an era of change. I had worked with the predecessor in the job for several years and was familiar with the role, the location, and the various stakeholders. There had been a break of a couple of years where I was fortunate to work with some very bright people on a variety of information technology research and development projects. There was an unusual combination of experiences preparing me for this opportunity. I was a retired reserve Marine officer coupled with a career in transportation that focused on information technology and business analytics. For several years on active duty, I was the project officer that fielded our readiness reporting software. This involved understanding and implementing the low-level details of assessment business rules, external interfaces, data standards, and user interfaces. On day one, the deputy branch head handed me a blue book by Richard Betts on military readiness. I dutifully read it immediately. It was and remains required reading for anyone working in military readiness. This work is not intended to replace, refute, or rebut Betts's book. It was very much a product of the Cold War, published in

1995, and it opened the door on what the post–Cold War might look like while still being deeply influenced by the preceding 40 years. I was a cold warrior myself, so I picked up on what Betts was saying, but my experience in the post-9/11 Global War on Terrorism era pointed me to some unanswered questions. I do feel strongly that it is a product of its time and the subject needs to advance into this century. This new century has upended lots of the old assumptions. I do not wish to throw the proverbial baby out with the bathwater. There is a solid foundation from which to expand.

I do want to discuss the concepts of military readiness both in general and more specifically to the United States and the Department of Defense. The Department of Defense (DOD) represents a significant investment on the part of American taxpayers, and we should engage in a frank discussion of what we are getting for our money. Even as I write this, there are momentous events playing out on the world stage with huge potential impacts for which we do not fully understand all the implications. I will make my best effort to provide a conceptual background, framework, and way ahead as to continue to be useful for the coming decades. I will lay out some practical approaches to avoid philosophical handwringing. Readiness alone is no guarantee of success. However, there are unambiguous, dire consequences for lack of readiness.

The role of data is a defining aspect of the twenty-first century, and that has to be a big part of the evolution of the understanding of military readiness. The ability to generate and access data has exploded. I will explore that space to try to clear up what we can and cannot measure well, where we should do a better job, and how to effectively use the data and turn it into actionable information and insight.[1]

[1] All data presented is notional, unit-level data based on general composition of forces from various nationalities over time. This is necessary to illustrate concepts as actual unit-level readiness data is classified and in general this veil of secrecy can impede the broader understanding and study of this subject. The Chatham House Rule is used when referring to specific interactions with senior leadership. In general, the term *senior leadership* appears throughout and refers to persons who are three- or four-star general or flag officers or presidentially appointed senior executives.

I will also speak about the underlying purpose. Readiness and all the associated information is defined, trained, measured, and studied for a reason. It is not academic or for posterity; we go through this to make better decisions. To have insight into the impacts of decisions and to bring up decision points you did not know about. Senior leadership is in competition for resources and potentially for the survival of the nation and must rapidly make decisions more effectively than their adversaries.

Many of the subjects touched on here could be and are expounded on in many other works great and small. I will touch on a variety of subjects across history, military, sociopolitical, and data science as part of this discussion, not as a comprehensive overview of all these items. Some items for the sake of brevity are mentioned in example and presume some broader knowledge, but I will endeavor to make this work accessible not only to military professionals, civil servants, and contractors working in this field but to any interested party.

During the past few years, we progressively opened the definitions and scope of data used to gain an understanding of readiness. It has been an exciting time to be in the readiness community as we expanded our understanding of readiness. Our work in the Marine Corps was selected by the deputy secretary of defense to be a pilot program for the Department of Defense. Based on our close work with the deputy assistant secretary of defense for force readiness, the deputy endorsed and directed that the work be adopted across the department. Fundamentally, we want to gain a better framework for understanding readiness across a bigger time horizon. Our efforts help our leaders understand the depth and breadth of impacts to readiness when balancing the need to maintain current readiness, modernization for tomorrow's readiness, and be good stewards of taxpayers' money. This has been a massive shift in readiness as "reading the news" or even backward looking to helping shape the planning for future force structure and posture.

After working as the systems section head for three years, I was promoted to be the deputy readiness branch head. It was here as I worked with a succession of very talented Marine colonels that one in particular, Colonel Alison Thompson, mentioned that I should write a book after I provided a lengthy explanation of some readiness concept or another. The suggestion stayed with me, and I began to compile notes. I taught the readiness reporting class to a variety of audiences and participated in a myriad of working groups across DOD on readiness and readiness reporting. From that well, I pulled together what I learned and am attempting to share this with you.

During the middle of this process, I was offered the chance to transfer to the Department of Defense from Headquarters Marine Corps. The job was to take a nascent capability we had put together in the Marine Corps and apply across the department working for the deputy assistant secretary of defense for force readiness. I could not pass up such an opportunity to work with a team of extremely talented people on one of several related initiatives to affect lasting change in areas long overdue. It was not long after the transfer in the fall of 2022 that I completed the first draft of this book. I was very honored to have Dr. Laura J. Junor-Pulzone, former principal deputy under secretary of defense for personnel and readiness and director of the Institute for National Strategic Studies at the National Defense University, review the draft. She graciously read it and provided very constructive feedback.

Her first question was if this work was the history of readiness reporting or advocating for change in readiness reporting. Generally, a book would do one or the other and it may be ambitious to attempt both in one. To that, I responded the primary purpose of advocating change should be obvious, so that is on me to fix. I do want to present enough history to demonstrate that there is depth to the subject and a body of thought, designs, systems, and data generated by this that has value.

While readiness has a specific context in defense, much of what it entails can have broad applicability to any large, complex enterprise.

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I would like to acknowledge the following people for their support, encouragement, and insights who helped me pull this work together.

Colonel John Enoch, USMC (Ret), now retired from government service, was the deputy readiness branch head from when I first worked as the project officer on fielding of the Defense Readiness Reporting System-Marine Corps in 2010 until I took the job when he retired in 2020. His steady leadership and mentorship were invaluable.

Colonel Jason Brown, USMC, was the readiness branch head when I became the deputy, and he took the chance to roll out our first readiness forecast.

Colonel Alison Thompson, USMC, became the readiness branch head after Colonel Brown and embraced the new readiness framework. Her encouragement to pursue this work was the determining factor in making this book happen.

Brigadier General Peter D. Huntley, USMC, was the director of operations during the rollout and evolution of the new readiness framework. His energetic support was crucial in moving this effort from the Marine Corps to the Joint Force in close cooperation with Deputy Assistant Secretary of Defense for Force Readiness Kimberly M. Jackson.

Kimberly Jackson brought me over to her office from Headquarters Marine Corps to take charge of the Readiness Decision Impact Model (RDIM) to pull together the forecasted readiness concepts to the Joint Force.

Lieutenant General George W. Smith, USMC, was the deputy commandant for plans, policies, and operations when we rolled out the forecast and we could not have taken it far without his support.

General David H. Berger, USMC, former Commandant of the Marine Corps, for challenging the readiness community to redefine readiness and his encouragement of our efforts.

Dr. Laura Junor-Pulzone, former director of the Institute for National Strategic Studies at the National Defense University and principal deputy under secretary of defense for personnel and readiness. Her encouragement and feedback on the manuscript were incredibly helpful.

Stacy Hull, dedicated Marine wife who put up with me working on this book during many nights and weekends.

ABBREVIATIONS

ADVANA	advanced analytics
AI	artificial intelligence
APC	armored personnel carrier
ATGM	antitank guided missile
BCT	brigade combat team
BRAC	Base Realignment and Closure
BTGs	battalion tactical groups
D2E	direct to engage
CAX	Combined Arms Exercise
CMC	Commandant of the Marine Corps
COA	course of action
DEPORD	deployment order
DHS	Department of Homeland Security
DMFA	depot maintenance float allowance
DOD	Department of Defense
DRRS	Defense Readiness Reporting System
DSCA	defense support to civil authority
DTM	decision-type memorandum
FMC	fully mission capable

FPV	first-person view
GAO	Government Accountability Office
GFM	Global Force Management
GFMAP	Global Force Management Allocation Plan
GPS	Global Positioning System
GSORTS	Global Status of Readiness and Training System
HA/DR	humanitarian assistance/disaster relief
IDF	Israel Defense Forces
IPT	integrated product team
ISIS	Islamic State of Iraq and Syria
ITX	Integrated Training Exercise
JCA	Joint capability area
JLTV	Joint Light Tactical Vehicle
MBTF	mean time between failure
MCDM	multi-criteria decision making
METs	mission essential tasks
METL	mission essential task list
ML	machine learning
MOS	military occupational specialty
NATO	North Atlantic Treaty Organization
NCO	noncommissioned officer
NDS	National Defense Strategy
NMCM	not mission capable for maintenance
NMCS	not mission capable for supply
NMC	not mission capable
NTC	National Training Center
NSS	*National Security Strategy*
OEF	Operation Enduring Freedom
OFRP	Optimized Fleet Response Plan
OIF	Operation Iraqi Freedom

OPT	optional practical training
PECL	Performance Evaluation Checklist
PMC	partially mission capable
PRC	People's Republic of China
SPEMS	Scaled Performance Evaluation Measurement System
TF	task force
UJTL	Universal Joint Task List

INTRODUCTION

Governments, administrations, and leaders change, and each has a unique set of priorities and strategies. In the U.S. Department of Defense, or any other nation with a significant military investment, the concepts contained here are applicable to understanding the current state of military readiness and how to provide decision support to leadership on the possible trade-offs to meet their priorities and strategies. Oftentimes, events arise that challenge the assumptions of a given strategy or priority. Military readiness is a necessary contribution to the decision calculus. Leaders, military professionals, politicians, and taxpayers want to know if their military is ready to serve its purpose. They have every right to know, so they can make better decisions. The question may sound simple, but the answers can be complex, and the environment is changing both in reaction to our military readiness and also to unrelated but important changes in technology. A nation cannot afford to have an incorrect assessment of their military readiness.

What follows is a book divided into three parts on the subject of military readiness. These parts are concepts, assessments, and challenges. The first part will establish the main concepts of this subject, including a necessary working definition to provide a logical framework to understand military readiness. There are also some fundamental aspects of the military enterprise that can make understanding readiness or preparedness difficult. Given a framework and understanding the nuances of the military enterprise, there is an ability to measure readiness to support decision making. The second part explores how readiness should be measured. It is a logical progression and evolution of current processes driven by a torrent of data. The exponential expansion of data is driving many changes. This is a reality unrelated to military readiness, but the military enterprise must take advantage of it. Also important is an orientation to what data and artificial intelligence can and cannot do. A balanced readiness framework is then introduced to understand what could and should be measured by any military enterprise. This spans from individuals to institutions across time horizons. Part two concludes with important areas that are not currently examined or are difficult to measure. Part three is about advocating for change in a large and complex institution like the U.S. Department of Defense. It walks through human, technological, and political factors to consider and how best to institutionalize changes that last. If the changes are made in the existing dynamic environment, the final value proposition is provided to determine if all the effort is worth it. The final chapter summarizes the previous three parts to assist readers and staff members wanting to pull out key parts rapidly.

This book advocates for changes in the understanding and measurement of military readiness. These are not solely for the United States and can be reasonably applied to many nations. Complex organizations can change in two general pathways. One can work through the existing bureaucracy or one can "burn it down" and rebuild it. The changes here can be implemented in either model. It offers not only advocacy but concrete steps to advance a successful change agenda. The overarching need for change is to ensure readiness assessments improve their accuracy and relevance in a changing world and military environment. This book does not offer a simple fix. The military readiness paradox is a dynamic problem set. It requires work to improve the probability of success that may never be fully tested or if tested may have unforeseen outcomes. The book does give a path to how we got here and where we can go to better understand how to quantify the trade-offs and decisions to be made.

READY OR NOT

THE MILITARY READINESS PARADOX

PART 1

CONCEPTS

This part will lay out the foundations of military readiness, its necessity, and the challenges in obtaining it. It starts with the broad problem set that any modern nation faces and then looks at the specific problems faced by the United States of America. There is a logical flow from establishing the need for military readiness to exploring the strategic trade-offs and finally to assessing the results.

> *Generals have often been reproached with preparing for the last war instead of the next—any easy gibe when their fellow-countrymen and their political leaders, too frequently, have prepared for no war at all. Preparation for war is an expensive, burdensome business, yet there is one important part of it that costs little—study. However changed and strange the new conditions of war may be, not only generals, but politicians and ordinary citizens, may find there is much to be learned from the past that can be applied to the future and, in their search for it, that some campaigns have more than others foreshadowed the coming pattern of modern war.*
>
> ~ *Field Marshal Viscount William Slim*[1]

[1] Field Marshal William Viscount Slim, *Defeat into Victory: Battling Japan in Burma and India, 1942–1945* (New York: Cooper Square Press, 1956), 535.

CHAPTER 1

CROSSING THE LINE OF DEPARTURE

Darkness was coming quickly. The sickly daylight faded as everyone glanced at their watches reflexively. Tension increased in direct proportion to the growing gloom. A quick consultation was taking place at the head of a column of armored vehicles over engines idling. Tracers arced into the sky and artillery bursts flashed. The line of departure was just ahead, a gap in the large earthen berm that stretched off in each direction. The berm was the border between Saudi Arabia and Kuwait. In military terms, the line of departure was the tactical control feature that marked the jump off for an attack. Anxiety ran through the ranks. The situation was unclear, moving into action at night was risky. After a quick brief, leaders rushed over to their vehicles, climbed into their hatches, pulled on their helmets, checked their radios, and rolled into darkness. The roar of the engines, the static of the radio, and the booms made a mind-numbing cacophony. Our mission was to link up with one of the other companies in contact with the enemy, conduct a casualty evacuation, and then roll back into a position on the battle line, extending our bridgehead in Kuwait.[1]

[1] To underscore the personal and therefore authentic experience of those involved, the author decided to use the first-person narrative in this part of the chapter.

I was a lieutenant in that company on that night in 1991.[2] Was I ready for the next several days of action? Was the company, battalion, and division also ready? This was not the war in Europe or Korea we had trained for. Most of us would be hard-pressed to find Kuwait on a map. In most respects, I was well trained for this task, I was a first lieutenant in the Marine Corps and a company executive officer (XO), the second in command of a light armored infantry company. I had been with the battalion for more than a year and trained as a platoon commander and weapons platoon commander before moving into a company XO position. I had already served in a regular infantry battalion as a platoon commander and rifle company XO. The company to which I was assigned was a reserve company mobilized for Operation Desert Shield the previous fall.[3] It was shorthanded with only one officer, the company commander. I was sent over to be the XO with an active component first sergeant and chief mechanic. This presented challenges as the light armored vehicle (LAV) was new to the Marine Corps. Reserve units do not have enough training days a year to build experience like full time, active component troops. During planning, they are mobilized and go through a period of training. In this case, it was a very compressed timeline, so there was very little remedial training. By readiness metrics, the company would be low on the overall readiness scale. The battalion was an active component battalion, and four reserve companies were assigned to it, so it was much larger than its normal strength. Is an overstrength battalion with four low readiness companies more or less ready? I joined the company already deployed to Saudi Arabia, so there was no time to train together. Many of the members were assigned from other reserve units to round out the strength, so even the company had to build a sense of cohesion in action. Our vehicles were drawn from war reserves and did not come with the proper radios. Older radios were substituted and had to be

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[2] LtCol Dennis P. Mroczkowski, *U.S. Marines in the Persian Gulf, 1990–1991: With the* 2d *Marine Division in Desert Shield and Desert Storm* (Washington, DC: Headquarters Marine Corps, 1993), 33.

[3] Mroczkowski, *U.S. Marines in the Persian Gulf, 1990–1991*, 4.

duct taped into the racks made for newer and smaller radios. We made this work, but it was not pretty. It would also have been considered low readiness in a larger sense. Despite these issues, the company pulled together and accomplished our missions during the course of Desert Storm.[4] The various parts of the system were ready enough.

Jumping forward to 2008, I deployed during Operation Iraqi Freedom.[5] This time, I was the reservist mobilized to a team of active component Marines. It had been a long time since 1991. I was a major but had five years "broken time" when I was not in the Marines in any capacity. The 11 September 2001 terrorist attacks changed everything. It was a difficult journey both physically and mentally to get back to the level of individual readiness expected. The team was assembled months before the deployment and went through a rigorous predeployment training program. Within 24 hours of landing in Iraq, I was on my first combat patrol working with Iraqi counterparts. In contrast to Desert Storm, we had all the proper equipment, we had a highly cohesive team, and the training prepared us well for the specific job. One hundred combat patrols and almost a year later, we completed our deployment successfully, as best as we could tell. It was disheartening to see Islamic State of Iraq and Syria (ISIS) overrun the area and the Iraqi troops we worked with in 2014.[6] Given what we had learned so far in Iraq, our team and others like us were by any measure highly ready for the mission.

These combat deployments were very frontline, tactical missions. My third combat deployment to Afghanistan in 2011 was leading the Joint Program Office for Mine Resistant Ambush Protected (MRAP) vehicles in Bagram.[7] We provided depot-level maintenance to all 13,600 MRAPs in Afghanistan across Army, Marine Corps, Air Force, and

[4] Rick Atkinson, *Crusade: The Untold Story of the Persian Gulf War* (Boston, MA: Houghton Mifflin, 1993), 198–208, 334, 376–81, 458.
[5] Barbara Salazar Torreon and Carly A. Miller, *U.S. Periods of War and Dates of Recent Conflict* (Washington, DC: Congressional Research Service, 2024), 12.
[6] Torren and Miller, *U.S. Periods of War and Dates of Recent Conflict*, 12.

Navy units.[8] This included battle damage repair and technology upgrades. We operated 11 facilities and had more than 2,500 personnel who were mostly skilled contractors and civilian mechanics. This provided a very different view of warfare.[9] Here, I saw the defense industrial base and theater-level sustainment activities working at scale.

Finally, at the Pentagon, I worked with readiness for not just units but the Joint Force and the broader strategic readiness. I sat in a front-row seat to see how readiness or lack of readiness in some areas does not guarantee success or failure. Strength in areas can help compensate for some shortfalls. In 1991, it seemed the United States was dominating precision strike capability, then drones came on the scene. As the capability proliferated, we saw guided weapons all over, often in the hands of smaller nations or nonstate groups that did not traditionally have access to such technology. The dependency of this technology on space and cyberspace domains opens whole new areas of concern.

My direct experiences above are not the definitive study of readiness; these are anecdotes that I share here to stimulate the reader's imagination and start asking questions. They do demonstrate that perspective on readiness can change greatly across the various levels in a given career. These perspectives are not misguided, only limited, and a complete understanding of military readiness should span across these levels coherently. These are not the answers, and I draw no conclusions from them. Readiness can mean different things at different levels of the military. However, I do not want to lose the human element. Forming, equipping, and training forces is a human endeavor. As such, there is significant "baggage" that comes with that versus the exercise of applied mathematics.

This book is not a history of readiness assessments, though there is plenty of history to help understand how we got here. It is not advocating change, as the change is already happening. This book is about

[8] "Mine Resistant Ambush Protected (MRAP) Vehicle Program Overview," PowerPoint presentation, Tactical Wheeled Conference, February 2012. This was within two months of when the author departed the program in December 2011.
[9] Mathuel Browne, "MRAP Program Celebrates 10 Years of Protecting Those Who Protect Us," Marine Corps Systems Command, 1 September 2016.

understanding, energizing, and sustaining change. These changes have survived multiple changes in government administrations and need to persist. Do these changes provide better outcomes? I will argue that these changes increase the probability of a positive outcome, but I cannot guarantee it. Even if our outcomes retain the same relative value, if we get there more efficiently that is also a benefit.

This book touches on broader issues of strategy, but it is not intended to provide a proposed or optimal strategy as a nation or as a military enterprise. It does try to show how measuring and assessing military readiness can influence and contribute to strategy. There has not been a book on this subject in 30 years. This book will look at some basic challenges and practicalities of metrics and assessments. It may get very specific in some areas, with a dose of history sprinkled liberally throughout. I will assume that some readers are not experts in all types of military formations, and some may not be experts in data science. If you are an expert in these areas, I beg your indulgence on behalf of those who are not and seek to "level the field" for the sake of the discussion.

Military readiness is not an academic exercise. It is part of a profoundly serious business. The aspects deserve a thoughtful discourse as the cost in resources is vast and the implications to who we are as a nation, what we stand for, and what we value are on the line. Having sat in numerous meeting rooms as leaders tackled complex problems for which there are no easy answers, these trade-offs are not just military necessity—there are moral, ethical, and political consequences.

Parts of the challenges change, but the basics remain the same. We still recruit and train young men and women to bear arms in the defense of the nation. Those arms are not always firearms. Some of the most powerful arms may be a computer. We have an obligation to those in uniform who come after us to make them as ready as possible and to provide them with the tools and understanding they need to help themselves.

CHAPTER 2

INTRODUCTION TO THE READINESS PARADOX

It is axiomatic that nations exist in the modern world where there are real threats of armed conflict. As such, nations establish militaries. All nations, even highly prosperous ones, have limited resources. A nation has competing priorities for these limited resources. Therefore, resources provided to the military establishment to ensure some ability to deal with threats is limited to the perceived severity of the threat balanced against the perceived importance of other priorities. This is the foundation of the readiness paradox; a nation cannot reasonably afford to be fully prepared for all military threats at all times. Senior leaders try to find the balance between sufficiency and affordability. The tension in this balance requires thoughtful decision making.

The extension of the readiness problem is that a nation needs to know how much readiness it requires and how much it is buying, therefore readiness must be carefully measured. This is the beginning of the fundamental assessment of readiness, which is achieved readiness divided by desired readiness. There are deeper considerations than the monetary costs; there are moral and ethical considerations as military investment involves human lives. We must figure out how to accurately measure readiness to help make better decisions.

When a discussion of military readiness happens at the Pentagon, it is inevitable that at some point Richard K. Betts's three questions are rolled out:

1. Ready for what?
2. Ready with what?
3. Ready when?[1]

These questions can start rounds of circular logic and can derail an otherwise straightforward discussion. In the case of military readiness, they have specific prosaic answers that are not particularly profound. The real problem is that most discussions of readiness focus on the granular unit level—the battalion, ship, or squadron—and as a "fight tonight" prospect. This myopic view can be downright dangerous as it could lead to decision making without all the facts, or worse, the incorrect facts. The author submits that the more productive questions that shape discussions of military readiness are:

1. What is military readiness?
2. Do we need it/how much do we need?
3. Can we adequately measure it?
4. How do we measure it now?
5. How should we measure it?
6. How do we get there?

These six questions will be covered in the following pages, so that readers come away with working answers and hopefully stimulate additional thoughts.

Any work on military readiness will experience some challenges to get past the academic models. If we want a practical guide, we hit a classification fire wall. These walls exist for the right reasons. The specifics of actual readiness are guarded secrets across all nations. This reality limits the depth of academic study on this subject. This also necessitates that this book must rely on notional examples based on

[1] Richard K. Betts, *Military Readiness: Concepts, Choices, Consequences* (Washington, DC: Brookings Institution, 1995), 33.

common force structures. A singular example is difficult as readiness spans units in all domains that can range from an individual to a team of three or to large formations of tens of thousands or more.

What Is Military Readiness?

Military readiness is not an afterthought of forming a military organization. It is why a military organization exists. From the moment people and equipment are brought together and begin training to perform the task of that unit, there is a real capability. In earlier times, the most practical way to express the capability of a unit was the amount of time that had passed from when it was formed. This lexicon is ingrained into our military vocabulary as green, experienced, or veterans. This longevity implied higher capability. As armies, fleets, and air forces evolved, the understanding of military readiness evolved with them. There are many definitions of readiness used at various echelons of a military enterprise from individuals to armies or fleets. The general definition within the U.S. Department of Defense refers to *readiness* as "the ability of military forces to fight and meet the demands of assigned missions." There is disagreement over what this definition or other alternatives mean.[2] To prevent becoming bogged down before we start and not link this to a specific national military enterprise, a comprehensive working definition is needed that consolidates key concepts from various definitions. To explore this concept further, we need a working comprehensive definition for military readiness. This definition is meant to be sufficiently abstract to be applied across all echelons and conceptual components to provide a logical basis for the discussion that follows: the military capability and capacity to deter, fight, and win across the full range of armed conflict with the appropriate personnel, equipment, and training to produce the desired results from now through the foreseeable future.

The unfortunate reality of this definition is that it is not fully achievable with certainty. A simple version of the math is what one *has* divided by what one *needs* equals the author's percentage of "read-

[2] G. James Herrera, *The Fundamentals of Military Readiness* (Washington, DC: Congressional Research Service, 2020), 1.

iness." Given that basic index, it presumes you have determined the need appropriately. However, building readiness is not a simple math problem. Military readiness is an undertaking in a dynamic system of competition among nations. It is relative to the readiness of competitors across a range of armed conflict and time horizons. Understanding of a potential adversary's capability and capacity is always incomplete. Given that uncertainty, the only way to drive down risk is to pursue a clear overmatch in quantity and quality. Obtaining such an overmatch across all capability areas, across all ranges of operations, and over time horizons outside of a nation fully geared toward war is prohibitively expensive. One could argue that the United States in 1945 approached that state of overwhelming overmatch, and then based on the speed of demobilization afterward it also indicated the reluctance to sustain it.[3] Driving the military enterprise toward certainty of readiness comes at an astronomical cost.

Since we as a nation make a massive investment in the military, we know intuitively that overall readiness for the above rests somewhere in a continuum between completely unready to do anything and completely ready to do everything. The United States cannot have a standing military of more than 1.3 million servicemembers that is not ready to do something.[4] Given the size and importance of the investment, there is an obligation to quantify this continuum so we could potentially optimize the level of readiness with what we can afford. That is the military readiness paradox. It starts with this axiom; you cannot afford all the readiness you want. It then follows that one must continuously evaluate both what you think you need with what you can afford. Once you think it has achieved a desired equilibrium, there is a change, and the balance must be recalculated.

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[3] Betts, *Military Readiness*, 15–16.

[4] *2022 Demographics: Report Profile of the Military Community* (Washington, DC: Department of Defense, 2023), iii. "The total number of military and civilian personnel is nearly 3.4 million strong, including DOD active duty military personnel (1,304,720); DHS's Coast Guard active-duty members (39,485); DOD ready reserve and DHS Coast Guard Reserve members (994,860); members of the retired reserve (183,728) and Standby Reserve (5,253); and DOD civilian personnel (appropriated funds (APF) and nonappropriated funds (NAF) (867,308)."

Measuring readiness within this continuum begins with unpacking the parts of the definition. It starts with military *capability* and *capacity*, which is the essential balancing act in determining the desired readiness. Competition between nations can drive to ever more expensive and exquisite capabilities, but these may not be able to be produced in sufficient quantities. Is a new aircraft that costs three times as much as a competitors three times better? If it turns out to be only twice as good, then a competitor could overwhelm it by spending the same and having more. Force designers must continuously evaluate the current and projected effectiveness of their forces and the affordability of the design to make sufficient capacity to support the full range of armed conflict. This is not done in a vacuum, but it is influenced by military traditions, Service parochialism, and political realities while being constrained by economic and industrial capacity.

The next component of the definition is to deter, fight, and win across the full spectrum of armed conflict. This creates a range of challenges. A modern military enterprise must be flexible and multifaceted. It cannot be solely focused on a single adversary and theater without losing capability in another. Each nation has a different version of this depending on geography and its roles in geopolitics. Major powers have the greatest challenge as they must build forces to go virtually anywhere in a wide range from peacekeeping to major combat operations. Larger militaries have the luxury of specialized forces for different types of operations at the risk of not having enough general-purpose forces for major conflict.

The appropriate personnel, equipment, and training to produce the desired results segment establishes the enduring pillars of measuring military readiness. Throughout this book, these are, and have been, the foundation of measuring the point on the continuum of readiness. This book will also explore expanding these classic pillars into additional dimensions to provide a more comprehensive understanding across multiple levels within the nation and its military enterprise.

The most difficult aspect of the working definition is time. The basic definition of *readiness* is the state of being fully prepared for something.[5] It implies timeliness and that forethought or preparation was made. There is a broader implication that, like a runner at the start line, the state of "fully prepared" cannot be sustained indefinitely. Moving from the general to the military definition, readiness for military elements means that they are organized, equipped, and trained to accomplish their mission either now or the near future. Military elements can span from an individual soldier or sailor to large formations such as divisions, fleets, or armies. Equipping could be as simple as a uniform or a laptop or as complex as a squadron of stealth fighters or an aircraft carrier. Training could span from weeks to months in any imaginable condition. Missions could be broad to the very specific. There are two aspects of timeliness: readiness implies an ability to perform now and to be prepared to be ready in the future. Current readiness cannot be sustained indefinitely due to wear and tear on personnel and equipment; the ability to have ready forces across time horizons requires generating and rotating ready forces. It also sets up a persistent problem of balancing current and future readiness in modernization of equipment, recruiting, and retention of people. Given the rapid advancements in technology during the last hundred years, militaries are always modernizing to retain relative capability. Current readiness then reflects a mix of legacy and modernized capabilities as the logistics of rolling out modernized equipment, updating force structures, and improving training necessitates a phased implementation. Future readiness sounds vague; but in practical application, the future is broken into time segments with different levels of detail. The next two years is generally well known and scheduled and is thought of as force management, then the next five offers good information as schedules extend into that window and is thought of as force development—that is, building and generating the designed forces. Force designers consider 10- and 20-year windows, as designing new things can often take that long or longer to realize.[6]

[5] "Readiness," Merriam-Webster, accessed 23 April 2025.

[6] *Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS)* (Fort Belvoir, VA: Defense Acquisition University, 2021), appendix A.

This working definition establishes these key components that form the basis of quantifying military readiness: capability, capacity, uncertainty, personnel, equipment, training, the range of armed conflict, and timeliness.

Can Readiness Be Measured?

Cardinal Richelieu is said to have created the first formal readiness reporting requirement for the modern era in the 1630s.[7] France was considered an early leader in the establishment of a national standing army that would set the standard for others to follow. It is no accident that the bulk of U.S. military terminology is French. They may not have called it "readiness" reporting, but in this regard any regular status report of a given force against a prescribed standard is de facto a readiness report. They managed to build and sustain multiple armies in each of the principal theaters around France's borders with Spain, Italy, Germany, and Flanders. They performed simultaneous campaigns in these theaters for years in a world without computers, phones, or the internet. In U.S. history, George Washington regularly reported the readiness of the Continental Army during the Revolutionary War in the smallest detail.[8] Much more time was devoted to raising, paying, clothing, feeding, and equipping the army than to where and when to fight the British. The term *readiness* first appears in the United States within military contexts in a House of Representatives report from the Committee on Naval Affairs in 1836.[9] It is clear throughout history that there have been attempts to measure and report the readiness of military formations. The pillars of military readiness started here with personnel, equipment, and training. These muster rolls and handwritten narrative reports provided the personnel and equipment on hand versus the requirement. Even at this early stage, there were concerns

[7] Hans Delbruck, *The Dawn of Modern Warfare: History of the Art of War*, vol. 4 (Lincoln: University of Nebraska Press, 1985), 229–37. Much credit for implementation goes to Michel le Tellier serving as secretary of state for war and then chancellor (1643–85), though his son would succeed him as marquis de Louvois (1662–91).
[8] John Ferling, *Almost a Miracle: The American Victory in the War of Independence* (Oxford, UK: Oxford University Press, 2007), 351.
[9] Herrera, *The Fundamentals of Military Readiness*, 1.

about data quality as it is said that Richelieu complained that he got more accurate reports about his own army from captured enemy documents than from his own commanders. Richelieu did not start in a vacuum. That period of European history saw an explosion of neoclassicism in military theory.[10] This included a profound fascination with the ancient Romans and Greeks. From a military standpoint, the Romans more than any other nation developed the true standing, professional army. Their approach presaged modern times where the military system was developed. The system featured a personnel management system that had fixed unit and rank structures, recruiting, retention, and retirement planning.[11] It incorporated technology to equip the soldiers over time with effective and evolutionary equipment that allowed them to dominate the battlefield. They built and trained on a tactical and operational doctrine that allowed units to operate across a massive empire in all climates and terrain against a wide variety of opponents to consistently defeat adversaries and keep the peace.[12] Is the modern U.S. military more like the Roman or French model? There are lessons to be absorbed from each.

Formulating a measurement system for military readiness is not the same as readiness reporting. We must first figure out what we can measure. Are we measuring the right things? Are we measuring what is convenient or what really matters? We also need different information at different levels of decision making. Can we make do with a single dataset with enough to support multiple audiences without overwhelming those doing data collection and entry? Once we have an idea of what we want, then a system of data collection must be considered. Readiness reporting is the policy, directives, instructions, and system for the collection of the needed data. A simplified example comes from the decision that measuring the personnel strength of units is important. Then we devise a metric like having x percent or the required per-

[10] Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800*, 2d ed. (Cambridge, UK: Cambridge University Press, 1996), 20–23.
[11] Adrian Goldsworthy, *The Complete Roman Army* (New York: Thames & Hudson, 2003), 94–101.
[12] Goldsworthy, *The Complete Roman Army*, 46–59.

sonnel is needed to be "ready." Finally, we set a policy of the applicable business rules, devise a monthly report format, then design and field an information technology system to enter the data per the policy. Each month, we can see how many units are then ready. We can then perform an assessment on aggregation and analysis of the data collected to address the larger questions than just how many ready units there are. Assessments include determining if the ready capacity is sufficient to meet various demands over time.

The classic straw man counterargument is that a unit can have all its personnel and equipment and still be unready. It is tossed around frequently. Can a fully staffed, fully equipped, and fully trained unit fail in combat? The answer is yes. It can and it has happened on numerous occasions. Certainly, warfare is inherently risky, and the adversary gets a vote. Success or failure may be wholly unrelated to the potential effectiveness of a single unit by broader circumstances beyond the control of the unit. Units are grouped into coherent intermediate formations, so readiness must be present across a set of units to be a viable force. Before combat, staffing, equipping, and training standards were developed, readiness was based on an assessment of what would be needed to be effective or what could be accomplished with the available time. That knowledge is always imperfect. What we can say confidently is that the unit that is fully staffed, equipped, and trained is far more likely to prevail than one that is not staffed, trained, or equipped. The data science answer is that success or failure is a critical data point in the continuous improvement of the standards to better prepare the next unit. Regardless of potential outcomes, a military unit still represents a significant investment, and an accounting of what the nation received as a return on that investment is needed. These are the two fundamental questions that drive readiness measurement:

1. Can a unit fight and win?
2. Did the nation get what it paid for?

The Department of Defense must answer the above questions.[13] To that end, readiness can be and is measured.[14] There is a statutory and moral obligation to American servicemembers to do so and to make it accurate, objective, and useful.[15] The DOD collects terabytes of data to help measure the readiness of U.S. forces.[16] There is plenty of space to debate what parts are good, bad, accurate, inaccurate, useful, or misleading. Regardless, if you had to start from scratch, you would likely come up with something very similar to what we use now. Our measurements of readiness should capture the staffing, equipping, and training of military formations across multiple echelons. During earlier times, the types of units and what capability they provided was a small variety and well understood: infantry, cavalry, and artillery. In today's modern military, there is a dizzying array of unit types and capabilities they provide. Even with traditional infantry, there are many variations such as mechanized, motorized, mountain, parachute, or air assault. To add an element to staffing, equipping, and training is a fourth pillar of an enumeration of capabilities that a unit can perform. The first three pillars are what we often refer to as resource-based reporting, and the fourth pillar is capability-based reporting.

Betts's moved from the conceptual three questions to a more focused definition paraphrased here as *perfect readiness*, that is, keeping a nation's potential military power available at all times. This is impossible outside of a garrison state, which is eventually self-defeating. Therefore, military readiness is always a risk mitigation exercise to select an appropriate level of readiness designed to cover the gap in time that exists between the onset of combat and full mobilization.[17] While this is not invalid, this statement opens an optimization problem. If one focuses on the war scenario that necessitates full mobilization, it may

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[13] Chairman's Risk Assessment, 10 U.S.C., § 153 (b)(2) (2025); and Secretary's Semi-Annual Readiness Report to Congress (SRRC) and (d) the Chairman's Semi-annual Joint Force Readiness Review (JFRR), 10 U.S.C., § 482 (a) (2025).
[14] *DOD Directive 7730.65, DOD Defense Readiness Reporting System* (Washington, DC: Department of Defense, 31 May 2023).
[15] Readiness Reporting System, 10 U.S.C., §117 (2008).
[16] *DOD Directive 7730.65*.
[17] Betts, *Military Readiness*, 27–29.

suboptimize readiness for other aspects. Given the range of military options and a nonpolar world, a broader understanding is needed to build readiness to perform tasks across a range of military operations and against a variety of adversaries that range from asymmetric transnational violent extremists to technologically advanced adversaries or their proxies. In other words, just focusing on the "big one" could lead to poor performance during the more likely "little ones" that could eventually make the big one more likely. Having readiness data that spans levels of conflict and capabilities can allow for a more comprehensive view. It also provides an arbitrary clock between the onset of combat and full mobilization. This is also too narrow. True readiness needs to span through mobilization, such as the resourcing and sustainment of the mobilization. How large is full mobilization? Once the force is mobilized, would we not continue to measure the readiness of its components to undertake continuing operations? How are forces reconstituted, repositioned, and retrained for a prolonged conflict? Readiness must persist post conflict to measure the rebuilding and resetting of the force for the future.

Level Setting on Terminology and Concepts

For the sake of clarity, it is important to establish a common understanding of terminology and concepts. Some explanation is needed in many cases that go beyond providing a glossary as an appendix. This overview is not intended to be comprehensive or authoritative other than to make this work easier to follow.

There are generally accepted levels of war and associated types of units. The following figures provide an overview of the three levels of war: strategic, operational, and tactical.[18] The tactical level focuses on fighting physical engagements and battles. A battle in the modern sense is a series of interrelated engagements that can involve hundreds of units over days. The tactical level could cover an engagement between two infantry squads of nine people lasting seconds, early modern battles that

[18] *Joint Warfighting*, Joint Publication 1 (Washington, DC: Department of Defense, 2023), II-9.

could have 50,000–100,000 men per side lasting one to three days, to modern engagements involving hundreds of thousands over weeks. The tactical level is broad in its specific military details, and many subdivide it into grand tactical, tactical, and small unit levels. The operational level of war is the pursuit of a series of battles and/or maneuvers generally known as a campaign to accomplish a strategic goal. It can be complicated by the modern military use of named operations (e.g., Operation Overlord, Operation Goodwood, and Operation Iraqi Freedom) that can apply to either tactical operations, campaigns, or entire conflicts.[19] The third level is the strategic level of war that is focused on deterring, fighting, and winning wars.

Readiness can be viewed and assessed at all these levels. Ultimately, a military must be functionally ready at all levels to be successful. It does not have to be good at everything, just better than their adversary. A military that fails in one of these levels can cause the collapse of the entire enterprise. During Operation Desert Storm (1990), the Iraqi Army displayed considerable skill massing and maneuvering large formations of soldiers and equipment, but at the tactical level—U.S. forces could outshoot them. It did not take long for them to realize that no matter what they did, they were overmatched in every engagement and the frontline forces collapsed. The United States did possess advantages across the spectrum, so this tactical failure was not the sole cause of their defeat, but it had a clear and compelling impact.[20] In the figure below, the levels of war are shown with a notional set of dimensions for each level.

What follows is an overview of the general organization of land, naval, and air forces. If the reader is well versed in this area, feel free to

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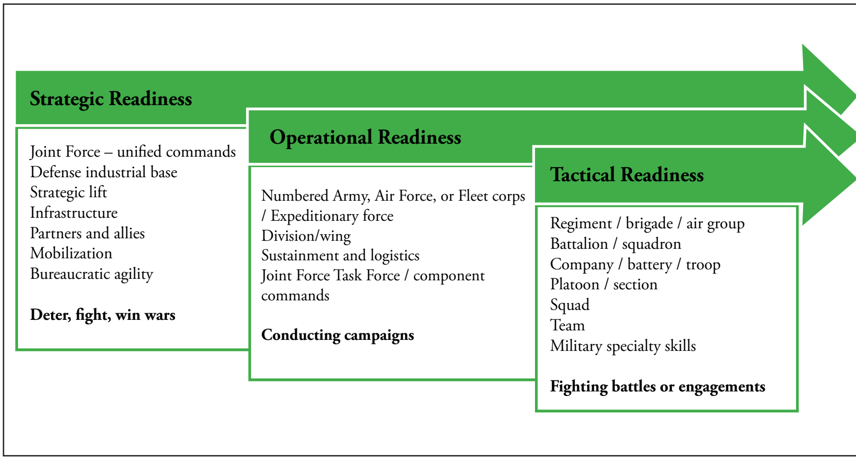
[19] William M. Hammond, *Normandy, 6 June to 24 July 1944* (Washington, DC: Center of Military History, 2019), 12; Barbara Salazar Torreon and Carly A. Miller, *U.S. Periods of War and Dates of Recent Conflicts* (Washington, DC: Congressional Research Service, 2024), 10; and James Holland, *Normandy '44: D-Day and the Epic 77-Day Battle for France* (New York: Grove Press, 2019), 537.

[20] Rick Atkinson, *Crusade: The Untold Story of the Persian Gulf War* (Boston, MA: Houghton Mifflin, 1993), 427–48, 457–68. The author also was a firsthand witness and combatant. The author can confirm the loss of confidence in Iraqi units through field interrogation of the numerous prisoners of war taken by 2d Light Armored Infantry Battalion.

Figure 1. Levels of war



Source: courtesy of author, adapted by MCUP.

skim over. Many nonmilitary readers may not have as detailed an understanding of these organizations and how they work at a basic level. It is also common that many military members know their Service well but are not well versed on the other Services. The military hierarchy is important and can be hard to follow as the names of the various parts are historical and nonstandard. The term *corps* has a different meaning among North Atlantic Treaty Organization (NATO) allied countries and the Russian Federation.[21] To add to the difficulty is that different military Services (U.S. Army, Navy, Air Force, etc.) may use the same word with a different meaning such as "group" or "squadron."[22] The following structures are notional, so it includes common components with all militaries, not just the U.S. NATO standards have officers as OF and enlisted as OR for other ranks (table 1).[23]

In the table, the command rank is in the notation of "O" for officer ranks and "E" for enlisted ranks. Like formation names, the ranks have Service-specific titles, making the numbering system useful when looking across Services. General officers and admirals start at the O7 and

[21] Mason Clark and Karolina Hird, *Russian Regular Ground Forces Order of Battle* (Washington, DC: Institute for the Study of War, 2024), 13–14.
[22] "Military Units," Defense.gov, accessed 24 April 2025.
[23] "STANAG 2116," NATO, accessed 18 June 2025.

Table 1. Military command hierarchy

Level	NATO/U.S. ranks	Command types
1	OF-9/O9–10 (3/4 star) (general/lieutenant general/admiral/vice admiral)	Theater or component commands, numbered fleets, armies, or air forces
2	OF-7-8/O8–9 (2/3 star) (lieutenant or major general/vice or rear admiral)	Corps, Marine expeditionary force, functional type commands, naval task forces
3	OF-6-7/O7–8 (1/2 star) (major or brigadier general/rear admiral)	Division, wing, naval squadron, or group
4	OF-5/O6 (colonel/captain)	Brigade, regiment, air group, large vessel
5	OF-4/O5 (lieutenant colonel/commander)	Battalion, squadron, ship, submarine
6	OF-2–3/O3–4 (captain/major/lieutenant commander)	Company, battery, troop, ship department, small vessel
7	OF-1/O1–2 (1st and 2d lieutenant/ensign lieutenant junior grade)	Platoon, section, flight, division (naval)
8	OR-3–6/E4–6 (staff sergeant, sergeant, corporal, petty officer)	Squad, section, large weapon, or vehicle crew
9	OR-3–5/E3–5 (private first class, lance corporal, corporal, sergeant, petty officer)	Fire team, element, small weapon crew
10	Individuals	Individual skills for soldiers, sailors, airmen, Marines, etc.

Source: author's assessment of rank structure and common command types found in U.S. and NATO formations.

higher. The O1–O3 are the junior, company grade officers, and O4–O6 are more senior field grade officers. The E4 and higher designations are the noncommissioned officer (NCO) ranks including corporals, sergeants, petty officers, etc. The size of each level can vary greatly in strength. In some organizations, a junior officer may command more than 100 soldiers or sailors, and in others it could be a dozen. A battalion commanded by an O5 (lieutenant colonel) is around 700–800 soldiers or more, a U.S. destroyer is a warship with a crew of more than 300 and is also commanded by an O5 (commander), and an aviation squadron commanded by an O5 (lieutenant colonel or commander depending on Service) may have around 200.[24] It is at level five, O5 command, that formal readiness reporting starts in the United States. It is the level where the command has a staff to enable the efficient gathering and checking of the data.[25] At lower levels, the commander is focused on task accomplishment and troop welfare.

Land forces evolved into a strict hierarchical structure to facilitate command of large formations, whereas naval forces are naturally ship-centric and form flexible groups of ships to accomplish tasks. Figure 2 shows a notional land force hierarchy that resolves to 81 battalions and in the real world would muster more than 100,000 soldiers. An army would be commanded theoretically by a four-star general officer (O10); the layer below is the corps, which is commanded by a lieutenant general (O9) with three stars. The division is then commanded by a major general (O8) with two stars followed by the brigade commanded by a one-star brigadier general (O7). Current reality over the notional structure shows U.S. brigades commanded by colonels (O6). This is a result of collapsing the traditional regiment and brigade. From the American Civil War to World War I, the U.S. Army had retained an older model of a brigade having multiple regiments and regiments

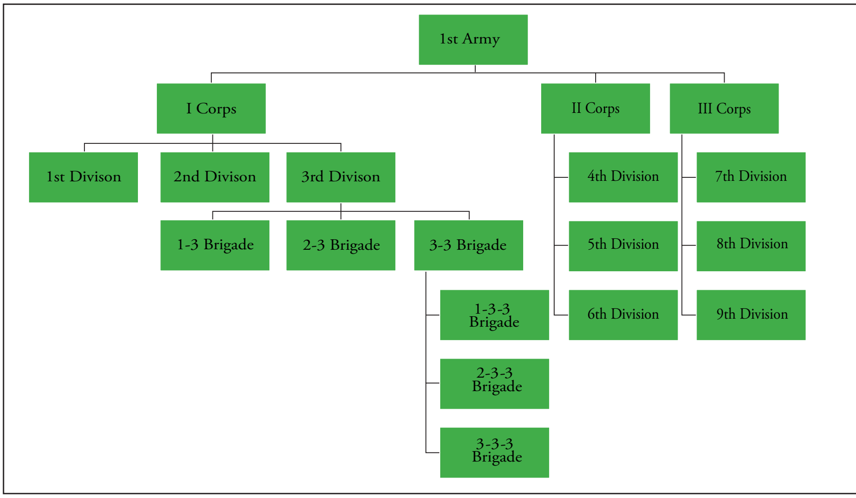
[24] "Military Units—Army," Defense.gov, accessed 24 April 2025. This interactive, multimedia website walks the user through the various echelons in each Service.
[25] *Chairman of the Joint Chiefs of Staff Instruction 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 2014), B3–B4.

having multiple battalions, which was similar to the Napoleonic style.[26] This was too unwieldy on the modern battlefield, so the current model was the triangular style after World War I.[27] The triangular model goes from an army of two or three corps, a corps of two or three divisions, a division of two or three brigades, a brigade of three battalions, a battalion of three companies, a company of three platoons, and a platoon of three squads. The Russian ground forces have a variation of this model with a division and a corps being a similar size unit. Russian divisions have regiments that each have battalions. Russian corps have brigades that are similar in size to regiments. Both divisions and corps belong to a military district. The Russian distinction is rooted in Soviet-era operational art, where the division and corps have different roles. During reforms before the 2022 outbreak of war in Ukraine, the Russian Army would field two task-organized battalion tactical groups (BTGs) per regiment or brigade.[28] The Chinese used the divisional triangular structure until 2017, when they converted to a "group army" consisting of six combined arms brigades of various types. These combined arms brigades and the component battalions have a square structure of four battalions of four companies, respectively.[29] Many countries can only field brigades and battalions that could be included in larger allied formations. The basic model is conceptual and historical. The implementation has countless variations based on the constraints of time and space, but it does serve as a useful guide for the scale and scope.

Figure 3 depicts the notional structure of a fleet. This also introduces an important concept in the organization and employment of military units. Military units are organized for ease of administration, but the organization for employment is different due to what is called "task organization." The fleet has type commands that are administra-

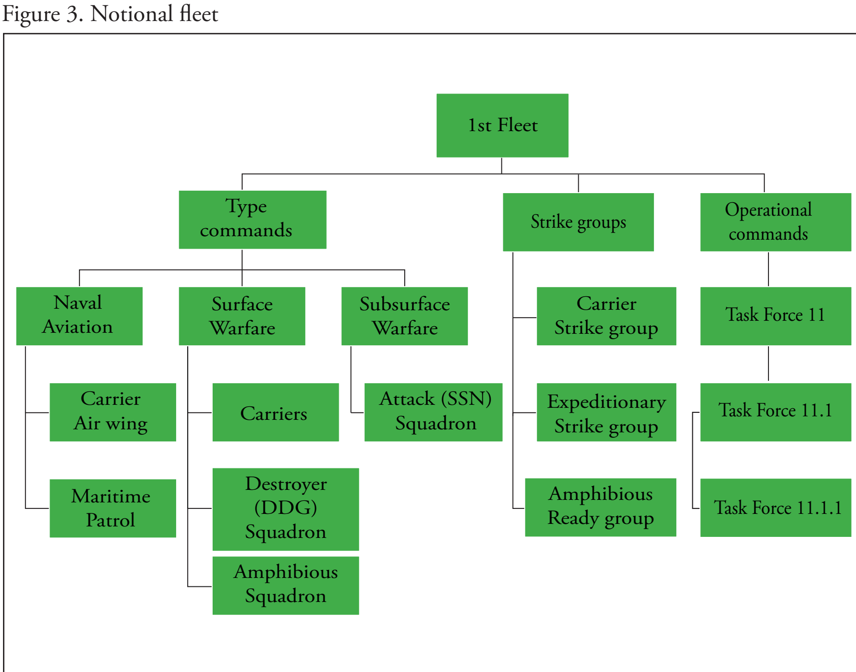
[26] Richard W. Stewart, ed., *American Military History*, vol. 1, *The United States Army and the Forging of a Nation, 1775–1917* (Washington, DC: Center of Military History, 2009), 60, 216.
[27] Richard W. Stewart, ed., *American Military History,* vol. 2, *The United States Army in a Global Era, 1917–2008* (Washington, DC: Center of Military History, 2010), 9, 70.
[28] Clark and Hird, *Russian Regular Ground Forces Order of Battle*, 13–14.
[29] *People's Liberation Army "Ground Forces": Quick Reference Guide* (Fort Eustis, VA: Army Training and Doctrine Command, 2021), 4–5.

Figure 2. Notional army/landforce hierarchy



Source: courtesy of author, adapted by MCUP.

Figure 3. Notional fleet



Source: courtesy of author, adapted by MCUP.

tive and facilitate training and equipping (i.e., all the destroyers are grouped in a squadron). In practice, the entire squadron does not put to sea together. Ships are assigned to operational groups, such as a carrier strike group, as needed. The strike groups are standing headquarters elements that are trained to integrate parts of the various types together. When assigned to operational employment the group then can be assigned a task force, task group, or task unit designation.[30] So, parts of the types are taken and assigned to groups in the middle and then employed on the right. While this occurs for land forces as well, the brigade, division, and corps units are already structured as combined arms units, so much of it occurs below the brigade level.[31]

There is a disconnect between administrative formations and tactical employment formations that started from the earliest establishment of national armies. A regiment was an administrative formation to facilitate the raising, equipping, and training of soldiers. A regiment when employed would form one or more battalions. When regiments were too small, they would be "brigaded" into a single battalion. In modern expressions, these words persist but have different meanings. This idea of an administrative organization, also known as the "garrison" structure, versus the way the formation is employed, is an ongoing challenge in understanding and measuring readiness.[32] If one measures the readiness of an administrative formation, does it tell us about the readiness of task organized formations?

The naval structure and task organization model above also highlights another issue. We often look at the readiness of a ship. A ship is a single large platform with a crew of a dozen to thousands, and a large platform has a collection of capabilities that function in multiple domains simultaneously. The ship can have a wide range of items in various degrees of readiness. Many modern warships are multimission platforms and so can perform antiair, antisurface, and antisubsurface warfare tasks. The readiness to perform each task is critical. Most ground

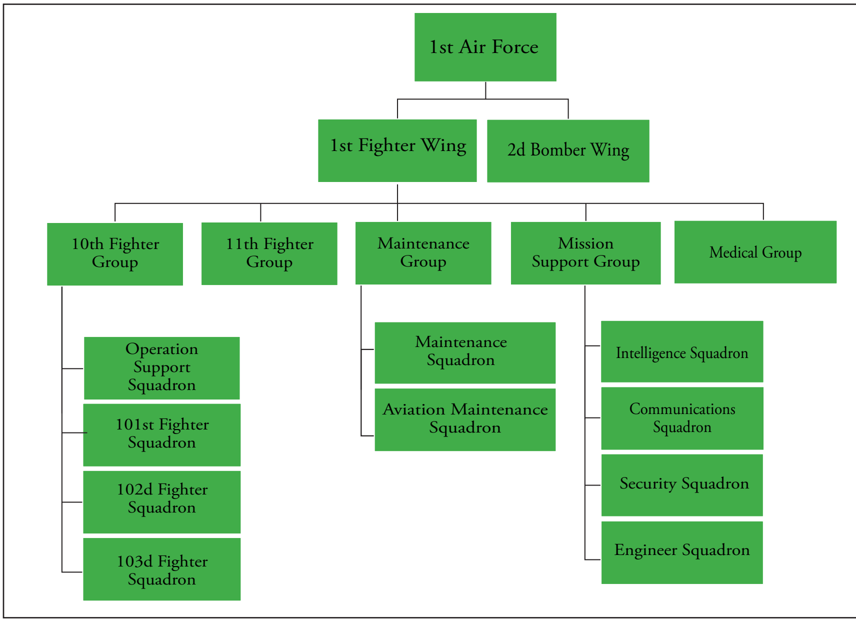
[30] "Military Units—Navy," Defense.gov, accessed 24 April 2024.
[31] "Military Units."
[32] *Global Force Management Data Initiative*, DOD Manual 8260.03, vol. 1 (Washington, DC: Department of Defense, 2022), 19.

and air units are a collection of things like a fighter squadron or an artillery battalion. A ship could be considered a collection of things like radars, sonars, missiles, torpedoes, cannons, power generators, communications, propulsion, and subordinate aircraft. When the platform is quayside or in dry dock, none of those capabilities are available. A ship could be underway with everything except its sonar working and could be assessed as ready, but it now has a critical gap if they need to find a submarine. However, the opposite can also be the case, where if a readiness assessment requires all systems to be fully functional, most ships would show unready despite having significant capabilities.

Air forces around the world follow two basic organizational models. The one used by the U.S. Air Force, Navy, and Marine Corps is the wing-group-squadron model.[33] A wing has a general type such as fighter or bomber wings. Each wing would have a set of groups each with multiple squadrons. All organizations within this construct are called squadrons so that all the support functions are in squadrons. The structure is inherently flexible and uses task organization extensively. The other model follows the land force structure with air or aviation divisions, regiments, and battalions/squadrons. This model is used by the Russian Federation and the People's Republic of China (PRC).[34] Traditionally, a wing-group-squadron model for fighters had 24 fighters in a squadron as opposed to the fighter regiment model of 36 fighters. Currently, the numbers of aircraft per squadron is more flexible, and there is a general downward pressure on the number of aircraft per unit due to the expense. The number of aircraft in a squadron or regiment is less important than the ability of these organization to generate sorties. A *sortie* is French, originating during World War I, and it refers to the measure of a single aircraft taking off for a mission. An *air mission* is a set of sorties of the aircraft needed for the mission. Tactical aircraft operate in sections or flights of two aircraft that can combine into divisions if needed. Generating a sortie is the goal of the

[33] "Military Units—Air Force," Defense.gov, accessed 24 April 2025.
[34] *The Military Balance, 2020* (Washington, DC: International Institute for Strategic Studies, 2020).

Figure 4. Notional air force



Source: courtesy of author, adapted by MCUP.

supporting squadrons that perform a myriad of tasks. If an air force squadron or regiment can efficiently generate more sorties per day than their adversary, it can overwhelm them even with less physical aircraft. If a squadron of 24 aircraft can generate 2 sorties per day per working aircraft and the regiment of 36 aircraft can only generate 1 per day per working aircraft and each has a base aircraft readiness rate of 70 percent, the squadron generates 33 sorties (fractions rounded down) to the regiment's 25. Figure 4 displays a notional numbered air force.

The supporting elements required for aviation operations are extensive, and depicting readiness based on the flying units alone could be highly misleading about the force's ability to sustain flight operations. The role of the underlying infrastructure of an airfield is another aspect of aviation forces. In the notional example, the force could either be expeditionary at an unspecified airfield somewhere else or have to fight from the airfield where they are based.

One of the aspects of the twenty-first century is the expansion of military forces and operations into new domains. For thousands of years, people made war in two domains: land and sea. The twentieth century brought the third domain of air and countries organized their militaries along these three lines. At the turn of the twenty-first century, two new domains have opened the list: space and cyberspace.[35] These new domains are now having forces aligned with them. It would be a mistake to underestimate the value of aligning warfighting capability against these new domains. Space is the new high ground that facilitates communication, observation, precision navigation, and timing. Cyberspace is the domain of information.[36] The twenty-first century represents the Information Age and that information flows between computers on transmission control protocol/internet protocol (TCP/IP) networks generally known as the internet. The flow of information and its control is just as important as holding the physical high ground. The organizational model for forces in these domains is still nascent, but it is likely to be based on one or more of the three existing models.[37]

There are certain functional areas that are not strictly domains, but creating forces in these areas is part of the larger equation. Special operations is a functional area that works across domains and across levels of conflict. These forces have unique readiness considerations. Installations support operations in all domains and are a critical part of the infrastructure of military forces.[38] Not only do they house the military personnel and their equipment, but they also provide the workspaces to safely maintain their equipment and conduct training. Twenty-first century capabilities far outstrip the ranges of the World War II era weapons and tactics for which the U.S. network of bases and stations was originally established. The training and education pipeline is another functional area that is crucial to overall readiness. Can the Services recruit, train, and retain the right mix of talent to support the designed force structure? Even in a conscription model there needs to

[35] *Joint Warfighting*, I-5.
[36] *Joint Warfighting*, V-1.
[37] *Joint Warfighting*, V-5.
[38] *Chairman of the Joint Chiefs of Staff Instruction 3401.02B*, C-21.

be sufficient space, instructors, materials, etc. to make conscripts into soldiers, sailors, or airmen. Depth of munitions, especially the high-tech twenty-first century "smart" weapons, both in stock and production capacity, is another aspect of readiness beyond unit level assessments. The specialized equipment is expensive with limited production runs and then the item cannot be easily manufactured again. Something as iconic and simple to produce as the World War II jeep is now vastly more complex. The Joint Light Tactical Vehicle (JLTV) that fills the modern role has enclosed armor protection, an integrated communication suite, and variable suspension.

Generating military power in all domains is not the sole key to victory. The key factor is the ability to synchronize and integrate force across all domains to achieve the desired results. This is an understanding that there is a synergy of force elements across domains, not merely a set of capabilities; however, there is training necessary to generate the capabilities across Services, functions, and domains. This is Joint warfighting.[39] The Joint Force is not just a construct to get the Services to play nice and reduce parochialism; it can be the decisive combination of each in time and space. Since it is not just an aggregation, it requires its own assessment of readiness.

Capabilities are those things that military forces perform. To encapsulate and create a hierarchical set of capabilities there is a Joint capability area (JCA) and a warfighting function.[40] The following table shows how a set of joint capability areas and warfighting functions align (table 2).[41] It includes the unit-level staff sections in U.S. units that manage these areas. The staff sections use the notation of "S"; when the staff is at general officer level, it uses "G"; and for Navy or Air Force headquarters, it will use the "N" and "A" prefix. The Joint Staff uses the "J" prefix. The warfighting functions and staff sections include the JCA in parentheses:

[39] *Joint Warfighting*, I-5.
[40] *2023 Joint Capability Area Definitions* (Fort Belvoir, VA: Defense Acquisition University, 2023).
[41] *Joint Warfighting*, x.

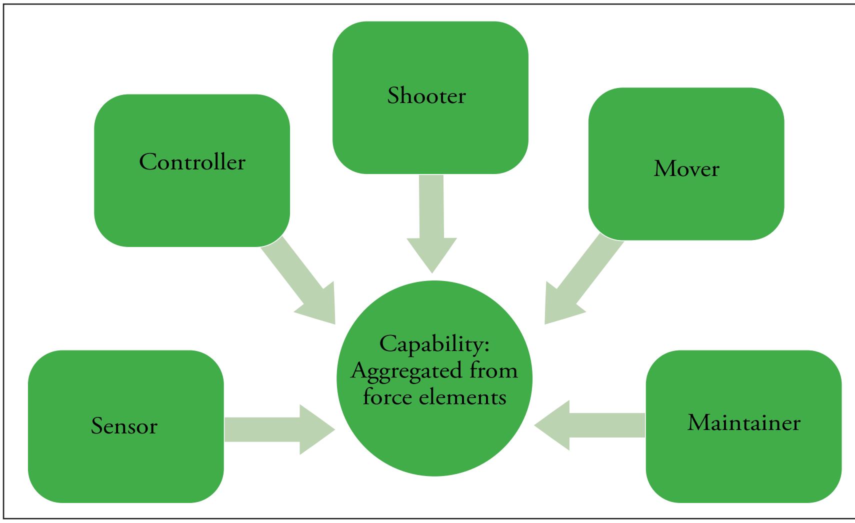
Table 2. Capability area alignment

Joint capability area	**Warfighting function (JCA)**	**Staff sections (JCA)**
1. Force integration		Administration S-1 (1, 8)
2. Battlespace awareness	Intelligence (2)	Intelligence S-2 (2)
3. Force application	Maneuver (3) Fires (3)	Operations S-3 (3, 5, 7)
4. Logistics	Sustainment (4, 8)	Logistics S-4 (4)
5. Command and control	Command and control (1, 5, 6)	Operations S-3 (3,5,7)
6. Communication and computers		Communication S-6 (6)
7. Protection	Force protection (7)	
8. Corporate management and support		

Note: the function of information is ambiguous as to where it maps across several areas as it can include public affairs, psychological operations, and cyberspace operations.
Source: author's analysis based on *Joint Warfighting*, Joint Publication 1, vol. 1 (Washington, DC: Joint Chiefs of Staff, 2023). Functions and JCA taxonomy to organizational staff sections.

As can be seen, even a broad taxonomy of capability areas does not cleanly align internally for the Department of Defense. It gets even more complex as the hierarchy is extended. There is a divide that grows between Joint capability areas that focus on *what* and warfighting functions that focus on *how*. To express the capability for a force element, we use a set of 1 to n essential tasks. These tasks (capabilities) are meant to be the irreducible minimum set that the force element is designed to provide the Joint Force and/or external consumer. These tasks are defined by a set of specific performance standards that provide an objective assessment of the unit's ability to perform the task and what or how much the consumer is getting when it is done. These measures can be cycle time, distance, or volume of work. There are some challenges with this construct. A capability or task for a unit has two logical types. The task is either performed by the unit collectively or the task is performed by a portion of the unit more or less independently from the rest. For example, a collective task may involve an infantry battalion performing offensive operations. The entire battalion is necessary to perform an attack with all parts working in coordination. By contrast, a logistics

Figure 5. Aggregated capability

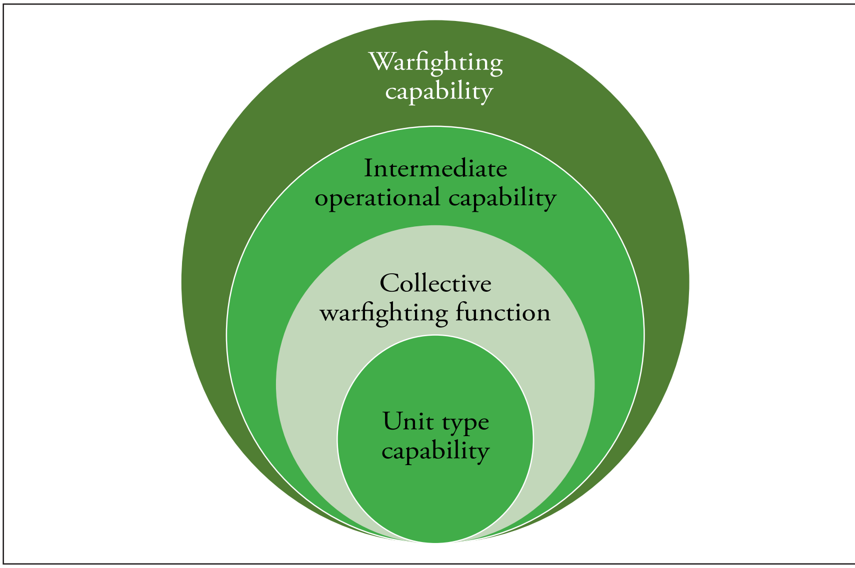


Source: courtesy of author, adapted by MCUP.

battalion may have a fuel company, an engineering company, and a transportation company. Each company provides the service distinctly, so a unit could be understrength in one company, but other parts might have sufficient capacity to perform a discrete task in another company. The next capability problem is that there is a hierarchy of enabling tasks. Capabilities are often assessed at a unit level, but higher-level capabilities may require successful output from multiple units. To demonstrate a capability model, we will look at a simplified long-range precision strike model. It has a chain of nodes that perform a function linking to the next step or node—often called a "kill chain"—that covers a set of steps from detection of a potential target to the firing of a weapon at the target. Another name for this chain is the detect-to-engage (D2E) process.[42] For some units, it may have all the means necessary to perform an engagement. In other types of engagements, several different units provide parts of the kill chain or D2E (figure 5).

[42] *OPNAV Instruction 3360.30D, Ship Antisubmarine Warfare Readiness and Effectiveness Measuring Program* (Washington, DC: Department of the Navy, 2018), 2. The D2E sequence appears in several U.S. Navy instructions for various mission areas.

Figure 6. Capability hierarchy



Source: courtesy of author, adapted by MCUP.

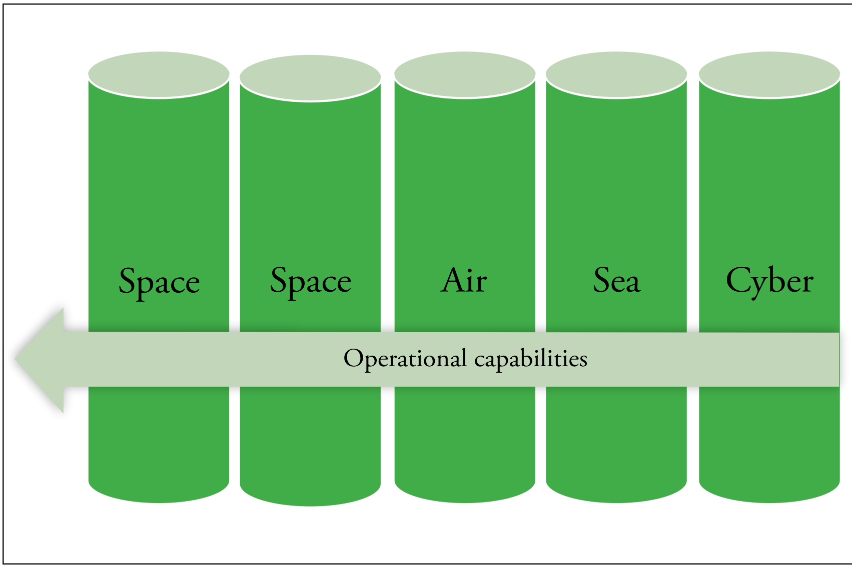
Since capability is not exclusively realized within a single force element, we are forced to consider the following hierarchy of capabilities, which follows to some extent the levels of war (figure 6).

Capabilities cannot be restricted to being realized within the enumerated domains. Many certainly are and that should be considered common, but the Joint Force uses capabilities across domains, horizontally, to generate the desired effects (figure 7). Air superiority is crucial to freedom of maneuver on land or sea. Space dominance allows for secure, timely communication, navigation, and timing. The effects in a given domain should not be considered a pleasant by-product of operations in another or an afterthought. It should be coordinated and synchronized to produce the needed effects with the limited resources available.

When Less Is More

The other thorny issue with a given capability or task is the intrinsic difference between unit types. In a hierarchical capability structure, the

Figure 7. Horizontal capabilities



Source: courtesy of author, adapted by MCUP.

force may have different kinds of units that provide a similar capability. For example, the force may have two types of artillery battalions that provide indirect fire. Some may be self-propelled and others towed, and they may have different calibers and ranges. Another example is fighter aircraft. There is a general classification of fighters in generation. Each generation is defined by a set of technologies. Most modern fighters are considered the fourth generation that starts around 1980 and includes U.S. fighters still in service such as the McDonnell Douglas F-15 Eagle, General Dynamics F-16 Fighting Falcon, and McDonnell Douglas F/A-18 Hornet. The fifth generation is defined primarily as having stealth or low observability characteristics, such as the Lockheed Martin F-22 Raptor and Lockheed Martin F-35 Lightning II. There is an intermediate area sometimes called 4.5 or 4+ generation that are upgraded versions of fourth-generation aircraft.[43] A fourth-generation fighter may have significant capability, but a fifth generation may have

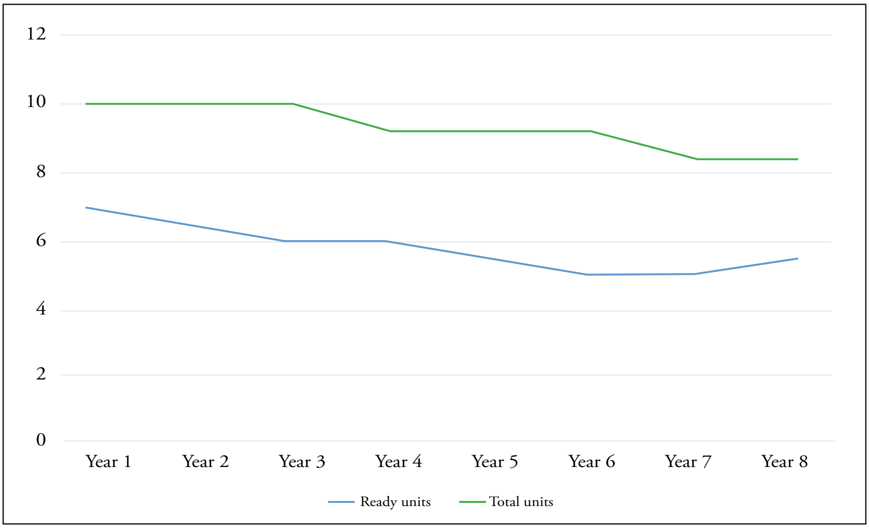
[43] David Baker, *Fifth Generation Fighters* (London, UK: Mortons Media Group, 2021), chap. 1.

far more capability in certain cases even with less basic readiness (like fewer aircraft). The extent of the difference is a closely guarded secret.

To take this a step further, we have units with a given capability that are modernizing to a new and improved version of the capability. Given the constraints of affordability, manufacturing, and fielding and training, this is not typically done en masse. The modernization process must be done while the force is still performing its deterrence, training, and maintenance with the legacy version of the capability. To illustrate how this looks, we have a notional set of 10 units in year one with the legacy capability (figure 8). The first line graph shows the number of ready units out of the total over an eight-year timeline. This illustrates a couple of things. First, the overall number of ready units is reduced from the high point in year one. The total population of the units is reduced as the new capability is more expensive, and 10 units is not affordable. It also shows that readiness does not rebound at the end of eight years. The chart does not differentiate which of the ready units are legacy or modern or which are in the process of conversion.

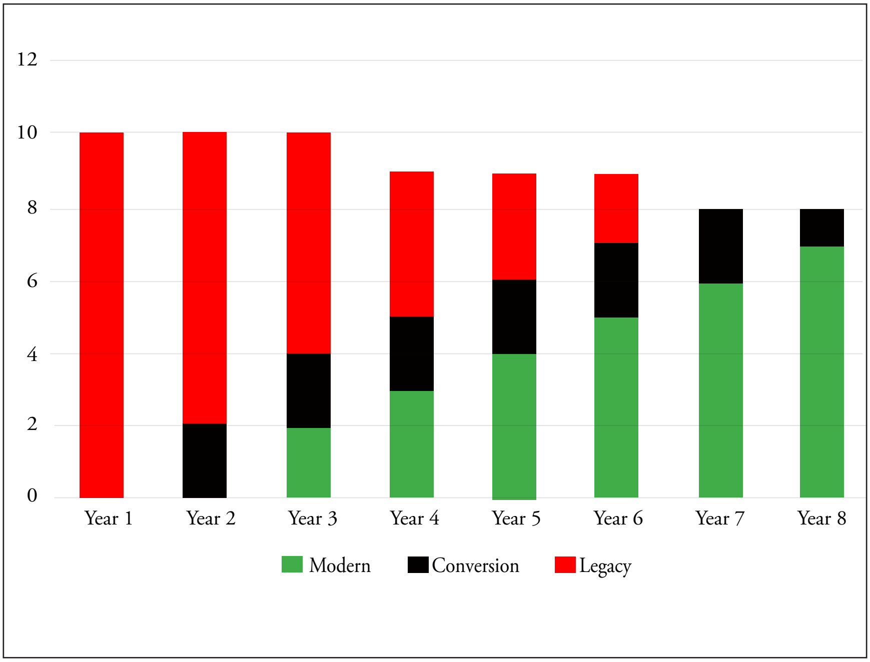
The next chart helps us understand what is happening in the modernization process (figure 9). Legacy units go into a conversion process that in this example takes more than a year to complete. Some legacy units will be deactivated over time until the population is down to eight units. At the end of year eight, there is still a single unit in conversion and seven modernized units. We can see from the previous chart that on average four of those units are ready that year, or 57 percent versus 70 percent ready in year one. If the legacy capability is no longer effective against potential adversaries, then 57 percent ready may be significantly more capability than 70 percent of an ineffective version. If there was a coefficient of capability so that a modernized version was two, meaning twice as capable as the legacy version, we could calculate that 4 x 2 = 8, which is more than the 7 in year one. Unfortunately, calculating a truly calibrated version of such a coefficient is exceedingly difficult to do reliably. The details for many capabilities are highly guarded state secrets. Understanding this concept is important, however. Modernizing takes time and comes at the cost of units taken offline

Figure 8. Ready versus total units



Source: courtesy of author, adapted by MCUP.

Figure 9. Modernization timeline



Source: courtesy of author, adapted by MCUP.

to convert. The depth and length of this effort is highly dependent on the complexity of the conversion.

In a general sense, this demonstrates the concept that less inventory, even with less readiness, can provide more capability. We can have a similar curve to the first graph even without modernization if the training standards are revised to reflect a changing threat. Military organizations routinely review and revise their training standards (professional ones) to reflect an evolving understanding of potential adversaries. This pace of change is moving rapidly these days as the pace of technology and demonstrated changes in combat capabilities in various conflicts around the world together energize modernization efforts. The rollout and adoption of new training standards can produce a chart not much different than the modernization timeline.

The less is more approach does run into a problem of resilience. In conflict, especially with a peer or near-peer adversary, we can expect to take losses. It is easy to grow complacent as the United States has experienced during the last few decades of warfighting with a very low loss rate. It is great that advances in training, protection, medical care, etc. have made this possible, but these cannot be taken for granted. Modern military capabilities are very lethal at great ranges and there are many of them (e.g., missiles, drones, direct and indirect fire, and cyber and electronic warfare). Some might say when confronted with very high initial losses it could break national resolve. One could strongly disagree, as the longer view of history indicates nations have a deep capacity to absorb losses. In a more pragmatic view, having depth in the inventory buys time for manufacturing to catch up to the losses. The calculus is the current inventory, readiness of the inventory, projected loss rate, and the ability of industry to produce new inventory. These are known quantities in many cases. The projected loss rate is an educated guess and brings with it the risk of underestimating. Industrial capacity can be challenging if the inventory is no longer in active production or has low production rates due to its cost or complexity.

We have reviewed organizational models for land, sea, and air and have introduced concepts of administrative versus operational formations and task organization. We have pulled in two new domains to consider. Beyond viewing forces along domains, we also introduced additional complexity of functional formations that operate across domains and finally we rolled out a Joint Force concept. All these work together to muddy the water when we try to understand and assess readiness. The twentieth-century military model was built around large formations: divisions, air wings, fleets, and their major subordinate elements. These were the size forces needed at that time to be effective. The new challenge of twenty-first century readiness is that strategic and operational effects can be generated by very small packages thanks to the outsized impact of nuclear, space, and cyber effects generated by small elements, while the traditional large formations still exist and are still needed.

CHAPTER 3

DECISION SUPPORT

Readiness assessments are fundamentally a decision support tool. If one is to provide decision support, we need to explore how decisions are made at the institutional level. For the uninitiated, decisions are made every day—both great and small—by senior leadership across the military enterprise. The core function of these leaders is to keep the machinery of the enterprise moving with their decisions. When we talk about a decision support tool in this context, it is not a specific information technology system. It is a collection of systems and analysts that produce input into a formal decision-making process. This input is readiness data processed into information related to the decision to be made. This can be in narrative information papers, charts and graphs on slides, or an online dashboard. These inputs may be found at different stages of the decision-making process. Analysis of readiness data to build these inputs can take weeks, days, or hours depending on the questions being asked.

Using Readiness Measures in Decision Making

All these aspects of readiness that can be measured are collected regularly into large databases to facilitate reporting and analysis. This data includes force structure, posture (location), personnel, equipment, training, deployment schedules, and war plans. There are years of complex data available for review and study. All this data is not an end to itself; it is collected to inform senior leadership within the Services, unified commands, Joint Staff, Department of Defense (DOD), and Congress. That can present a challenge as the two basic questions from above have vast amounts of detail to help answer, and it must be analyzed so that leadership can make sense of it all. Data literacy looks at four levels of data analytics, all of which are in play and build on the other.[1]

1. Descriptive analytics: What is happening now?
2. Diagnostic analytics: Why is it happening?
3. Predictive analytics: What will happen in the future?
4. Prescriptive analytics: What should I do to get the desired future?

Understanding the data is essential to support decisions as well as all four levels of data analytics. The following characteristics of readiness data are needed to support readiness decision making:

- Reliable: provides data when needed.
- Believable/defensible: the data quality and timeliness is high enough to be trustworthy and useful, especially if analysis shows something counterintuitive.
- Easy to understand: the data presented should be succinct and informative.
- Sufficient depth: intuitively we know that readiness is not a simple yes or no question. There are many reasons why units may not be ready, and there may be substantial resources available in units that are not ready. How much is still usable from the unready units is arguably the most important aspect of any readiness assessment.
- Easy to input/automated capture of data: not an inordinate burden on the operating forces and reporting organizations.

[1] Jordan Morrow, *Be Data Literate: The Data Literacy Skills Everyone Needs to Succeed* (London: Kogan Page, 2021), chap. 2.

- Provides strategic/institutional decisions: not micromanagement of units.
- Broadly useful: sufficient utility at multiple levels of the military enterprise, not just the top layer.

These attributes form the foundation of any system of readiness data collection and usage. Even if we hit all the wickets above, we must then use it properly. Many associate readiness data with descriptive analytics, as it traditionally has been presented that way. There is a need for that information. The current status of the full collection of forces is the result of a complex institutional process that is designed to produce ready forces, like a giant engine of force generation. As such, it does not, nor should it change dramatically month to month. A sense of complacency then sets in if one watches a status that does change much. To move beyond providing a known starting point and to support decision making, the analyst must move up the list of data analytics. The four types build on themselves. If we know what is happening and can determine why, then it is possible to predict what a range of likely outcomes. If one can predict this range of likely outcomes, one can understand how to aim for a desired end state.

For readiness, there is a logic train that allows rapid grouping of forces that starts with this simple question: Is a unit ready now or not? These are binned into the two groups, then the focus is on the bin of units that are not ready now. What do the unready units need to make them ready? If resources are shifted, how long would it take for them to become ready? The data collected and metrics should support answering these questions.

Fog of War and Decision Loop

The distinguishing feature of the twenty-first century is the proliferation of data in all forms. The amount of data collected is growing exponentially. The challenge is how to use this data to make better decisions. Carl von Clausewitz introduced the idea of the fog of war to address the fact that, in the nineteenth century, decisions had to be made with incomplete knowledge.[2] The temptation is to wait for the fog to clear but that can be a fatal mistake. Waiting for the fog to clear was not an option—your opponent would strike out of the fog. The twenty-first century fog of war is the opposite condition with a similar consequence. There is too much information to process and slowing down to absorb it all has the same problem. It is the responsibility of staffs to rapidly analyze the massive amounts of data to gain insights. The goal of this process is to cut through the fog more efficiently and use the data to make better decisions faster.

Often there are numerous references to data informed and data driven decision making in the DOD, and these terms are often used interchangeably. There is an important distinction between the two in how data is part of the decision-making process that is worth exploring. *Data informed* implies that decisions need to be made regardless of the data, but the data should make for better decision making. These decisions are often time driven, such as budgeting and force management. The senior leader must make the decision—the budget is due. The leadership wants to understand the implications and trade-offs in the decisions to be made. *Data driven* implies the data is the source for the need to make a decision, because analysis, or insight from data monitoring, shows that something is wrong or could be improved and a decision needs to be made. The implied task is that there are people dedicated to data analytics monitoring the system and looking for potential decisions to be made. This is an example of a true added value where predictive and prescriptive analytics provide important insights. The data reveals something not known or understood and queues a decision. Both are important; however, data-driven decisions are the key to outmaneuvering an adversary. To compete with adversaries, it is necessary to make faster and better decisions. At the strategic level of war sits the business systems and organizational effectiveness dimension that considers the bureaucratic agility of the DOD, which sounds like an oxymoron, but it is where data-driven decisions generated by

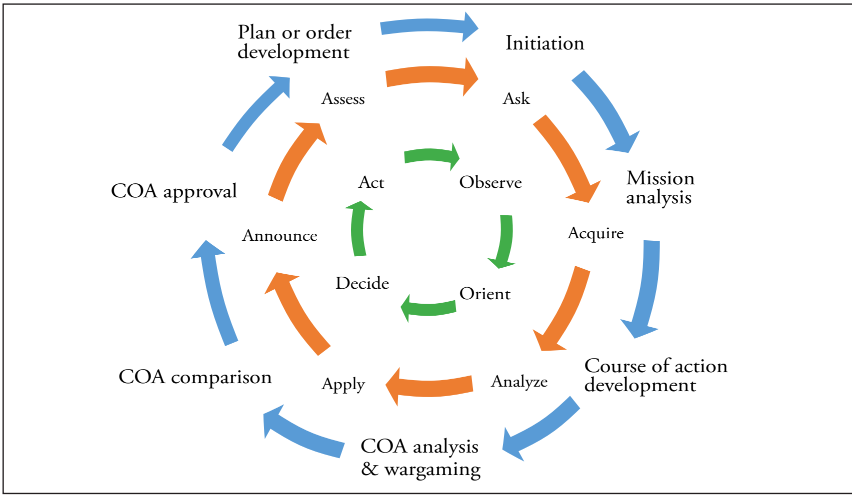
[2] Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 101.

the data analysis of readiness measures can impact the most.[3] In competition with an adversary across the range of military operations, there is an action/reaction cycle. Some call it the OODA (observe, orient, decide, act) loop developed by Colonel John R. Boyd; it is also known as the initiative in conflict.[4] The side with the initiative drives the action and forces an opponent to react, and if sufficiently pressed cannot break out of a reaction cycle. At that point, the opponent can be forced into increasingly unfavorable reactions.

Within the figure, concentric loops are provided for three decision process models (figure 10). The outer ring is the Joint Planning Process (JPP) for a military decision-making process, the middle ring comes from Jordan Morrow (representing a general industry approach for data-informed decisions), and the inner ring comes Boyd's OODA loop.[5] There are numerous ways to organize the steps—each of the military Services has a variation of the JPP that are similar. Boyd's model originally described pilots in air-to-air combat. It has since been adapted across a broad range of competitive decision cycles. It was the logical view of the mental process. The more formal processes are intended to help coordinate the activities of a staff supporting the decision-making process. A decision loop still exists in non-time sensitive environments, but the key to the use of readiness data to support military decision loops is that it is always in competition with an active or potential adversary (figure 10). Morrow's model comes from a data science perspective, which is fundamental to military readiness data. His loop is easily adapted to a military implementation. In today's operating environment, it is essential to use massive amounts of data quickly and effectively to support decision making. The outside model is the unique military staff approach. It can be a very formal process, taking weeks

[3] *DOD Instruction 3000.18, Strategic Readiness* (Washington, DC: Department of Defense, 30 November 2023), 12.
[4] *Joint Warfighting*, Joint Publication 1, vol. I (Washington, DC: Department of Defense, 2023), IV-1.
[5] *Joint Planning,* Joint Publication 5-0 (Washington, DC: Department of Defense, 2020), III-4; Morrow, *Be Data Literate*, 158–68; *Joint Operation Planning*, Joint Publication 5-0 (Washington, DC: Department of Defense, 2011), IV, IV-1–IV-57; and Robert Coram, *Boyd: The Fighter Pilot Who Changed the Art of War* (New York: Little, Brown, 2002), chap. 24, 327–44.

Figure 10. Decision loops



Source: courtesy of author, adapted by MCUP.

with numerous meetings and working groups, or as rapid as a staff in a conference room working through a problem in a couple of hours. It is notable that the two internal models have a specific or implied assessment of the impact of the decision to continuously appraise the quality and effectiveness of the decision as well as the process behind the decision.

It is worth mentioning that these processes in a large bureaucratic organization come across like a risk mitigation exercise. In any large enterprise—military or commercial—there is a need to perform due diligence and be able to withstand scrutiny with decisions that involve significant sums of money, materiel, or lives. Documenting the process not only supports the assessment of the effectiveness for the data scientist and staff, but it also supports the ancillary requirement to show your work to auditors, historians, and higher authorities. The other pitfall that can happen with some decision processes is enforcing a rigid adherence to the process over the people doing the work. The author always told his teams that processes exist to help people get work done effectively. If a process is preventing people from getting work done, it needs to be reevaluated.

Data and Analytics at the Speed of Relevance

If readiness data is going to inform or drive decisions it has to be available on time or faster than U.S. adversaries. It must include data that is current, or at least current enough to make informed decisions. U.S. data systems are readily available and have proven to be reliable over the years. The current statutory requirement is that changes in operational unit readiness be *near real time*, which is defined as within 24 hours. The general approach is that units report monthly, and if there is a change to the overall readiness they have 24 hours to submit a new report. The sticking point is that we do not know if there has been a change that would necessitate a new report; we must trust the unit commander to update if the readiness changes outside the monthly cycle. A quick review does show that the number of reports exceeds the number of units every month, so we can infer that some commanders are complying with the policy to some extent.

Because of the elapsed time from update to data pull to support a decision, the data could be less than a month old. As such, they generally carry over the assumptions of the analysis when the data was current as of date. This often gives the impression that the data is out-of-date and therefore no longer predictive, and it is often an argument when someone disagrees with the analysis. We do have supporting analytics that can narrow the range of uncertainty on the data as of 2025. First, in a general sense, measured readiness is not highly volatile. With readiness data, we do include the commander's forecast, and when compared to actuals, the forecast is shown to be generally accurate, and with supporting trend analysis and scheduled events we can narrow the range significantly. If the data ages beyond two months, it should be refreshed to make a product more current. For example, when reporting a quarterly update to a Service chief and the content of the meeting went through stages and was reviewed during a roughly two-month period, any current readiness data would be stale. The section of current readiness status was always refreshed within two days of the meeting. There is work being done to close that gap so software can detect potential changes and prompt the commander to submit an updated report. Even if we do all this correctly, the data is not all that has to be available. Time is needed to analyze the data. The author has experienced rapid analysis where products were delivered within a few hours in a single working day of the request. The only way to support that kind of efficiency is to have working analysis products ready. That takes meta-analysis of the types of questions to anticipate and prepare. One approach is to build monthly products ready to answer the anticipated questions. This cannot guarantee rapid analytical decision support. In-depth analysis takes time, sometimes days, weeks, or even months. Speeding up the ability to do in-depth analytics is the subject of several parallel efforts. The first is bringing together data from the dozens of relevant databases into a single data environment. The second is supplying powerful tools for analysts and data scientists to use their time more effectively. This includes advanced modeling and simulations that can determine impacts over much larger time horizons in minutes instead of hours or days. The third effort is improving the collaboration across the analytic community so we can help each other and reduce redundant work. Sharing products, tools, and approaches can improve their productivity.

The time crunch only applies to a certain portion of the decision support demand. The precise ratio compared to time-driven decisions depends on external factors beyond the control of the analysts, such as world events. Schedule-driven decision support analysis allows for planning and time to undertake a more in-depth approach. These schedule-driven decisions include budgeting cycles, force management planning cycles, force structure design cycles, and regular Service chief reviews, such as the quarterly event mentioned above. Budget building and integration is an annual process that is well known, so planning analysis for them requires time to review the data and choose focus areas. Some analysis is required every budget cycle, and other specifics are called out for review in annual guidance documents. Force management involves formulation and evaluation of the plan for generating readiness and posturing forces. As with budgeting, this a known schedule every year.[6] In the United States, these events happen annually and two years ahead of time, so we are working on budgeting and force management for fiscal year 2026 during fiscal year 2024. The schedule in general terms is known well in advance and there is time to plan. It can be difficult to execute decisions when schedules shift or key positions turnover and some institutional knowledge is lost.

Data-driven decision support is most often an outgrowth of performing analysis to support either time sensitive or schedule-driven decisions. It is working with data that insight may be discovered and brought to the attention of leadership for a decision. The author has found that most senior leadership will encourage and reward this type of decision support as it gives them the rare opportunity to be proactive.

No matter how fast we can perform an analysis, it still must be packaged into a product and coordinated. This process can take a few hours for high-priority topics—or weeks for lower priorities. Regardless of the rapidity, quality, or depth of analysis, senior leaders are responsible for the decisions based on the data they have. They drive the demand for better analytic support. This demand is driving improved tools, bringing data sources together, and building a better analytic workforce. One must avoid the desire to meet this by building a monolithic workforce and approach. Senior leaders need a diversity of opinions and input to prevent groupthink. Dissenting opinions can be more valuable than a chorus of concurrence.

Ready versus Available versus Suitable

There has been much talk lately about readiness using the three concepts of readiness, availability, and suitability (table 3). With rapid advances in technology and current events ushering in an era of accelerated change after a long period of the Global War on Terrorism, it is natural to be concerned with not conflating these terms as equivalent. A force is ready if it is organized, equipped, and trained to perform its designed mission to the established standards. The concern is that what is con-

[6] Brendan W. McGarry, *Defense Primer: Planning, Programming, Budgeting, and Execution (PPBE) Process* (Washington, DC: Congressional Research Service, 2024).

Table 3. Readiness, availability, and suitability

Readiness	Organized, equipped, and trained to perform its designed mission to prescribed standards.
Availability	Ready for tasking by not being otherwise committed and having an acceptable level of readiness.
Suitability	The organization, equipment, and training is effective for the situation, mission, or adversary being considered.
Sufficiency	Enough available and suitable forces for a given mission.

Source: author's assessment of basic definitions to a military readiness context to clearly frame discussion where the distinction in terms is important, adapted by MCUP.

sidered ready may not be organized, equipped, or trained to meet the real threat. There are two aspects to the concern that a force is available but not ready. One of these is the "paper tiger" problem. This is a valid concern as it has been observed throughout history that a slow erosion of capability due to many causes including gaming the system for personal gain, zero defects mentality, overreliance on looking good, or groupthink.[7] Examples of this problem are the Russian failures to date in the Russo-Ukrainian War, the French collapse in May 1940, or even U.S. struggles to respond to the crisis in Korea in June–July of 1950. The other concern is that we could have a truly ready force, but that force is not suitable for the future fight. It is like having many well trained and equipped horsemen up against tanks. The cavalry could be expertly trained, have the finest horses, and the best saddles, but if they are trained in the massed cavalry charge, they are no match for tanks or machine guns. Evolving capabilities are creating a World War I-like situation where armies rapidly mobilized with doctrines and training that did not account for the devastating advances in defensive firepower of bolt-action rifles, machine guns, and rapid firing artillery. They had to learn the hard way—the disconnect is suitability. Are the ready forces

[7] Gen Charles Q. Brown Jr. and Gen David H. Berger, "Redefine Readiness or Lose," *War on the Rocks*, 15 March 2021.

of today suitable for the future threat? Military leaders should always ask this question in peace or war as there is always the action-reaction cycle. A force that is ready for the wrong mission is certainly available for tasking, thus the admonition to not confuse an available force for a ready force. Once suitable modernization is undertaken, the next challenge is sufficiency. For many years of a modernization program, the force will be a Frankenstein's monster of old and new organizations, equipment, or training, which will require an assessment of the sufficiency of the ready forces—both old and new styles—to accomplish the higher level missions against a variety of threats.

Multi-criteria Decision Making

How senior leadership makes decisions is crucial to understanding how readiness data and metrics can support the decision. Most of these high-level decisions are formal and have a codified process, like the JPP. These decisions are the result of weeks or months of meetings, working groups, analysis, charts, and graphs. Readiness data, metrics, and visualizations may be used and evolved during many iterations. These follow a common pattern that are either repetitive decisions or an event-driven decision process. Formal decision processes are based on much thought and research into an area called multi-criteria decision making (MCDM). MCDM has been around for decades and, in general, seeks to quantify the criteria to aid in making a better decision.[8] One value of a formal process is that it can be documented for accountability and assessment. Decisions involving billions of dollars and lives of servicemembers should be open for scrutiny with security constraints for accountability. Good documentation can help refine the next decision process.

There are more than 40 popular methods of MCDM in circulation. Regardless of the specific version, the concept involves enumerating a set of criteria and then a potential course of action (COA). Each COA

[8] Murat Köksalan, Jyrki Wallenius, and Stanley Zionts, *Multiple Criteria Decision Making: from Early History to the 21st Century* (Singapore: World Scientific Books, 2011), chap. 1, https://doi.org/10.1142/8042.

can be scored and compared and then down selected for execution and assessment of effectiveness. In general practice, a staff will produce three COAs if possible. Depending on the problem, one COA is often the "do nothing" COA, as not acting is also a decision. The COAs should be sufficiently different to represent a meaningful difference, and it is discouraged to use a "throwaway" COA that is an obviously poor option, thus steering the leader to the preferred COA. Most processes do allow the staff to recommend a preferred COA. As depicted in the loop graphic, there is a COA development, refinement, wargaming, comparison, and selection (see figure 10). MCDM processes identify the criteria and scoring used in the refinement, wargaming, and comparison sets so that informs the recommended COA and COA selection. These steps are customizable in time and energy expended depending on time available to make the decision and the resources available to the staff. In crisis action scenarios, a set of COAs can go through the full loop during a single meeting of an integrated/operational planning team. The concept of an integrated product team (IPT)/optional practical training (OPT) has its roots in World War I when it was determined to be more effective to bring together representatives of all stakeholders, empowered by their leadership, to represent their equities together to develop plans.[9] It has been codified in doctrine and practice. In acquisition decision processes, the IPT is also known as an integrated product team as their process produces a product-based plan versus an operation plan or order.[10] Most institutional decisions are not as urgent, and the criteria can be much more complex with a known set of milestones like budgets. These may involve generating analysis products (charts and graphs) over multiple iterations during many months. The process of COA refinement can involve numerous adjustments, for example, when a senior does not like any of the COAs and either asks that aspects of COAs be combined or the set thrown out and sent back to the drawing board. The critiques

[9] Peter FitzSimons, *Monash's Masterpiece: The Battle of Le Hamel and the 93 Minutes that Changed the World* (London: Constable, 2018), 108–21.
[10] *DOD Integrated Product and Process Development Handbook* (Washington, DC: Office of the Under Secretary of Defense, Department of Defense, 1998), chap. 3, 29–45.

are a valuable part of the process. Senior leaders are there because of the special trust and confidence placed in them to make these difficult decisions, including analyzing which decision is the best given the data available. The analytics, charts, and graphs can help the leader, but they are not a substitute for their judgment. The extent of the process is a function of the personality of the senior leaders. Each has their own style and preferences of how they make decisions and how they prefer to absorb and synthesize information. Some prefer narratives, others prefer graphics. Some will decide during the briefing session, and some will prefer to take the information and make their decision after a period of consideration.

A COA can be described by a narrative supported by charts and graphs that lives on PowerPoint slides and may have backup data and information papers. PowerPoint is merely a tool that, if properly used, can rapidly communicate visual and narrative information and is adaptable to a variety of venues and situations. The use of live, data-based dashboards is often pushed as a superior alternative to static presentations. While it sounds like a better alternative at the first glance, the reality of the senior leader decision process makes it less useful. Senior leaders are typically very busy and there is significant competition for their time. Most institutional decisions for an enterprise as large as the DOD involve socializing and refining COAs across many parts of the department. The COAs must be static enough to build the narrative and analytics and pass them around for comments and refinements. The good news is that at high levels, aggregated data does not generally change rapidly so there is time before the underlying data becomes stale. It is incumbent on analysts to alert leadership if the underlying data has changed enough to alter the viability of and scoring of a COA.

The MCDM approach then can provide a scoring and comparison of the COAs. The scoring is the source of much of the art and science of using MCDM in formal decision making. Having used a variety of approaches, it can be as simple as an abstract score of one to three or four representing relative cost or complexity. In the following example, we can use a 1 to 3 scale with 3 being high cost or complexity, so across

Table 4. Example multi-criteria decision making matrix

COA	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Sum
COA 1	1	1	3	3	3	11
COA 2	2	2	2	2	2	10
COA 3	3	3	1	1	1	9

Source: courtesy of author, adapted by MCUP.

multiple criteria the ideal COA would have the lowest cumulative cost (table 4).

In the example, each criterion is relative to the other, but the sum across the criteria indicates that COA 3 has the lowest total cost and may be the preferred COA. This approach provides a broader perspective as the high cost on criteria 1 and 2 could mask the others and miss that COA 3 is better than COA 1. This approach is only as good as the criteria selected to evaluate. Sometimes this is limited to what we can measure. Variables we cannot measure may be omitted or become a footnote. All the decision processes have an evaluation or assessment phase that is supposed to refine the next iteration. With criteria clearly enumerated, the assessment can be used to include criteria that were missed or adjust the scoring to fit reality.

Coup d'Oeil

Napoléon's glance is a concept that may represent the opposite of MCDM. It is referenced by many notables of military art and science. From Carl von Clausewitz to B. H. Liddel Hart, it is an innate or intuitive ability to perceive and analyze a situation and its possible outcomes all in the mind nearly instantly and make a decision: "When all is said and done, it really is the commander's *coup d'oeil*, his ability to see things simply, to identify the whole business of war completely with himself, that is the essence of good generalship. Only if the mind works in this comprehensive fashion can it achieve the freedom it needs to dominate events and not be dominated by them."[11] Its initial meaning was more tactical; an eye for the ground is well known among military professionals. As with many concepts from the eighteenth century, the meaning has expanded beyond the "eye for the ground" reference to decision making.

Is the mark of a great general the ability to make good intuitive decisions? Is this ability innate? These ideas have significant implications. Fortunately, modern scholars have done some important work on human cognition and how we make decisions. Daniel Kahneman described these as System 1 for intuitive decision making and System 2 for slow and calculated decisions.[12] Based on this approach, it is more likely that that coup d'oeil is not innate but learned given that there is a range of propensity for that type of decision making. More simply, it is learned, but some learn it faster and/or better than others. Experience shows that we achieve a System 1 approach as we gain experience in a given dataset. The data could be from a sport, hunting, painting, cars, or military readiness. In essence, expertise is developing the capacity of a System 1, coup d'oeil, for the given subject. It takes months to train an analyst to see the patterns and detect anomalies in a given data environment, and some get it faster and better than others. Kahneman does point out the dangers of System 1 decision making—it can be tricked. It works so fast because it uses shortcuts.[13] The brain is a powerful optimizer that uses these patterns to work very quickly through a massive amount of data stored (approximately 2.5 million gigabytes).[14] A great example is the ability to see and recognize faces. We store a significant amount of image data, but the pattern recognition tricks us into seeing

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[11] Clausewitz, *On War*, 578.

[12] Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus, and Giroux, 2011), 20–21. System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control. System 2 allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration.

[13] See Kahneman, *Thinking, Fast and Slow*, 209–21, describing the "The Illusion of Validity." That is the name of the section in the book, and it is an important concept that appears in other literature.

[14] Paul Reber, "What Is the Memory Capacity of the Human Brain?," *Scientific American*, 1 May 2010.

faces in the Moon, toast, or random rock formations. The danger is that these institutional decisions are often very complex sets of criteria. There is a subtle pressure and desire to use System 1 to demonstrate intuitive expertise and to be seen as wise, when using System 2 is what is really needed to perform complex calculations. Senior leaders may have been exposed to many of these complex decisions and may have developed some System 1 capability against this type of problem, and that is what is needed in crisis action planning when there is no time for detailed analysis. Using the calculated System 2 approach should be encouraged as much as possible to help "teach" System 1 a more accurate pattern. Grinding through numerous MCDM processes and working groups can build the expertise to enable more effective senior leaders. One could describe the scientific method as using a System 1 decision to devise a theory that then experimentation, a System 2 calculation, can confirm or deny.

A heuristic approach can be defined as "proceeding to a solution by trial and error or by rules that are only loosely defined."[15] In the military readiness arena, the related decisions are seen through the loosely defined rules of military maxims. These are oft quoted in professional military education from entry level training through command and staff colleges to war colleges. Most senior leadership are either veterans or had the opportunity to attend the top-level schools. Sun Tzu, to Clausewitz, Antoine-Henri Jomini, Alfred Thayer Mahan, and others provide a backdrop of principles of war.[16] Formal education tells leaders to keep these principles in mind when making decisions. Some of these principles become criteria in an MCDM COA matrix. Others can be used to weigh options in COA comparison. The definition above does describe a distilled version of much of the decision-making process, given a set of loosely defined rules and using trial and error to choose a COA. Assess the effectiveness and then do it again. There is never a perfect solution as all things are in motion. Some things are moving

[15] Oxford Languages Online Dictionary, Oxford University, accessed 5 January 2025.
[16] *Joint Warfighting*, VIII. There is an enumeration of 12 principles referred to as the Joint Principles of War and further explained on pp. II-14–II-15.

fast and others slowly, making decision making even more difficult and fluid.

Military Readiness in Decision Making

Military readiness data is a component of decision support for senior military and civilian leaders for budgeting, force design, force generation, force employment, and war planning. It is used to answer the fundamental questions of:

- Can I fight effectively now or in the future?
- Was the preparation sufficient for readiness (i.e., how effectively did I organize, equip, and train the force I said I needed)?

To say we use military readiness data for decision support is one thing, but we need to consider the value proposition. What is added to the decision process? We do not want to bog down an already difficult process. The readiness data analytics can add value along three lines:

- Provides the opportunity to "see yourself."
- Provides top cover to decisions that would otherwise be guided by institutional bias.
- Provides a foundation of understanding readiness based on neutral, unbiased data.

The phrase "see yourself" has become common in the halls of the Pentagon. There is an honest desire among senior leadership to have a mirror that shows their organizational health with as little distortion as possible. In the offices of readiness shops, we called this "reading the news" or "calling balls and strikes." Each phrase captures the idea of an impartial umpire. The data is not the decision. It is not necessarily the answer or even a potential course of action. When preparing senior leaders, the current status slide is merely the starting point. It is like the map of the shopping mall or airport with a big star that says, "you are here." The top cover is the decision support aspect of readiness analytics with "support" as the key word. Decisions must be made with or without supporting readiness data analytics. There is often no time to wait. That shifts the onus on the readiness analysts to figure out how to organize and train to provide the timely support needed. Without the unvarnished readiness data, decisions will be made based on the bias or coup d'oeil of the leader making the decision. It may not change the decision, as many times the data aligns with the leader's intuition. The times that it does not and it influences the decision are the true value added. Either way the decision goes, it has supporting data to understand why the decision was made. When going back to understand why decisions were made it is often said, "I made the best decision I could with the data I had at the time." We have to show what that data was. The final bullet is vital to get past strawman arguments over the data. The readiness data is not perfect—no data source is perfect, but it is a common set that is neutral and unbiased as possible.

These decisions follow a formalized process given their importance and complexity. A staff, IPT/OPT, or working group supported by data scientists and analysts will study the problem seeking to distill it to its essential elements. Senior leaders must have the necessary information to make a decision and not be overwhelmed by details that do not change the essence of the decision. The supporting staff determines a set of COAs, refines them, and then performs a COA comparison. The senior leader is typically presented a read ahead or prebriefs before the decision meeting. They come prepared to discuss the COAs and arrive at a consensus if there is a group or leaders or choose a COA if no consensus is necessary. The decision is then codified in a decision-type memorandum (DTM), execution order (EXORD), deployment order (DEPORD), or modification to an existing order or plan.[17] The supporting readiness data is used at each stage in data visualizations in various iterations of the decision brief. The process may involve dozens of meetings and multiple versions of the supporting data and visualizations. Some iterations may change the data to be included or modeled,

[17] *DOD Instruction 5025.01, The DoD Issuances Program* (Washington, DC: Department of Defense, 2023), 13; and *Global Force Management Allocation Policies and Procedures*, Chairman of the Joint Chiefs of Staff Manual 3130.06D (Washington, DC: Joint Chiefs of Staff, 2024), enclosure F.

and others may be cosmetic changes to help convey the information more effectively. This readiness data may include a mix of descriptive, diagnostic, and predictive analytics to provide a data-informed COA. Decision support is not telling the senior leader what COA to choose. Senior leaders want to know what happens if they choose a COA. They want to understand the ramifications of a decision. The readiness data can then tee up data-driven decisions to mitigate the risks revealed in the data. A good analyst will retain the work as major decisions or contentious ones are often revisited or analyzed. It is not as dramatic as battlefield decisions made over maps spread out on the hood of a command vehicle, but it is no less vital. If done properly, it sets the conditions for the battlefield commander to have viable options with forces designed, staffed, equipped, and trained at the right time and at the right place.

CHAPTER 4

THE RANGE OF MILITARY OPERATIONS

Understanding that readiness is not just being ready for the "big one," but it is the ability of the military to conduct a range of operations across a continuum of conflict, to include noncombat operations such as deterrence, support to civil authorities, and disaster relief. The uncomfortable reality of the twenty-first century is the blurring of the lines between peacetime and wartime. Many hold the notion that there should be clear lines delineating war and peace, but throughout history there have been numerous gray zone conflicts, including civil wars, civil unrest, proxy conflicts, insurgencies, etc. History has clearly shown that these are not rare exceptions but actually quite common. Given that these types of military operations are known possibilities, and their likelihood is high compared to a major conflict, it would be irresponsible not to be adequately prepared.

The former chairman of the Joint Chiefs of Staff, General Joseph F. Dunford Jr., is quoted as saying, "Our traditional way that we differentiate between peace and war is insufficient" and "we think of being at peace or war . . . our adversaries don't think that way."[1] In Rosa Brooks's *How Everything Became War and Military Became Everything*, she uses

[1] Colin Clark, "CJCS Dunford Calls for Strategic Shifts; 'At Peace or at War Is Insufficient'," Breaking Defense, 21 September 2016.

the peacetime versus wartime dichotomy as a basis of much the discussion.[2] In many respects, it represents a false dichotomy and eventually comes back around to the "gray area, " the middle ground on the range of military operations between little to no armed conflict, "peace," to large scale combat operations, "war."[3] She questions the use of military capability for much of the "gray area" operations, such as expeditionary hospitals.[4] The reality is that the military has capability needed to fight a potential conflict and represents a sunk cost for the nation to use to help those in need. This activity is also part of the range of competition between nations to invest in goodwill, opening markets, and potential alliances, as well as supporting existing partners and allies. These operations can build institutional readiness by working out the details of deploying and employing capabilities in a dynamic real-world environment. The second problem is that the military culture is deeply ingrained in many societies so that military service is a cultural norm and to build a purely civil version of that kind of capability would be much more difficult to sustain, or impossible to build at the scale needed. The flexible use of military capabilities has a long history, including the Romans, whose professional military guarded the far-flung frontiers of the empire, but also built roads and enabled the peaceful establishment of civil society.[5]

Is the blurring of the lines a cynical power grab from the military-industrial complex or a pragmatic reflection of geopolitical realities? There is historical precedent of a general mistrust of a large standing military. It is a tradition brought to the United States from Great Britain. Their mistrust flowed from the turmoil of the English Civil Wars and the Commonwealth.[6] When attempts to provide the revenue via taxation for large land forces to be based in the colonies, it helped

[2] Rosa Brooks, *How Everything Became War and Military Became Everything: Tales from the Pentagon* (New York: Simon & Schuster, 2016), 169–82.
[3] Brooks, *How Everything Became War and Military Became Everything*, 340–41.
[4] Brooks, *How Everything Became War and Military Became Everything*, 357–58.
[5] Adrian Goldsworthy, *The Complete Roman Army* (London: Thames and Hudson, 2003), 145–49.
[6] Rodert Middlekauff, *The Glorious Cause: The American Revolution, 1763–1789*, rev. ed. (Oxford, UK: Oxford University Press, 2005), 56.

spur the war for independence.[7] The United States maintained a small army that would form the nucleus of a large army in times of necessity. During both World Wars, the United States rapidly mobilized hundreds of thousands of soldiers, sailors, Marines, and airmen.[8] During World War II and its aftermath, the world changed. Military capability became more technically advanced, and the atomic bomb fundamentally changed the dynamics of warfare. We were now faced with a world where an existential threat could be realized in mere minutes. Many adversaries confronted with annihilation were forced to focus on asymmetric competition and warfare. The blurring of the line was in fact an outgrowth of the nuclear sword of Damocles, which is a natural consequence of nuclear power.[9] Competitors develop strategies to advance their aims without triggering policy or legal thresholds that can result in escalation. This could also be described as incrementalism—small actions taken over time that chip away at an adversary until the policy goals are achieved.

A modern military cannot afford to be an idle force waiting for the event that may never happen while not participating in the full range of operational capability or attempting to operate without proper organizing, equipping, and training. While many military capabilities are single use for warfighting, like artillery, nuclear weapons, or tanks, there are a multitude that can be broadly useful for a variety of activities such as expeditionary hospitals, construction, power generation, water purification, and bulk fuel distribution. The list is long, and it would be immoral for a government to withhold these capabilities in a time of need instead of saving them for a potential conflict.

The Nature and Character of War

The nature of war describes its unchanging essence. Its attributes differentiate war from other human endeavors. The character of war describes the changing way that it manifests in the real world. While

[7] Middlekauff, *The Glorious Cause*, 62.
[8] Richard Betts, *Military Readiness: Concepts, Choices, Consequences* (Washington, DC: Brookings Institution, 1995), 5–15.
[9] Betts, *Military Readiness*, 29, 58–61.

the nature of war is unchanging, our understanding of the theory and practice changes as we gain more insight into how warfare fits into the human experience. Like it or not, war has been a part of the human experience from our earliest understanding of human history. At its genesis, it was part of group dynamics. Groups of humans worked together starting with familial ties as a survival strategy. Groups came into competition and that can escalate to the use of violence to resolve a dispute. Carl von Clausewitz postulated that war was a continuation of diplomacy by violent means.[10] Some have said the opposite, that diplomacy is a continuation of war by less violent means, buying space and time for a resumption of fighting.[11] It is worth arguing that war is a range of military activities that are part of a larger continuum of competition. The military enterprise of nations is the marshaling, control, and application of violence, or the threat of violence, across the broad array of activities as part of the competition between nations and people groups.

For the sake of illustrating general motivations that drive nations, people groups, or more importantly their political and military leadership into competition, the following list is an overview drawn together by the author. It is neither comprehensive nor drawn from any one source. It does illustrate the wide range and that some motivations intertwine.

- Markets for expanding economies: opening trade routes and making trade agreements through negotiation or coercion
- Resources for economic growth: oil, rare metals, raw materials for industry
- Basic resources to sustain population: food, water, energy
- Ideological expansionism: religion, -isms (fascism, Communism)
- Historical redress: perceived need to address a historical loss

[10] Carl von Clausewitz, *On War,* trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 87.
[11] Andrey Kortunov, "Politics as Continuation of War by Other Means?," Modern Diplomacy, 28 October 2018.

- Manifest Destiny or imperialism: perceived need to expand power and influence, such as U.S. westward expansion or Great Britain's building of their empire across Africa, India, and the Pacific are examples
- Independence or decolonization: the founding and establishment of a new state breaking away from an established state, such as Eritrean independence from Ethiopia, the decolonization of India, Burma, Vietnam, and Algeria (post–World War II era)
- Clash of cultures: expansion and/or movement of populations that have perceived incompatible cultural differences (e.g., race wars or ethnic cleansing), including Bosnia and the Islamic State of Iraq and Syria (ISIS)
- Dynastic sustainment: keep the ruling family or class in power, as seen in the three generations of Kim Il Sung (in power 1948–94), Kim Jong Il (1994–2011), and Kim Jong Un (2011 to present)
- Kleptocracy: the pursuit of the personal enrichment of leaders, arguably the Russian Federation fell into this as the "oligarchs" obtained massive wealth and former state-run industries after the fall of the Soviet Union
- Balkanization: the deconstruction of a nation-state into component groups or regions often driven by one of the other factors and/or the ineffective administration of the nation. The word is derived from the collapse of Yugoslavia into its components of Serbia, Croatia, Slovenia, and Bosnia
- Retain balance of power: keep perceived competitors in check, maintaining the status quo. Classic casus belli in Europe during the eighteenth century = keeping the power of France and/or Holy Roman Empire in check

The list is in no particular order and specific conflicts often have a mix of these factors. They are not often cleanly discernible, and some factors can be co-opted by leadership to justify other motivations, like a dynastic leadership using an ideology as cover for its purely self-serving aggression. These are not restricted to nation-states but can apply equally to internecine conflicts and transnational people groups.

Military Strategy

To obtain the full benefit of the significant investment of a nation into its military capability, there should be an underlying strategy to guide all aspects of designing a force through staffing and equipping rather than just force employment. Most nations have some sort of formal strategy development process. This process should integrate various parts of the government and military. Ideally, this should produce a military strategy to guide all the parts of the military establishment. All large enterprises struggle to align the multitude of efforts into a cohesive implementation, but the strategy serves as the guardrails on the highway of activity. The challenge in producing an effective strategy is to build flexibility to adjust to situational changes and to innovate. A weakness of large institutions is dealing with innovations and innovators. Military organizations can be profoundly conservative due to the necessary order, discipline, and adherence to orders. Paradoxically, military organizations often embrace innovation as the overarching mandate to succeed in conflict. If an innovation leads to a win, it gets adopted. It may seem incongruous to be so rigid yet also so open to innovation.

We are part of a military revolution that dates to the adoption of firearms and the industrialization of warfare. Military technology prior to roughly 1500 was generally stable in capability for the previous 2,000 years (i.e., swords, spears, arrows, shields, and armor). With the adoption of firearms, the speed of innovation gained steam. Firing mechanisms improved, organizational changes were embraced, and mass production became critical. Society went from a handmade matchlock, smooth bore musket throwing a 500 grain (1.14 ounces) lead ball 100 paces to an intercontinental ballistic missile with multiple independently targeted thermonuclear warheads in 400 years. The accompanying organizational changes from semiprofessional armies of a few thousand raised for a conflict and disbanded to current standing professional militaries with hundreds of thousands to millions of servicemembers and civil servants.[12]

Military strategy cannot be divorced from social norms that provide constraints to the exercise of all means. Going into World War II, there was a much greater tolerance for collateral damage that was justified as a limitation of technology, the existential threat, and the precedent leading to an escalation throughout. Tolerance has gone down significantly coming into the twenty-first century. This is arguably the consequence of mass media that has become increasingly pervasive. The lowered tolerance for collateral damage has also driven technological and doctrinal changes behind the precision strike regime and pervasive surveillance.

The precision strike regime as we know it covers guided, smart munitions including antitank guided missiles, programmable cruise missiles, Global Positioning System (GPS) guided munitions, and kamikaze first-person view (FPV) drones. When precision strike capabilities rolled out, they were only affordable for major military powers. Due to the expansion and reduction in the cost of microelectronics, this led to a proliferation of these capabilities. Conflicts of the twenty-first century like the Syrian Civil War, the Armenian-Azerbaijan War, and the Russo-Ukrainian War have all shown the growing impacts of precision strike munitions, often in the hands of proxies or less than top tier militaries.[13]

Pervasive surveillance is becoming a harsh reality of modern military operations. The proliferation of surveillance means that anything from multi-billion-dollar exquisite satellite constellations to off-the-shelf drones provides unprecedented battlefield awareness. It makes the concentration, maneuver, and disposition of forces increasingly difficult. Coupled with precision strikes at greater distances, it can upset the current understanding of the balance between defense and offense. Some

[12] Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800*, 2d ed. (Cambridge, UK: Cambridge University Press, 1996), 155–76.
[13] Thomas G. Mahnken, "Weapons: The Growth & Spread of the Precision-Strike Regime," *Daedalus* 140, no. 3 (Summer 2011): 45–57.

authors opine that maneuver warfare as we know it is dead.[14] This will force a greater dispersion of forces. Dispersion of forces in basic tactical formations goes back to World War I with a rapid increase in lethality of weaponry. This makes command and control dependent on radios. With greater dispersion, even radios with their physical limitations struggle to keep up, which creates a new dependency on satellite or drone relays for communication as well as surveillance, all of which are vulnerable to electronic warfare. Can widely distributed forces operate without positive communications along mutually supporting cooperative objectives? If this is required, how are these formations sustained? These questions cannot be answered here. This illustrates an important concept in readiness assessment. Since the character of war is in constant flux, overall readiness metrics must be relative to the current understanding of the capabilities needed. It is also worth noting that pervasive surveillance is a significant contributor to the data explosion. All this information overwhelms the ability to analyze it. Distributing the data and the growing dependency on it creates a strain on the bandwidth and creates a critical vulnerability. If one becomes accustomed to seeing everything and that capability is denied, can the force continue to operate? Will its leaders become paralyzed to act without enough information? Is there enough precision strike capability to engage all the targets? Will forces strike what they see versus what is a high value target, forcing a manufacturing and distribution problem with precision strike munitions?

The Range of Military Operations

Having referred to the range of military operations already, it may be helpful to provide a detailed working set of potential military activities that run the range.[15] The following list is not necessarily comprehen-

[14] Patrick Hofstetter, Alan Borioli, Till Flemming, "Manoeuvre Is Dead—But It Can Be Revived: Overcoming Stalemates by Gaining Competitive Advantage," *Defense Horizon Journal,* 28 October 2024; and Col Pat Garrett, USMC (Ret), and LtCol Frank Hoffman, USMCR (Ret), "Maneuver Warfare Is Not Dead, But It Must Evolve," U.S. Naval Institute *Proceedings* 149, no. 11 (November 2023).

[15] *Joint Operations*, Joint Publication 3-0 (Washington, DC: Department of Defense, 2011), V-1–V-2.

sive but is based on historical precedent and widely known potential capabilities.

- Legitimate presence for training, deterrence, and demonstration—Joint exercises, freedom of navigation, and security cooperation events
- Humanitarian assistance/disaster relief (HA/DR) and defense support to civil authority (DSCA)
- Proxy forces (across the spectrum below, Special Operations Forces)
    a. Includes equipping and training (example: Ukraine)
- Nonkinetic strikes only (cyber, electronic, space, and information warfare)
- Air or missile strikes only (Iraq no-fly zone, Libya, Serbia, Syria)
- Small-scale intervention less than division size (around nine maneuver battalions) (Grenada, Lebanon, Haiti, Panama, Somalia)
- Major intervention greater than division size (Korea, Vietnam, Desert Shield/Storm, Operation Iraqi Freedom, Operation Enduring Freedom). Did not require full mobilization, but some guard and reserve mobilization were used to sustain active readiness
- Major war where mobilization of guard and reserves is required
- Major war where full mobilization of the industrial base and mass conscription is required
- Nuclear demonstration, which can cover a range of launching missiles, surfacing of nuclear capable submarines, to a nuclear detonation in an unoccupied area
- Nuclear strike

Previously, some of these operations were labeled as regional conflicts, and some may be confined to a particular region. Given the global information space, interdependent global economy, and global reach of cyber and precision strike, no conflict could realistically be confined to a geographic region anymore. The list is generally arranged in ascending order of severity. The last three are interrelated, though. There is a nuclear threshold that exists for nuclear equipped powers—that is the point in which the leadership feels justified to conduct either a nuclear demonstration or a nuclear strike. One may start at the nuclear threshold based on the perceived or actual threat. The list does provide a notional set of operations that a military force may need to be ready to conduct, not just the major war with full mobilization.

This list then leads to a discussion of risk. The range of operations needs to be trained to be proficient. A given to the argument is that it is not possible to be ready to do all activities all the time. There are resource constraints, time constraints, and human limitations to support the argument. Risk is an issue that may happen at some point in the future. Risk is not a problem happening now; it is an issue needing resolution. Formal risk analysis starts with an if-then statement that describes the risk followed by an assessment of probability and consequence. For example, if the military does not train to support proxies, then that military option is not readily available. The probability is high that working with proxies will occur, but the consequence is much less than an existential threat. Generally, the less capable a force is in the lower end of the range, it will increase the likelihood of the need for readiness in the more severe end. The opposite is not necessarily true, however. The force that is strong on the high end and weak on the low end is vulnerable to asymmetric competition in the low end.

Readiness assessment is not a risk assessment. Managing readiness for a military or national enterprise is part of a larger risk mitigation plan. A military strategy codifies the decisions and guidance as part of that overarching risk mitigation. In discussions of risk management, there are four basic types of risk mitigations:

- Avoid: do not undertake the "if" section of the risk. If rain is a risk to a wedding ceremony, planning to do it indoors avoids the risk. This may include the use of diplomacy, information, or economic power as other levers of national power to avoid military risks.
- Control: invest in activities or capabilities to reduce either the probability or consequence. This is the domain of a nation in-

vesting in a military enterprise. Its size, equipping, and readiness to act are all types of risk control investments.

- Accept: No military undertaking is risk free; military activity comes with inherent risks, even in peacetime. Finding the level of risk that leadership is "comfortable" in accepting is ultimately the goal of readiness assessments.
- Transfer: To let someone else control or accept some of the risk. In the national-military enterprise this is the area of allies, coalitions, proxies, and partners that have common interests.[16]

Risk management has become a pervasive practice across the U.S. DOD at nearly all levels of work, from small unit training to institutional investments.[17] By focusing too much on risk management, there is a pernicious influence of risk management across the military enterprise that is inherently risk averse. It creates a subtle risk averse bias that makes for a force more concerned with not losing than winning.

The Nuclear Threshold and Proportional Force

It is axiomatic that wars are won by decisive overmatch at the critical time and place. This overmatch can be purely military or in the minds of an opponent. Ultimately, defeat is a mental conclusion forced on an opponent by their own perception of the circumstances. If the opponent is convinced that further resistance is futile, they are more likely to surrender. With military force, the easiest way to achieve that moment is through the application of overwhelming force. We seek this in various manifestations such as traditional fire superiority or air dominance to the modern multidomain operations that include information, cyber, space, and electromagnetic spectrum. There are various

[16] *Joint Risk Assessment Methodology*, Chairman of the Joint Chiefs of Staff Manual 3105.01B (Washington, DC: Department of Defense, 2023), B-8.

[17] *Risk Management*, Army Techniques Publication (ATP) 5-19 (Washington, DC: Department of the Army, 2021), 1-2; OPNAVINST 3500.39D, *Operational Risk Management* (Washington, DC: Department of the Navy, 29 March 2018), 3-4; and *Risk Management (RM) Guidelines and Tools*, Department of the Air Force Pamphlet 90-803 (Washington, DC: Department of the Air Force, 2022), 8.

models to help determine the likely force needed to achieve these ends. Much training and doctrine is built around this concept.[18]

When decisive overmatch and nuclear threshold come together, it spawns a tough moral and military dilemma, that is, the use proportional force. Along the continuum of military operations, there is a wide variety of actions below the nuclear threshold. Nuclear capability comes with a distinct stigma and huge risks. It is absolutely necessary to deter other nuclear equipped nations. We cannot guarantee other nations would not use nuclear threats to achieve their policy goals if there was not a balance of power in that arena. In fact, the nuclear balance of power kept the peace in Europe for decades. It does, however, force nations into other means to achieve their goals. Even so, the United States did not depend solely on nuclear deterrence. The United States and many of its allies and partners, as well as our competitors, have made significant investments in conventional military capability.[19] This gives these nations viable options besides racing to their nuclear weapons to resolve every dispute. Given this vast nuclear overmatch, it forces a proportional force problem on the nation. We must voluntarily gauge our military options into proportion to the perceived threat, potentially sacrificing the lives of our servicemembers to "play fair." These are difficult choices on force employment that are also part of the information warfare space. Use of force has enormous implications for positioning the force on the moral or ethical high ground. The use of force must be perceived as necessary and just, at least in the United States. To adversaries, it must be perceived with sufficient risk to deter them. The alternative even sounds odd to our ears, like threatening a nuclear response to an Iraqi invasion of Kuwait.

[18] *Joint Warfighting,* Joint Publication 1-0 (Washington, DC: Department of Defense, 2023), VI-3, VI-4.

[19] "Defence Expenditure of NATO Countries (2014–2024)," press release, NATO, 12 June 2024. "In view of differences between these sources and national GDP forecasts, and also the definition of NATO defence expenditure and national definitions, the figures shown in this report may considerably diverge from those that are referenced by media, published by national authorities or given in national budgets. Equipment expenditure includes expenditure on major equipment as well as on research and development devoted to major equipment. Personnel expenditure includes pensions paid to retirees."

Even states that would be considered rogue (Nazi Germany, North Korea, Revolutionary Iran, Vladimir Putin's Russian Federation) have levels of self-imposed restraint. The Germans in World War II made advancements in poison gas including nerve agents, for which the Soviets had no effective defense. Despite the Germans losing ground rapidly to the Soviet advances in 1944–45, they did not employ these weapons.[20] U.S. forces did not know that they would not, and American troops landing in France brought chemical protective equipment. Some believe that a similar stigma to nuclear employment could set the stage for large-scale conventional warfare between major powers.[21] The author would put Richard Betts in this camp as much of the focus was on the readiness to buy time for full mobilization. Full mobilization can be very destructive to the economy and, during the World Wars, nations were very careful with how far and deep they mobilized until there was no viable alternative. The other argument is that the depth and resiliency of the nuclear triad with its significant investment was meant to prevent ever having to consider full mobilization.

One could naively hope that nuclear capability coupled with significant conventional capability would adequately deter U.S. competitors and would peacefully obtain our policy goals in a mutually beneficial outcome. The reality is that many goals are mutually exclusive, and we are set in competition. It is a geopolitical system under pressure. That pressure cannot be fully contained so it will manifest, most likely where it was least anticipated.

The perverse incentive is to obtain nuclear weapons. The list of nuclear powers is short.[22] This "elite" group has many options open that other nations do not. Through active pursuit of nonproliferation by nuclear equipped nations, it is difficult for other nations to obtain nuclear

[20] Sarah Pruitt, "The Nazis Developed Sarin Gas during WWII, but Hitler Was Afraid to Use It," History.com, updated 1 April 2019.
[21] Jonah Lo, Ng Kang Jie, and Hannah Lo. "Reconstructing the Ladder: Towards a More Considered Model of Escalation," *Strategy Bridge*, 1 September 2022. Deconstructs Kahn's famous escalation ladder with a more nuanced approach across military and nonmilitary actions.
[22] *SIPRI Yearbook 2020: Armaments, Disarmament and International Security* (Stockholm: Stockholm International Peace Research Institute, 2020). The list includes the United States, Russia, China, Britain, France, India, Pakistan, Israel, and North Korea.

capability, but not impossible.[23] The logical next step is to build a conventional capability to achieve policy goals, but given the United States' significant conventional capability, other nations cannot hope to compete but can instantly obtain freedom of action by having nuclear weapons.

If the timeline to obtain nuclear weapons is too long or expensive and building sufficient conventional capability is also prohibitively expensive, the alternative is the asymmetrical use of force via proxy or violent extremist organizations. With these approaches a nation has a buffer, and the risk of loss is transferred to the proxies or terrorists. The edge here is that this approach can exploit an emphasis on nuclear and conventional capabilities. Even if the approach is a longer game, it can distract and buy political maneuver space or bleed resources from the United States as a form of economic warfare. The resource drain can be exacerbated by internal inefficiency. When the United States built a large and capable conventional military in the 1950s and 1960s, it appeared as if the country had a hammer so it saw all problems as nails and thus decisions might not be proportional to the threat. As a result of this large buildup of reserves, there were more than 500,000 servicemembers in Vietnam.[24] Interestingly enough, Vietnam in 1968 had a population of 16 million, and that is less than one-half that of modern Ukraine.[25] The Russian Army invaded with less than 200,000 with a woefully misguided notion that that could subdue such a geographically large nation.[26]

Russia's use of nuclear threshold threats are an interesting case study in the dynamics of the Russo-Ukrainian War in 2022. The Russian Federation used threats to ridicule North Atlantic Treaty Organization

[23] Sascha Sauerteig, "The Effectiveness of the Nuclear Non-Proliferation Regime—An Institutionalist Analysis" (PhD thesis, University of Bath, 2019), 224–25.
[24] David Coleman, "U.S. Military Personnel 1954–2014," History in Pieces, accessed 23 November 2024. This is a summary compiled from the Defense Manpower Data Center with active strength of the Services at 3,302,104 in 1954 after the post-Korea demobilization and shrinking to 2,476,435 in 1960 and building back to 3,547,902 in 1968 at the height of the conflict in Vietnam.
[25] "MACV Orientation Edition," *Stars and Stripes*, Summer–Fall 1968.
[26] Mason Clark, George Barros, Kateryna Stepanenko, "Russian Offensive Campaign Assessment," Institute for the Study of War, 17 March 2022. The report details the mounting Russian failures to achieve decisive results earlier in the invasion.

(NATO) members. However, the threats must be taken seriously as the consequences of a nuclear strike would be significant. This did create a threshold of support to Ukraine that NATO carefully used in a series of incremental encroachment steps to increase the size and effectiveness of the military support, slowly pushing back the threshold. The threat of nuclear strikes when made and then undermined with an incremental approach could be dangerous as it increases the potential decision space between threat and strike that could lead to a misreading of a future situation.[27] The nuclear threats made by Russia were also a confirmation of the loss in confidence of their conventional forces to adequately deter NATO. Action on the ground clearly showed the Russian Army was not as capable as advertised, leaving a nuclear response as their remaining response. Even with the larger population, Russia sought to limit the scope of the mobilization. Though they could theoretically mobilize hundreds of thousands of conscripts, they could not equip them to the level of their current forces.[28] During the course of two years, they could mobilize and equip them in Soviet-era equipment and use mass to overwhelm the Ukrainians, but that does not seem politically viable at this time. Historically, from Imperial Russia through the Soviet Union, the Russian Army has demonstrated great capacity to absorb losses and regroup to the point that its stoic acceptance of heavy losses is a core part of its identity. It would be premature to count them out, though the Ukrainian Army has inherited a similar identity from their shared origins.

The U.S. conundrum is that it must maintain both a nuclear and massive conventional deterrent. The general military strategy is to leverage the buffer provided by two oceans to emphasize expeditionary warfare by engaging adversaries on their territory, thus preserving U.S. physical resources. Therefore, we must overmatch adversaries in a variety of climes and places at the end of a long logistical tether on

[27] Anna Chernova, "Putin Fine-tunes Russia's Nuclear Doctrine after Biden's Arms Decision on Ukraine, in Clear Signal to West," CNN, updated 19 November 2024.
[28] James Beardsworth, "Explainer: What Does Russia's Partial Mobilization Mean?," *Moscow Times,* 21 September 2022.

their home turf. That means the United States has the multifaceted challenge of being ready to fight in many conditions and environments while most competitors can focus on a single use.

Force Generation and Mobilization Models

Betts postulated that readiness was the trade-off to buy time for mobilization. This is rooted in the classic mobilization model from the nineteenth and twentieth centuries.[29] A basic mobilization model can be broken down into three tiers (table 5).

The mobilization model above invests in current readiness of the cadre to have sufficient capability to get the reserves mobilized, and then investment into the reserve buys time for conscription. On the European continent, the time for calling up reserves ranges from two weeks to a month. This provides forces with some training, but it is understood that their proficiency is substantially less than the regulars. This force then must be sufficient to win or buy time for conscription, which would take three to six months to provide replacements to existing units and six to nine months to produce new units. Like the reserves, it is understood that their proficiency would be less than the regular and reserve forces. For major European powers, they used short periods of compulsory service to build a large body of reserves. The longer the time since their compulsory service, the lower the proficiency of this pool. This model could rapidly expand armies from a few hundred thousand to millions and sustain armies in the millions for several years. The mobilization of personnel is also accompanied by the mobilization of industrial capacity. A nation facing mobilization has difficult competing requirements. The mobilization of reserves and conscription are taken from the labor pool needed to perform the industrial mobilization. While a national economy can shift labor, it takes time and that can track with the increasing demands of personnel mobilization. Traditionally, the labor shift included adding women to the labor force, careful use of deferments for skilled workers, use of

[29] Betts, *Military Readiness*, 39–41.

Table 5. Mobilization model

Tier	Content	Description
1	Professional, standing military also known as the cadre	Contains regular formations and partial formations to be filled in by rapid mobilization. Develops and maintains difficult skill sets.
2	Reserves	Minimally trained for rapid call up. Can be subdivided into subtiers based on levels of training.
3	Conscription	Calling up personnel that require entry level training.

Source: courtesy of author, adapted by MCUP.

not physically qualified workers, reducing the capacity for nonmilitary industries, and finally forced labor (as seen in Germany and the Soviet Union). Thus, a nation facing mobilization is facing long-term economic damage.[30] Prior to the nuclear threshold, mobilization could be seen as a form of mutually assured destruction as played out in World War I. Much of the German war planning for both World Wars was built around securing victory before full mobilization of their adversaries could be accomplished. The physical limitations of the time and space involved in conventional mobilization gave adversaries a planning window that could invite a war versus deterring one. When the United States first fielded the nuclear triad concept (intercontinental ballistic missiles, long-range bombers, and submarine launched ballistic missiles) in the 1950s, given the expense involved, the investment was meant to provide a flexible and resilient nuclear deterrent that would eliminate the need for mobilization by providing deterrence that was instantly available with the ability to strike with total devastation of an adversary within minutes.[31]

The U.S. tradition was influenced heavily by the British tradition. For the majority of U.S. history, a small professional army backed by state militias was the conceptual model. The traditional British definition of the militia was all able-bodied men 16 to 60 years of age, and they were expected to be armed and able to provide for the defense of the locality. From the militia forces could be drawn forces on a

[30] Betts, *Military Readiness*, 212–13.
[31] Betts, *Military Readiness*, 20–21, 58–59.

volunteer basis for specific campaigns. The U.S. tradition was to have periods and conditions of service tightly defined and adhered to. This left the United States lagging well behind the European powers, but geography made the basic model unnecessary. The British model was similar. It is worth noting that during the American Civil War state militias were the conceptual pool from which volunteers were called up until volunteers could no longer sustain the forces in the field and conscription was phased in. The British approach in World War I was similar in that the standing army was dwarfed by the French and Germans in 1914, but they fought the Germans to a standstill in Flanders, Belgium.[32] The British regulars were essentially bled out and instead of using the existing territorial forces, the British chose to build a new expeditionary force from volunteers much like the Americans in 1861. This force took time, and the remaining regulars were forced to hang on until it was ready. By 1916, the new army was needed. The French were under great pressure at Verdun, France, and could not hold unless the British applied pressure in their sector.[33] This precipitated the Somme offensive. The new army was not as well trained as the regulars, and that forced their employment to be governed by their limitations. By 1917, the volunteer approach was not sustainable, and conscription was necessary, like the Americans in 1862–63.[34] This third iteration of the British Army required substantial changes in employment due to its limitations. The U.S. experience in World War I was a version of the classic model, but the standing army was too small to provide the cadre to the mobilization of the National Guard and conscripts. The World War II experience was similar, but the buildup was not as rushed as the Franklin D. Roosevelt administration recognized that war was coming.[35]

[32] "1st August 1914, General Mobilization in France," ReallyFrench.com, 5 May 2025. The call to mobilize 3,000,000 went out on 1 August 1914. There were 880,000 active soldiers, "On the 30th of September, 3,986,000 men had been called to serve in the First World War. In two weeks, 686 battalions of Infantry saw their number rise to 1636, the 54 divisions in metropolitan France and the colonies of North Africa were 94 at the end of August."
[33] Goran Corrigan, *Mud, Blood and Poppycock: This Will Overturn Everything You Thought You Knew about Britain and the First World War* (London: Carrell, 2003), 249–57.
[34] Leonard L. Lerwill, *The Personnel Replacement System in the United States Army*, Army Pamphlet 20-211 (Washington, DC: Department of the Army, 1954), 91.
[35] Betts, *Military Readiness*, 217–22.

Rapid demobilization after World War II set the stage for the next era.

Across a broad range of military operations, we have to revisit mobilization models as they are applicable to some types of scenarios where nuclear force is not appropriate but are larger than the standing forces can sustain. Using this train of thought, mobilization is scalable as a cost control measure to provide just enough depth, not necessarily the classic use case of national mobilization as a deterrent. The Korea experience showed a dramatic erosion of conventional capability due to a misreading of the effectiveness of the nuclear deterrent.[36] The asymmetrical, proxy wars that are created by the nuclear deterrent require an appropriate conventional response. Since these conflicts have considerable political constraints, there is a perverse incentive for them to last for long periods; they simmer to avoid boiling over. This strains the available conventional capacity to deter in other areas and as a form of economic and psychological warfare, draining resources from the economy and creating internal turmoil. This is how the United States spent years in Vietnam as a proxy conflict with the Soviets, and the favor was returned in Afghanistan. Prolonged use of conventional forces requires a sustainment version of the mobilization model. The modern U.S. model uses a large standing conventional force and layers of reserves, but they do not scale the force in the same proportion as the classic European model. The United States is committed to an all-volunteer force for active and reserves. This upends the classic model of compulsory, providing a large pool. It does provide for relatively high training standards for reserve forces, just not as many. The U.S. Army National Guard provides less maneuver brigades than the Regular Army (31 to 27). A full mobilization of the National Guard would nearly double the number of brigades, but this is a stark contrast to the classic model where the reserves could provide two to five times the number of personnel. For the other Services, they have even less proportional capacity in their reserve components.

[36] Betts, *Military Readiness*, 224–25.

The next aspect of the classic mobilization model that is increasingly obsolete in this era is that the incredibly complex operating environment has continuously raised the bar for effective entry-level training. During the twentieth century, mass conscription could conduct entry-level training in three to six weeks, followed by skills training for a similar period, then ship them as replacements to existing units. These replacements were clearly not well trained, even by the standards of that period. Units were expected to integrate and finish training the replacements on the job. Building new formations would take much longer as it involved equipping new units as well. Is limited proficiency possible with modern capabilities? The equipping of new formations with complex modern weaponry may take the industrial base two or more years to produce. This constraint buys time for training, but the unit cannot fully train until fully equipped. Equipping was easier in previous eras, when production of rifles and personal equipment was in full swing. Modern equipment involves a myriad of electronics, vehicles, optics, as well as weaponry. Even the complexity of vehicles has come far from the World War II-era jeep to the modern Joint Light Tactical Vehicle (JLTV).[37] New formations could be equipped from obsolete equipment in storage, but that fundamentally changes their capabilities. Russian forces are equipped with 30-plus year old equipment brought out of long-term storage. It is less capability, but it is better than zero capability.[38] Both Russia and Ukraine are using hybrid conscription and contract mobilization models.[39] This approach has not kept up with the heavy losses, and the Russians are bringing in North Korean troops and actively recruiting foreign troops from China and Africa.[40]

[37] Andrew Feickert, *Joint Light Tactical Vehicle (JLTV): Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2024), 1–2.
[38] Vasco Cotovio, Clare Sebastian, and Martin Bourke, "Russia Is Sending Museum Pieces into War, but Experts Say They May Still Be Effective," CNN, updated 8 May 2023.
[39] Guy Faulconbridge, "Russia Says 335,000 Sign up to Fight, No Plans for New Mobilisation," Reuters, updated 3 October 2023; and Samya Kullab and Joanna Kozlowska, "Ukraine's Divisive Mobilization Law Comes into Force as a New Russian Push Strains Front-line Troops," Associated Press, updated 18 May 2024.
[40] Elizabeth Wishnick, "The Chinese Mercenaries Fighting Russia's War in Ukraine," *Diplomat,* 1 May 2025.

The U.S. military Services have consistently raised the bar over time since the introduction of the all-volunteer force post-Vietnam. The available pool of recruits grows smaller as the disqualifying conditions expand and the physical requirements increase. Recruits used to ship out to basic training and would be whipped into condition there, but now with delayed entry programs, recruits in the pool often train together to pregame the training before arrival. The U.S. military is more than 1 million strong, which hypothetically would need to attract no more than 20 percent of its total strength in any given year, so that higher end number is approximately 200,000 volunteers.[41] According to the Census Bureau, the U.S. population in 2020 had 22,494,260 males between 20–29 years of age.[42] Even if only 5 percent were physically qualified, this represents 1,124,743 from the population. The cycle of the 20–29 age band is roughly 2,000,000 per year. Keep in mind that including females doubles the eligible population. A smaller U.S. population in 1940–45 put more than 12 million in uniform.[43] The United States could certainly make a larger pool of personnel available but could not realistically train them to the level of the standing professional force, and it would take years to fully equip them. The Selective Service System providing some infrastructure to support a larger scale mobilization has not been exercised and its capability to generate the needed personnel is unproven.[44] Traditionally, patriotic fervor at the outset of hostilities can bring a flood of volunteers, but that action tends to lose steam. The current model could supply a steady stream of less qualified replacements to existing formations but would take a long time to produce new formations.

[41] *2022 Demographics: Profile of the Military Community* (Washington, DC: Department of Defense, 2022), 13.
[42] Laura Blakeslee et al., *Age and Sex Composition: 2020* (Washington, DC: U.S. Census Bureau, 2023), 5.
[43] David Coleman, "U.S. Military Personnel 1954–2014," History in Pieces, accessed 24 November 2024. Compiled from the Defense Manpower Data Center (DMDC).
[44] Katherine L. Kuzminski and Taren Sylvester, "Back to the Drafting Board: U.S. Draft Mobilization Capability for Modern Operational Requirements" Center for a New American Security, 18 June 2024.

During World War II, the U.S. industrial base was broad and was able to produce full equipment sets for combat divisions by 1944–45 after a two-year ramp up. For example, U.S. Army divisions in the Philippines in October–December 1944 that were allocated to the coming assault on Okinawa were fully reequipped, including uniforms, small arms, vehicles, radios, etc.[45] If we consider what it would take to provide a full equipment set for even a division of two heavy brigades, could the United States realistically produce enough tanks, fighting vehicles, radios, optics, and electronics after a two-year ramp up? It is a little more realistic if we consider infantry formations liberally equipped with drones and low-cost, easier to produce loitering munitions.

There is a critical decision point in mobilization planning that produces a substantially less capable force. At that point, military planners are faced with a regression of capability. Just like the British in 1916 and 1918, they had increasingly less capable infantry formations that necessitated inventing a new form of warfare, leveraging the technology of tanks and aircraft as force multipliers and economy of force measures to accomplish the same tasks. Necessity is the mother of invention. Less capable infantry formations can force innovation. One approach was to use massed infantry attacks that could lead to heavy losses based on the "mass has a quality of its own" concept.[46] This approach can lead to a collapse in morale or the eventual running out of people. Using the bodies of soldiers to absorb enemy ammunition until they run out is a terrible plan and it is antithetical to the U.S. military ethos. Adopting a combined arms approach that closely integrates artillery, infantry, tanks, aircraft, and logistics was the winning approach for the British

[45] Nathan N. Prefer, *Leyte 1944: The Soldiers' Battle* (Philadelphia, PA: Casemate, 2012), 315. The 7th, 77th, and 96th Infantry Divisions of MajGen John R. Hodge's XXIV Corps were fully reequipped in late December after nearly three months of hard combat on Leyte in preparation for the Okinawa landing in April 1945.

[46] This is a modern paraphrase used commonly in Pentagon discussions using the term *mass* from the standard principles of war in place of *quantity*. The quote is attributed to Joseph Stalin, but its exact origin is not clear.

in 1918 and was continued through World War II.[47] This approach was an industrial-age approach to warfare, emphasizing steel over flesh.[48] Massed fires and liberally equipped forces became the definition of the American way of war through the end of the twentieth century.

The key point here is that the twentieth-century view of readiness as readiness for a large-scale conflict to buy time for full mobilization is outdated. The more modern view of readiness may include a time trade-off, but what mobilization would look like is not what it was before. It could follow a similar pattern as the British World War I model, or numerous variations of partial mobilization of some sectors of the society or economy. Much of this is based on the progress of the conflict. Much of U.S. readiness is focused on available capability to deter the start of a conflict or reduce the chance of a prolonged conflict. Once a conflict starts, it takes on a life of its own. The ability to resource and measure military readiness cannot predict the outcome of a given conflict, and the question goes beyond purely military considerations.

The Germans were by all available measures ready for World War I at the beginning. They had a large, well-equipped, and reasonably well-trained military. The planners had carefully determined the delicacy of their position between potential adversaries. They determined, quite accurately, that if they did not win in the first few months that mathematically they could not win a two-front war. When they lost the Battle of the Marne in September 1914, it was clear even then that they could not win, but nonmilitary considerations prolonged the war, despite the potentially advantageous bargaining position the Germans held.[49] We see a similar problem in Ukraine in 2022; the Russians needed to win quickly for a major policy victory, but they did not and now

[47] Peter FitzSimons, *Monash's Masterpiece* (London: Constable, 2018). Australian Gen John Monash created what he called "peaceful penetration" by creating an integrated planning team with armor, infantry, artillery, and air planners to figure out combined arms warfare. This was the testbed adapted for the Amiens 100-day campaign.
[48] James Holland, *Normandy '44: D-Day and the Epic 77-Day Battle for France* (New York: Grove Press, 2019), 554–56, 575–78, 610–12.
[49] Holger H. Herwig, *The Marne, 1914: The Opening of World War I and the Battle that Changed the World* (New York: Random House, 2009), xi, xii, 315–16; and Winston S. Churchill, *The World Crisis, 1911–1918* (New York: Free Press, 2005), 168.

find themselves in a prolonged conflict. Arguably, it was an attempt to resolve the conflict started in 2014, but they have an advantageous position in the possession of terrain but have not to date chosen to use it for incremental or more modest policy gains.[50] In both cases, larger considerations drove decisions well beyond purely military readiness.

A final consideration in a broader context is that in a complex world, military readiness is still useful during a conflict at a given level. Readiness measurements can support decisions on conflict continuation or escalation as well as deterrence in other areas. Since most conflicts are not world wars, measuring readiness is just as important as there could be opportunistic adversaries that could require a range of responses. Even in a larger mobilization scenario, readiness measures can assess the effectiveness of the enterprise in reconstituting formations, building new formations, and deploying ready formations.

U.S. Changing Tradition of Military Readiness

The United States had a long tradition of minimal readiness prior to World War II. That tradition has changed. Conflicts from the Revolutionary War to World War II involved mobilization and raising new military units and then demobilizing them after the war passed. Post–World War II marks a completely different approach. The establishment of a large standing conventional and nuclear-capable military enterprise changed everything. This enterprise has been in place for more than 70 years, experienced numerous military operations, and is highly unlikely to revert to the previous model. The basic difference is that for the largest operations, the United States used standing units while maintaining other standing units in various theaters to maintain deterrence and the ability to do so increased in effectiveness over time. The sequence of the major military operations discussed here are Korea, Vietnam, Operation Desert Storm, Operation Enduring Freedom, and Operation Iraqi Freedom. There were many other smaller events

[50] Samuel Charap and Sergey Radchenko, "The Talks that Could Have Ended the War in Ukraine: A Hidden History of Diplomacy that Came up Short—but Holds Lessons for Future Negotiations," *Foreign Affairs*, 16 April 2024.

that would normally be handled by standing forces, even in a previous era. These events involved significant commitment of forces that would have been beyond the scope of the previous era's standing forces.

Korea in 1950–53 was the first test of the new paradigm and did not start smoothly. Many works have dealt with various aspects of lack of readiness, especially at the beginning. It is worth taking a step back and reviewing the readiness of the standing force to deploy forces. To shape the discussion, it is clear that without U.S. intervention, the North Koreans had overwhelming military advantage over the South Koreans and were going to achieve a decisive victory within days. The conventional wisdom did not yet fully understand that nuclear deterrence was inappropriate to deal with this situation. Conventional warfighting capabilities atrophied as many felt that large scale conventional warfare was no longer necessary with nuclear weapons coupled with rapid reduction in the size of the standing force from the World War II force. This general situation meant that U.S. conventional forces were not ready to engage in high-tempo, major conventional combat operations. However, there was significant residual readiness and capability that was rapidly brought to bear. Much has been written on the lack of readiness of Task Force Smith, which was the first U.S. ground unit committed to action.

The Korean War started on 25 June 1950. Task Force (TF) Smith went into action on 5 July after coming together the day before, and only 10 days after the conflict started. This involved a strategic decision to commit U.S. forces, identifying what forces were available, leaving Japan to get to Korea, and traveling to the battlefront. There was very little time for mission analysis and training. The unit was made up of 406 men of the 1st Battalion, 21st Infantry Regiment, 24th Infantry Division (less its Company A detached), and 134 men of Battery A, 52d Field Artillery Battalion, both under the command of Lieutenant Colonel Charles B. Smith. By readiness measurements, the soldiers of Task Force Smith were not a ready unit. The infantry battalion only had two of its usual three rifle companies and these were understrength. They set up north of Osan, South Korea, in a blocking position on the main road leading south. Their flanks were open, meaning the left and right flanks had no other friendly forces. This is a common military technique, but these positions cannot be held for long; it is meant to delay an advancing enemy force to buy time. During World War II, there are several instances where single battalions held up significant enemy forces, including those supported by tanks. The common denominator in the precedent was a large amount of supporting artillery. In many cases, an infantry battalion could be supported by the fires of as many as seven artillery battalions laying down a "steel curtain" of fire.[51] TF Smith only had the single battery of six guns attached. They faced the advance of the North Korean 4th Infantry Division, with its nine infantry battalions, supported by tanks. The task force delayed the North Koreans for about 8 hours at the cost of 150 casualties (20 killed and 130 wounded or missing) or 28 percent. This loss rate is consistent with engagements during World War II, with similar tactics and technology. The equipment of the battalion was largely ineffective against the Soviet-made tanks but was sufficient to inflict punishment on the North Korean infantry. The mention of TF Smith is intended as a cautionary tale these days.[52] However, from an operational readiness standpoint, the speed of getting a military unit of any level of readiness to that location in that time is significant. Would a fully ready 800-man battalion with newer antitank weapons have made a difference? In the big picture, no, the position would have been outflanked anyway and may have bought more time, but it would have become untenable by the much larger enemy force, and TF Smith in all likelihood would have used darkness to withdraw to another position as was doctrine of the time. A single battalion task force will not defeat an infantry division, not with the technology available at that time. Strategically, it was highly important as it showed the United States was committing

[51] Charles B. MacDonald, *A Time for Trumpets: The Untold Story of the Battle of the Bulge* (New York: HarperCollins, 1997), 381–83. This details the 11st Battalion, 9th Infantry, 2d Infantry Division, holding action at Rocherath, Belgium, supported by the four battalions of artillery from the division and three battalions of artillery from the corps. Pages 403–8 cover 2d Battalion, 26th Infantry, 1st Infantry Division, at Dom. Bütgenbach also supported by multiple artillery battalions.
[52] T. R. Fehrenbach, *This Kind of War: A Study in Unpreparedness* (New York: Bantam,1963), 65–85. Betts also mentions TF Smith as a cautionary tale.

ground forces to ensure the survival of South Korea. It was no Little Bighorn event—the battalion lived to fight another day—playing an important role in the Pusan Perimeter battles that held the North Koreans long enough for the Inchon landing.[53]

The next step in the evolution of the current approach was the Vietnam War. Specifically, it was the commitment of major ground forces from 1965 to 1970, which peaked in 1969 with 543,000 U.S. troops in Vietnam.[54] This was accomplished with conscription, but not with the mobilization of the guard and reserve. There was a standing draft already in place. All this happened while maintaining significant forces in Europe. Some new units were created, but the large majority were standing formations. The commitment of major ground forces into a conflict that these formations were ill-suited for was problematic. The force structures evolved to be better suited, but the individual rotation system made it difficult to build highly trained, cohesive units. This would profoundly influence how operations would be conducted in the early twenty-first century. The war in Vietnam was very different from previous experiences for those with World War II and Korean War experience. The elusive enemy that could hide in difficult terrain and conduct classical guerrilla attacks and then rapidly mass for battalion-size operations and then disperse presented a complex tactical and operational challenge. Independent small unit actions require a higher level of skill and training that cannot be easily developed in a 12-month tour of duty. Small units could be easily overwhelmed if the enemy showed up in greater strength, which was uncommon but happened enough to make it a real threat.

To contrast the first battle in Korea of TF Smith, the fighting in the Ia Drang Valley of Vietnam in November 1965 was one of the first major engagements with large enemy formations. During the 23 October–

[53] Fehrenbach, *This Kind of War,* 85–100. The 24th Infantry Division was roughly handled at Taejon and Pusan Perimeter after TF Smith at Osan. The division suffered some 3,600 casualties in 17 days, with the 34th Infantry Regiment broken up after heavy losses and the soldiers reallocated to the 19th and 21st Infantry Regiments.

[54] "Vietnam War Allied Troop Levels 1960–73," Americanwarlibrary.com, accessed 5 May 2025. Compiled from the Defense Manpower Data Center (DMDC).

26 November period, three U.S. "air-cavalry" battalions and their supporting elements and two battalions of the Army of the Republic Vietnam's paratroopers fought a series of engagements with five North Vietnamese battalions and a Viet Cong battalion. Three hundred and five U.S. soldiers were killed in action.[55] The North Vietnamese reported 554 killed and 669 wounded.[56] U.S. intelligence estimates put the North Vietnamese losses much higher, but of five battalions engaged, even their reported numbers were a significant percentage of their force. The U.S. soldiers from the 1st Cavalry Division were using new and modern techniques for airmobile combat operations. These were designed to counter many of the disadvantages the French faced in the 1950s. The U.S. units had artillery and air support throughout. This chapter focuses on the battalion level to have a direct comparison with 1st Battalion, 21st Infantry, at Osan in 1950. The 1st Battalion, 7th Cavalry, fought at landing zone (LZ) X-Ray from 14 to 16 November 1965. The 1st Battalion, 7th Cavalry, was surrounded in a sustained action versus the eight-hour fight by 1st Battalion, 21st Infantry. Due to a variety of factors including limitations of helicopter lift capacity and malaria cases, the 1st Battalion, 7th Cavalry, under then Lieutenant Colonel Harold G. Moore, went in with 450 soldiers in three rifle companies and a weapons company.[57] The authorized strength of the battalion was 767 officers and enlisted, so in the classic measurements of readiness the personnel level was low (58 percent of its strength is the lowest readiness level in the U.S. system). The German system from World War II would still consider it a strong battalion for having more than 400 soldiers. The 1st Battalion, 7th Cavalry, lost 79 killed in action, 121 wounded, and zero missing for 200 casualties out of 450 engaged or more than 44 percent.[58] The North Vietnamese had a numeric advantage around three to one for Moore's 1st Battalion, 7th Cavalry, and this advantage

[55] Harold G. Moore and Joseph L. Galloway, *We Were Soldiers Once . . . and Young: La Drang—The Battle that Changed the War in Vietnam* (New York: Random House, 1992), 375.
[56] "Công tác hậu cần trong Chiến dịch Plâyme năm 1965" [Logistics during Operation Plâyme 5 1965], Qdnd.vn, accessed 5 May 2025. Translated from the *People's Army Newspaper* (online edition).
[57] Moore and Galloway, *We Were Soldiers Once*, 42.
[58] Moore and Galloway, *We Were Soldiers Once*, 216.

was nullified by artillery, air strikes, and training. Moore was facing the newly arrived North Vietnamese *66th Regiment* with all three battalions at about 450 men each.[59] Air mobility reduced the reliance on roads so, unlike TF Smith's blocking position, 1st Battalion, 7th Cavalry, could stand in an all-around defense.[60] This battalion was much more prepared than TF Smith, having been in Vietnam nearly two months prior to the engagement and a core of the unit having trained together in the United States. However, by the U.S. system of measurement, both were low readiness. Neither had faced a significant combat action prior. Moore contrasted the 1st Battalion, 7th Cavalry, at LZ X-Ray with the 1st Battalion, 7th Cavalry, that suffered heavy casualties in an ambush at LZ Albany while moving on foot versus using helicopters to move around the battle area.[61] The operational forces were more ready than the 24th Infantry Division in July 1950. The 1st Cavalry Division had established camps and firebases and had been operating in the area for weeks before the battle. The battle was not decisive by traditional measures. It had a more strategic impact, as both sides learned how the other would fight and set the pattern for much of the war. Tactically, the United States could field ready units that could inflict punishment, but the definitions of a ready unit evolved. Major structure, equipment, and training changes were made to make units more effective in that environment.

In the three levels of war, improved readiness of tactical units contributed to the goals of a flawed strategy. This serves as a classic example that one must be ready at all three levels, not just one. The common canard is that it was an "unwinnable" war. This is utter nonsense; it was certainly winnable for the North Vietnamese. What people are trying to say is that it was not worth winning with how we intended to fight it, and that is a very important distinction. The actual cost of a military intervention is difficult to gauge, but the United States had a good analogy from the French experience. That falls into the strategy—the strategy was

[59] Moore and Galloway, *We Were Soldiers Once*, 55.
[60] Moore and Galloway, *We Were Soldiers Once*, 100.
[61] Moore and Galloway, *We Were Soldiers Once,* 233.

fundamentally flawed. That bled down to the operational and tactical levels. In recent years with the opening of Vietnamese records—though not completely open—they do provide modern historians a better understanding of Vietnamese strategy, operations, and tactics. It is worth noting that even with the flaws in the U.S. strategy, the insurgency approach failed and it took a massive conventional invasion of North Vietnamese Army formations (including large numbers of tanks and artillery) to finally win the war on the second attempt.[62] The first invasion failed in 1972 due to strong South Vietnamese resistance backed up with U.S. air and naval support.[63] The U.S. political will ebbed and did not support the erstwhile South Vietnamese allies in the 1975 invasion. It is also worth noting that the North Vietnamese Army was supported by Chinese and Soviet advisors, equipment, and intelligence. It was this external influence that swayed the United States to get involved in the first place.[64] Dwight D. Eisenhower's Domino Theory did not pan out quite as envisioned. First, Communist expansion was actively opposed, causing it to lose momentum, even if not overtly defeated. Second, the United States did not foresee the infighting within the Communist camp. Vietnam invaded Cambodia to depose the murderous Khmer Rouge in 1978, and China attacked Vietnam in 1979. The ultimate victory of the United States in the long run is the growing economic ties with Vietnam. This should provide an example of trade partnerships and diplomacy as an effective alternative to a purely military solution.

Jumping ahead to Operation Desert Storm from 1970 to 1991, the readiness model saw a significant shift. The Services moved from the standing force supported by a peacetime draft to the all-volunteer force.[65] The force post-Vietnam struggled with a bit of an identity cri-

[62] Merle L. Pribbenow, trans., *Victory in Vietnam: The Official History of the People's Army of Vietnam, 1954–1975* (Lawrence: University Press of Kansas, 2002), 246.
[63] James H. Willbanks, "How the 1972 North Vietnamese Easter Offensive Tested Nixon's War Strategy," Historynet.com, 31 March 2022; and Stanley Karnow, *Vietnam: A History* (New York: Viking Press, 1983), 643.
[64] Karnow, *Vietnam: A History*, 661–70.
[65] Richard W. Stewart, ed., *American Military History,* vol. 2*, The United States Army in a Global Era, 1917–2008*, 2d ed. (Washington, DC: U.S. Army Center of Military History, 2010), 374–79.

sis, but the all-volunteer force and a refocus back to the Soviet threat combined to build a new force. The key benefits of the all-volunteer force were that servicemembers served four years for the typical enlistment. This doubled the time per soldier to build skills and cohesion. This increased skill building, which coupled nicely with increasingly complex, high-tech weapons systems. The third key improvement was instrumented training ranges and events. The Air Force's Exercise Red Flag, the Army's National Training Center (NTC), and the Marine Corps' Combined Arms Exercise (CAX) were able to take the more skilled servicemembers through increasingly rigorous training. This compound factor produced the tactical overmatch in Desert Storm. A common statement after Desert Storm was that NTC was harder than the actual war. The experience exorcised the demons of Vietnam.

Although the roots of the precision strike regime can be found in Vietnam, Desert Storm saw it come into its own, evident by the sheer disparity in losses such as Iraqi losses of more than 3,300 tanks compared to Coalition losses of 31.[66] Traditionally, loss rates of 2 or 3 to 1 are considered decisive, but 100 to 1 is overwhelming. In contrast, the Israelis had a 5-to-1 advantage (approximately 2,250 to 400) in tank loses during the 1973 Yom Kippur War.[67] With such a tactical overmatch, it can challenge the need for readiness above the tactical level. This was behind the reduction in the size of the U.S. military with the fall of the Soviet Union. The tactical overmatch meant that not as many forces were needed. The Army shuttered one-half of its divisions and shifted the operational unit from the division to the brigade. Brigades went from three to two maneuver battalions. The 700,000 U.S. troops supporting Desert Storm were considered to be too much in hindsight. Without the Soviet threat and given the tactical overmatch was so great, the United States was overinvested in conventional military readiness.

[66] Stephen A. Bourque, *Jayhawk!: The 7th Corps in the Persian Gulf War* (Washington, DC: U.S. Army Center of Military History, 2001), 455.

[67] Abraham Rabinovich, *The Yom Kippur War: The Epic Encounter that Transformed the Middle East* (New York: Schocken Books, 2004), 496–97. The Israel Defense Forces (IDF) had more than 1,000 tanks disabled, of which 400 were destroyed—the other 663 were damaged or captured. The IDF returned damaged tanks to action much more effectively than their adversaries.

There are flaws in the thinking that would cause problems in the twenty-first century. There is an old military maxim in the debate over quantity versus quality that quantity has its own quality. Now, going back to a large conscript force is not what is being suggesting. It is not as much quantity as presence. You need enough high-quality units to cover the needed space. Quality can increase the space a unit can cover effectively, but there is a real tyranny of distance that can only go so far.

The post–Vietnam era also saw a change in thinking on the role of the reserve and guard formations. The prolonged war in Vietnam not only gave birth to the all-volunteer force, but also the shifting of key warfighting capabilities to the reserves. General Creighton W. Abrams as chief of staff of the Army (1972–74) with Secretary of Defense Melvin R. Laird's 1970 Total Force Policy is credited with this shift.[68] General Abrams's quote adorns the Army Reserve hallway at the Pentagon: "If we go to war again, we're taking the reserves with us." In a classic passive-aggressive move, the Army could not mount a major intervention without some sort of mobilization of reserve and guard formations that has a political cost. It was a reaction to the large standing force being too easy politically to be committed to a military "adventure" that may end up being a strategic mistake. To be fair, it may also have been an affordable and necessary move to revamp the reserve and guard after years of neglect and provide for a larger, more capable force in the event of a major conflict.[69] With this change, Operations Desert Shield, Desert Storm, Enduring Freedom, and Iraqi Freedom required significant mobilization of reserve and guard forces. Short of a full declaration of war, the president has statutory authority to mobilize guard and reserve units for up to 12 months. The author served as a reserve officer in the Marine Corps during this period and was mobilized twice.

Operation Iraqi Freedom in 2003 saw a major invasion of Iraq with large-scale U.S. and Coalition partner formations. The U.S. forces were

[68] *Total Force Policy Interim Report to the Congress* (Washington, DC: Department of Defense, 1990), 3.
[69] Richard W. Stewart, ed., *The United States Army in a Global Era, 1917–2008*, vol. 2, *American Military History*, 2d ed. (Washington, DC: U.S. Army Center of Military History, 2010), 379–81.

less than one-half the size of the Desert Storm force. The Iraqis had not recovered from Desert Storm and with the ongoing sanctions were substantially less capable than in 1991.[70] The problem confronting the U.S. forces was not tactical overmatch; it was physical distance. The U.S. forces were more than capable at sweeping aside the Iraqi resistance but were not in sufficient quantity to effectively occupy the country. This created the opportunity for the insurgency to become established. In a perfect asymmetric approach, the insurgents avoided facing the overwhelming tactical overmatch. The Iraqi insurgency was fundamentally different than the Vietnamese. The Viet Cong had strong external support and were organized along the Maoist insurgency model that anticipated shifting to conventional combat in the final phase.[71]

The Iraqi insurgency used a cellular model. This approach is very difficult to defeat as each cell is well insulated from others so rolling up a network is like fighting organized crime networks. This is hard to kill but cannot mass easily into conventional capable forces to assume legitimate control of the government.[72] In Vietnam, there was a persistent threat of Viet Cong or the North Vietnamese Army suddenly massing in battalion or regimental strength. There was no real threat of this in Iraq. Even during the larger battles such as Fallujah, there were not insurgent companies and battalions maneuvering, but bands of loosely networked groups of fighters. The individual rotation system from Vietnam was much hated in military circles as the root of many problems and the U.S. approach to Operation Iraqi Freedom was to use a unit rotation system. A unit was composited in the United States to train for their mission in Iraq and deploy together. The unit personnel were stabilized so no one would be transferred in or out during the predeployment workup and the deployment itself. The Services used different deployment lengths. This approach meant there were not enough standing (active component) units and that sustaining this approach required involuntary mobilization of guard and reserve units. The Army targeted

[70] Stephen A. Carney, *Allied Participation in Operation Iraqi Freedom* (Washington, DC: U.S. Army Center of Military History, 2011), 1-6.
[71] Stewart, *The United States Army in a Global Era, 1917–2008*, 294–97.
[72] Stewart, *The United States Army in a Global Era, 1917–2008*, 490–502.

12-month deployments, and the Navy and Marine Corps continued their preexisting 6–7-month deployment model. The Army experienced some challenges with this as the guard and reserve mobilization authorities would not support 12 months overseas as the legal authority was for 12 total months mobilization, which includes the time to mobilize and get trained up to speed for the deployment and demobilize after return. This led to some active component units being extended to 15 or more months deployed. The same approach played out in Operation Enduring Freedom in Afghanistan that ran concurrently and then persisted past the end of Operation Iraqi Freedom.[73]

Was unit rotation better than individual rotation? At the tactical unit level, the resounding answer is most definitely yes. For a 12-month deployment window, the impact was similar for an individual, though it represents the upper end of mental endurance for frontline troops. A shorter deployment window allows for the unit to sustain a higher operational tempo during the deployment, but the learning curve is experienced more often. There is a natural cycle during a deployment window that includes a learning curve, high tempo, and then fatigue, reducing tempo and effectiveness. Good predeployment training can reduce the learning curve, but it is still an important factor. There are real concerns that in counterinsurgency whether a shorter deployment has enough time to really get to know the area and all its subtleties. For units, it is a significant improvement. The unit that has personnel stabilized can build a much more cohesive team. Unit leaders have become accustomed to this luxury. A unit that is fully staffed with no changes planned for its full predeployment training and deployment is truly ideal and can obtain high levels of proficiency. Is this a realistic expectation for future combat operations? The downside to unit rotations is that the force must have enough inventory of units to rotate through to sustain the model. The U.S. model and personnel stabilizations must also work within the context of entry level training before servicemembers are assigned to a unit and given terms of enlistment.

[73] Stewart, *The United States Army in a Global Era, 1917–2008*, 502–3, 511–12, 515.

Additionally, the Department of Defense has established policy and guidelines for how often and how long personnel are deployed.[74] The force never resorted to conscription throughout Iraq and Afghanistan, so sensitivity to personnel issues is an imperative. Guard and reserve units were mobilized and some (several thousand) involuntary mobilizations of individuals and the "stop loss" involuntary extensions of active service were needed to sustain the unit rotation model. If the service is too onerous it is difficult to recruit.[75] The biggest failure of the unit rotation is the rotation of senior leadership. Troops on the line must be rotated due to physical and mental exhaustion, but the senior leadership cannot afford to be rotated every 12 months. How can a theater commander come to Iraq or Afghanistan and gain insight into the situation, develop a strategy, implement, assess effectiveness, and adjust as needed, leading to long-term stability also known as victory? The practice of rotating leadership flies in the face of the precedent of our greatest military leaders in history that stayed in place for the duration or until relieved for cause. During the 12-month rotation, the focus comes to a "prevent defense" so as to not lose on your watch. Not losing is also not winning, which is how one gets a war that drags on for years with little real change. This area is fully in the strategic readiness realm.

The post–Iraq and Afghanistan period has many parallels to the post–Vietnam era. The military was consumed with long counterinsurgency campaigns. The endings were anticlimactic, and the subsequent collapse of the U.S.-sponsored government of Afghanistan was an eerie reminder of the fall of Saigon. The Department of Defense has turned its focus back to great power competition. The Army is moving the operational unit back to the division as it considers the realities of large-scale combat operations against a truly capable enemy.[76] The elevation

[74] *DODI 1336.07, Management of Personnel Tempo* (Washington, DC: Department of Defense, 28 December 2020).
[75] Col Mark F. Cancian, USMCR (Ret), and Paul V. Vane, "Marine Corps Reserve Forces in Operation Iraqi Freedom," *Marine Corps Gazette* 88, no. 7 (July 2004); and Authority of President to Suspend Certain Laws Relating to Promotion, Retirement, and Separation,10 U.S. Code § 12305 (2025).
[76] LtCol John P. Dolan et al., "Enabling the Division in 2030: Evolving Division Reconnaissance and Security Capabilitiesm" eArmor, accessed 25 June 2025.

of cyberspace and space as warfighting domains and the allocation of resources accordingly are also indicative of the revitalization of the military enterprise.[77] All the U.S. military Services are undertaking rapid modernization efforts. It feels a lot like the 1980s again. Then it was new equipment like the M1 Abrams, M2 Bradley, General Dynamics F-16 Fighting Falcon, McDonnell Douglas F/A-18 Hornet, and doctrine such as Maneuver Warfare and AirLand Battle. Now, it is the precision strike regime, multidomain warfighting, Lockheed Martin F-35 Lightning II, Northrop Grumman B-21 Raider, hypersonic weapons, etc. The standard of readiness has evolved. An infantry battalion today is significantly better trained and equipped than TF Smith in 1950 or 1st Battalion, 7th Cavalry, in 1965. In the author's experience, they have seen the bar raised and though having fond memories of 2d Battalion, 8th Marines, in 1988 and 2d Light Armored Infantry Battalion in 1991, the units of 2022 are better by any measurement. The trick is that readiness is measured against the current standard. These modern incarnations must face the modern threat, not the threat of 30 odd years ago. It is also clear that none of these major military operations in the post–World War II era were unready in the way the United States was in prior eras. There was certainly room for improvement and some improvement has been demonstrated. It also shows that readiness at the tactical level, even when very high, does not solve all problems. None of these operations was a direct existential threat to the United States. One could argue that even with these significant conventional commitments of forces, often during many years at great cost, the U.S. military still successfully deterred a major war with the Soviet Union and China. Proving a negative is difficult, but in this case the avoidance of World War III despite the intense competition, proxy conflicts, arms races, and provocations is clear that much of the national investment in readiness forces was sufficient.

[77] *Joint Warfighting*, Joint Publication 1-0 (Washington, DC: Joint Chiefs of Staff, 2023).

CHAPTER 5

CURRENT READINESS ASSESSMENTS

Road to the Current State

In general, given the working definition of military readiness, any sort of reporting on the status of a unit is considered a form of readiness reporting even if it does not use the word readiness. Therefore, reports on the manning of units, their conditions, and logistical considerations during the last several hundred years are included in the broad concept. To close the gap from this broad view to the specific methodology in use today, a brief look at how the current system came into being is necessary. The leader across the U.S. Department of Defense in this regard was the U.S. Army in the post–Korean War era. All Services were involved in a variety of readiness related activities, but the precursor of the current readiness reporting system was the Army's solution. The Army experimented with multiple approaches; it came down to objective formulas versus subjective assessments and how to properly account for active, reserve, and National Guard units.[1] The reporting took place quarterly at the divisional level. This process came together with the issuance of the *Unit Readiness,* Army Regulation 220-1 (AR

[1] William M. Donnelly, *Army Readiness Reporting Systems, 1945–2003* (Washington, DC: U.S. Center of Military History, 2018), 26.

Table 6. Original C-level definitions

Redcon	Days to C-1	Definition
C-1	0	Fully combat ready.
C-2	5	Combat ready; some personnel and/or equipment shortages require fill for sustained operations. If shortages are filled, it can attain C–1 within five days.
C-3	20	Combat ready; personnel and/or equipment shortages of sufficient magnitude limit its capability to perform its mission and permit it to do so for only a very limited period. If shortages are filled, it can attain C-1 within 20 days.
C-4	60	Marginally combat ready; if shortages are filled, it can attain C-1 status within 60 days
C-5	>60	Not combat ready; requires more than 60 days to attain C-1 status after shortages filled

Source: William H. Donnelly, *Army Readiness Reporting Systems, 1945–2003* (Washington, DC: U.S. Center of Military History, 2018), 44.

220-1), in August 1963.[2] In 1960, the Joint Chiefs of Staff asked all the Services to provide detailed, regular reports of the readiness of major units not assigned to a unified or specified command.[3] Under the John F. Kennedy administration, world events highlighted the need for a responsive and detailed readiness system to enable useful crisis action planning. Defense Secretary Robert S. McNamara was briefed on the approach of *Unit Readiness,* AR 220-1 and pushed for its adoption across the Services.[4] As with any new system, the *Unit Readiness,* AR 220-1 was modified many times in the first few years of its adoption, but it established many key components of the current system. *Unit Readiness,* AR 220-1 established a readiness condition (REDCON) that was the current state of the unit. REDCON was measured on a scale of C-1 to C-5 with the specific definitions (table 6).

The *Unit Readiness,* AR 220-1 system had some other components that have not survived. It had another reporting value called readiness category (REDCAT). It also expressed on the same scale as the REDCON and indicated the expected level of readiness for that unit given its role. Thus, a unit with a REDCON of C-1 and a REDCAT of C-3 is overresourced, likely at the expense of units requiring a higher state of

[2] Donnelly, *Army Readiness Reporting Systems,* 43.
[3] Donnelly, *Army Readiness Reporting Systems,* 59.
[4] Donnelly, *Army Readiness Reporting Systems*, 52.

readiness. Conversely, a unit with a REDCON of C-3 and a REDCAT of C-1 is not ready to meet its planned level of readiness. It also codified that the overall readiness was the lowest of three pillars of personnel, training, and logistics. Over time, the logistics pillar became equipment or hand and equipment condition levels.[5] The fixed times have been deprecated over time as the broader force has many considerations that make the time to C-1 to be highly dependent on external factors well beyond the control or understanding of the unit filling out a report.

Submittal was originally at the division level on a quarterly basis using a preprinted page form. Forms were submitted and collated at Army headquarters for storage and analysis, including punch cards for early computers.[6] The Berlin crisis between 1958 and 1960 and the Army's response on nondivisional unit readiness opened the aperture toward the current state on reporting on all "measured units" associated with operational planning.[7]

The current state of reporting readiness data is the monthly report (or as significant changes occur) for thousands of measured units, installations, major commands, and combat support agencies in a classified computer system called the Defense Readiness Reporting System (DRRS). The system also taps dozens of underlying data sources to facilitate the accurate and timely reporting by leveraging existing data from personnel, equipment, and maintenance systems. DRRS integrated the legacy Global Status of Resources and Training System (GSORTS) and added the capability assessment portion to the system. GSORTS was fielded as an enterprise computer system around 1980. DRRS was fielded in a phased implementation in 2004–6 and integrated GSORTS several years later. DRRS is operated within the Office of the Under Secretary of Defense for Personnel and Readiness.[8]

[5] *Chairman and the Joint Chiefs of Staff Instruction 3401.02B, Force Readiness Reporting* (Washington, DC: Department of Defense, 2014), C-3–C-5.

[6] Donnelly, *Army Readiness Reporting Systems*, 77–80. See DA Form 2715, Unit Status Report Worksheet.

[7] Donnelly, *Army Readiness Reporting Systems*, 40; and *CJCSI 3401.02B, Force Readiness Reporting*, B-3.

[8] *DOD Directive 7730.65, DOD Readiness Reporting System* (Washington, DC: Department of Defense, 31 May 2023).

Components of Current Assessments

While much of this work is primarily based on the U.S. military enterprise, the author had the opportunity during the last several years to gain some insights into other nations' military readiness assessments. Much of readiness assessment is classified, so it can only be described in generalities. They all perform some form of resource-based assessment at the battalion, regiment, brigade, and division levels. They do not have unified systems that integrate readiness of different Services together. Readiness reporting stays within the organizations. All have concerns about the subjectivity of data as the resources are not generally based on the underlying business systems (personnel, equipment, training management). They struggle with a disconnect between reported readiness and performance at capstone training events. The author has worked with many U.S. allies and partners and believes the United States benefits from the statutory readiness reporting requirement levied by Congress and the oversight that comes with it, which appears to be unique. It mandates a single readiness system for all the Services with standardized metrics.[9] Readiness is scrutinized by Congress through regular reports, testimony, and use of the Government Accountability Office (GAO) on top of the policy and oversight from within the Office of the Secretary of Defense and the military departments.[10] The U.S. military enterprise also benefits from its size and investments in information technology. On several occasions, the United States has worked with its allies and partner nations on how they might improve their readiness assessments. We do look at what is available on the readiness assessment methodology of potential adversaries. It is reassuring that they have the same challenges. The U.S. system has evolved during the last 40 years of automation to be a highly complex system of data exchange that could not easily be shared as-is. The concepts, processes, and general design can be shared as these

[9] Readiness Reporting System,10 U.S.C., § 117.

[10] Chairman's Risk Assessment, 10 U.S.C., § 153 (b)(2); and 10 U.S.C., § 482, (a) Secretary's Semi-Annual Readiness Report to Congress (SRRC) and (d) the Chairman's semi-annual Joint Force Readiness Review (JFRR).

parts are unclassified; only the data is classified. The building blocks are universal. Any national military enterprise can benefit from a regular review of how they assess readiness. They all have battalions, ships, and squadrons with thousands of soldiers, sailors, and airmen.

The Department of Defense uses a long-standing methodology to measure readiness.[11] The methodology includes units (counting intermediate commands such as regiments, brigades, divisions, corps, and wings), installations, combat support agencies, and unified commands.[12] Measured readiness is neither accident nor is there a random distribution of results. Units are resourced to be ready to do missions, even if these are peacetime deployments or are alert statuses. The general formula for building unit readiness is:

Unit readiness = (Personnel + Equipment + Consumables + Training areas + Time to train) / (Wartime requirement of personnel and equipment + Demonstrated proficiency against enumerated performance standards)

Consumables = (Training ammunition, rations, fuel, repair parts)

Wartime requirement = (Approved/authoritative table of organization and equipment [TO&E])

The methodology to measure readiness falls into two main areas of assessment: resources and capabilities. The oldest part is the resource area and is an adaptation of a German system that dates from World War II, possibly earlier, as adapted by the U.S. Army in the late 1950s and early 1960s.[13] While it has been around for decades, there were various efforts over time that improved the underlying fidelity and utility by integrating underlying authoritative data. This was substantially updated with the inclusion of capability-based reporting in the early

[11] JCS Publication No. 6 (1961). The Joint Operational Reporting Procedures (JOPREP) was the beginning of the Joint force reporting requirement that has continuously evolved to our current state.
[12] *CJCSI 3401.02B, Force Readiness Reporting*.
[13] Donnelly, *Army Readiness Reporting Systems*, 163–64.

2000s. In simple terms, the resource reporting looks at the personnel, equipment, and training and provides a simple index value for each and an overall index. The overall index is set to the lowest of the component indices. Capability assessment looks at the designed or assigned mission for a unit and breaks it down into its component essential tasks and the performance standards associated with each task.

There is an overlap between the approaches and that can create frustration in those that are filling out reports and to the consumers of the data. The basic problem is that there is a one-size-fits-all approach that struggles to deal with the diversity of unit types and capabilities. Complexity in the specifics aside, there are fundamental building blocks of readiness that are applicable to any organization. These building blocks form the logical data model of a readiness assessment for any unit type. The index used is a simple four-point scale with one being most ready, two being mostly ready, three not ready with some capabilities, and four not ready and incapable of performing its wartime mission without additional resources. There are also two other levels: five for unavailable for structure change (modernization, activation, reactivation, reorganization, or relocation) and six for resource not measured. The capability assessment produces a different answer from the numeric index. It produces a "Yes," "Qualified Yes," or a "No." Table 7 summarizes the index, basic definition, scholastic grade for comparison, the mission qualification, and the general category. The table includes the standard color coding for each level.

This system is easy to use and understand when looking at large numbers of units. It supports the ability to rapidly spot readiness shortfalls and identify other units that could be cannibalized to make whole units. This is a core function of the preceding German system that managed more than 200 divisions. The Germans became very good at reconstituting formations rapidly. The index was called *Kampfwert* or combat value.[14] The index value is calculated for each resource and then the lowest of the resource values represents the overall index. When

[14] Niklas Zetterling, *Normandy 1944: German Military Organization, Combat Power, and Organizational Effectiveness* (Havertown, PA: Casemate, 2019), 13.

Table 7. Readiness scoring

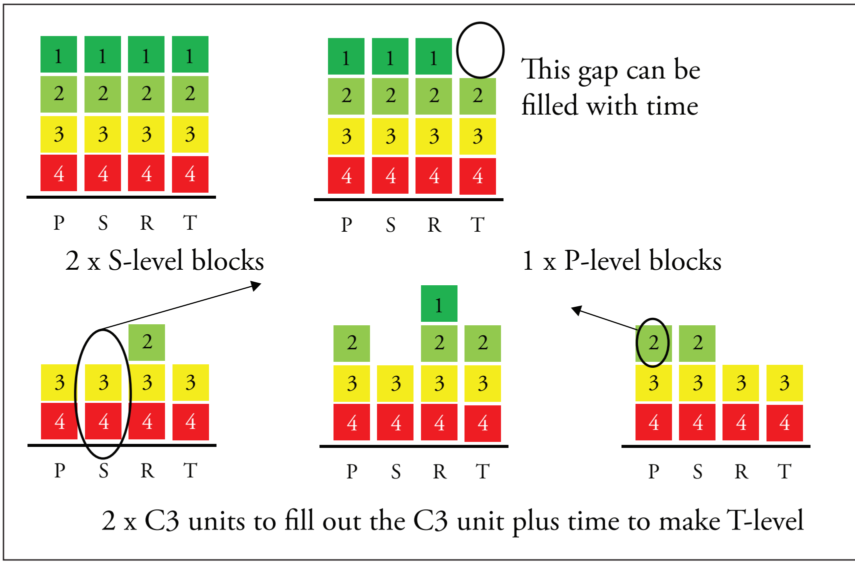
Index	Basic definition	School grade	Mission qualification	General category
1	Fully missions capable	A	Yes	Ready
2	Mostly mission capable	B or C	Qualified yes	Ready
3	Some mission capability	D	No	Not ready
4	Not mission capable	F		Not ready
5	Not available			Not ready
6	Not measured			Not applicable

Source: courtesy of author, adapted by MCUP.

looking at units of like types that are not ready, the resource levels easily translate into blocks that can be moved about to make ready units like the classic computer game *Tetris*. In the current system, there are four resource levels that have a corresponding letter: personnel (P), equipment on hand (S), equipment condition (R), and training (T). The overall readiness letter is C, and unit readiness is often referred to as the "C-level." Figure 11 represents the use of building blocks.

This illustrates a basic ability to build ready units out of the pieces and parts of unready units rapidly. What is missing from this scale is the time factor. Time was included in the formula above but is not part of the index. The readiness indices represent snapshots, and a time factor is an additional data element. The C-level is a measurement of current readiness, including how long at the current level and how long to change, which are different questions. These answers are provided in the full readiness reports and have many influences. With limited data inputs, evaluation of the time factor provided at the unit level can be highly subjective or have the appearance of subjectivity as much of the supporting data is not easily captured. Through careful historical analysis by unit type, the time factor can be determined and forecasted much more reliably. One of the challenges with forecasting is that for major conflicts, the business rules are different. Forecasting for day-to-day operations is much more reliable now due to years of data available. Major conflicts come with changes in routine personnel rotations, in

Figure 11. Readiness building blocks



Source: courtesy of author, adapted by MCUP.

some cases servicemembers are retained beyond their anticipated end of service. Crisis or major contingency operations plan for releasing emergency funds to repair items quickly. Each of these business rules have measurable impacts to the resource areas used to calculate readiness and are modeled. The trick is that each type of unit has a unique version of the model.

People

Measuring how many people are assigned to a unit is the earliest form of readiness assessment going back to the 1630s.[15] Even this fairly simple question has layers of potential nuance. Starting at the initial question, we can then use sequential logic to determine if the personnel component of a unit is ready. How many people does the unit have? It sounds simple, but it actually has several components, such as the number of personnel assigned, the number present for duty, and any

[15] Hans Delbruck, *The Dawn of Modern Warfare: History of the Art of War*, vol. 4 (Lincoln: University of Nebraska Press, 1985), 229–37.

Table 8. Personnel strength

Required	Assigned	(+) Attached	(-) Detached	(-) Unavailable	On hand
800	750	40	10	25	755

Source: courtesy of author, adapted by MCUP.

Table 9. Leadership strength

Rank (grade)	Required	Assigned	(+) Attached	(-) Detached	(-) Unavailable	On hand
Lieutenant colonels (O5)	1	1	0	0	0	1
Majors (O4)	4	3	0	0	1	2
Captains (O3)	8	7	0	1	0	6
Junior officers (O1/O2)	25	20	1	1	1	19
Total officers	38	31	1	2	2	28
Senior NCOs (E7–E9)	7	7	0	0	0	7
Sergeants (E5–E6)	28	25	1	1	1	24
Corporals (E4)	68	60	3	4	4	55
Total NCOs	103	92	4	5	5	86
Total leadership	141	123	5	7	7	114

Source: courtesy of author, adapted by MCUP.

additional personnel attached to the unit. Additionally, how many are not available for duty due to illness, injury, legal matters, leave status, or detached for duty elsewhere? These aggregate numbers are then divided by the wartime requirement or establishment strength (table 8).

From the example 750 + 40 - 10 - 25 = 755, then 755/800 = 94 percent (fractions rounded to the nearest whole percentage point). While this is a useful metric, it does not capture two other aspects of leadership and critical skills. In the example above, all personnel are equal, but in reality, some personnel are leaders and represent various grades such as sergeants, lieutenants, captains, master sergeants, majors, etc. Some personnel have specialized training such as communications, mechanic, or medic (table 9).

This look at leadership can be an officer fill of 28/38 for 74 percent or NCO fill of 86/103 for 83 percent. Now each leadership spot is weighted to 1/141 (.7 percent per person) versus 1/800 (0.1 percent). In this example unit, the leadership percentage is much lower than the total unit. Even with an aggregated leadership percentage score, the above is skewed to the junior officers and corporals. In theory, there might be a unit with 100 percent assigned and available for duty, but they could all be privates with a leadership percentage of 0 percent and a critical skills fill percentage of 0 percent. These are supporting numbers, so the total strength is not useful without leadership, as a unit needs both. It also needs certain critical skills, which looks very similar to the leadership breakdown.

The critical skills aspect has two logical variations. The first is when all personnel assigned to a unit show up with the necessary skills. The unit training is then focused on building and integrating the skills into a coherent team. The ability of the institution to properly staff these types of units is a function of the throughput of the schools that produce the various skills. The advantage of this style is that it can train as a unit and coalesce into an effective, ready unit faster. Many of the twenty-first century's highly technical unit types have a post assignment skills progression pipeline. In these cases, the institution provides basically trained personnel, but they arrive at the unit without the necessary qualification and/or certifications to be fully capable (table 10). This is common in aviation with both pilots and maintenance skills as well as cyber, counterintelligence, electronic warfare, and signals intelligence units. The onus is on the unit to manage the assigned workforce through the skills progression while balancing operational training. As opposed to the first style, this style requires more time to get ready.

Once the various percentages are calculated, the appropriate index value can be assigned to a percentage range.[16] Here is where it can go awry. The standard percentage breaks for a personnel health index are meant to enforce a general standard, thus making reporting more objective. It presumes a similar percentage of personnel are needed for all different units. Some units are force providers or enabling service pro-

[16] *CJCSI 3401.02B, Force Readiness Reporting*, C5–C8.

Table 10. Personnel rules

P-level	Total available strength	Critical personnel fill	Critical grade fill (optional)
P-1	90% or greater	85% or greater	85% or greater
P-2	80% to 89%	75% to 84%	75% to 84%
P-3	70% to 79%	65% to 74%	65% to 74%
P-4	Less than 70%	Less than 65%	Less than 65%
P-5	Not used		
P-6	Not measured (used for units such as proposition equipment that do not have personnel assigned)		

Source: *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 31 May 2011), C-8, adapted by MCUP.

viders to other types of units. Their establishment likely includes sufficient depth to support multiple supported units. Normal day-to-day operations may have personnel attached out and still retain capacity to support others. Some of these attachments may represent the wartime requirement for that unit. The standard percentage breaks have not aged well and typically reflect a battalion mentality. The battalion mentality represents an organization that conducts operations as a single, whole unit, such as an infantry battalion. A flying squadron functions very differently from a logistics unit, for example. Many of our technology-intensive units are quite small compared to a battalion of 800, making the percentage calculation highly sensitive to small changes of one or two people. This also opens the door on staffing dynamics.

Assuming a generally healthy balance of leadership and skills, the full organization will have a level of flex as there are known and predictable percentages of personnel unavailable. If the wartime requirement is set too tight, then the known wastage of injuries, legal, and administrative matters during day-to-day business would degrade the unit's readiness. The P-level percentage breaks do account for this. A fully manned unit is not necessarily at 100 percent strength and the actual unit should be designed to be fully functional within that range. The next nuance is the minimally manned level that can still perform the full mission. That could vary widely based on the type of unit and the tasks. Does the unit work in shifts only, does it use a hybrid model of shifts and general quarters like ships, or is it a full force that performs its task collectively and must rotate out of line when physically exhausted? What is the specific threshold that, once crossed, the unit can no longer perform the mission, be it as a whole or loss of a shift? Capability-based reporting has the potential to provide a better answer than standardized percentage breaks. Understanding these layers are part of the art and science of designing military units.

Looking at the planning considerations for designing military units, the author will consider the example of an infantry battalion. The battalion is the key battlefield infantry organization dating back to the Romans who had a cohort of six centuries or companies.[17] In modern armies, an infantry battalion is typically a headquarters company, three rifle companies, and a support or heavy weapons company. They can range in establishment from 500 to as many as 950 personnel or more personnel per element. To contrast the raw personnel number, the number of crew served weapons (machine guns, mortars, and antitank missiles) fielded within the battalion is the measure of its raw firepower or combat power. Typically, units will continue to man their crew-served weapons as personnel are lost until there are no more personnel. This allows modern formations to maintain firepower as they experience attrition. Table 11 contrasts the number of crew-served weapons between a battalion of about 650 and a battalion of 950 from existing tables of organization. The specific organizations are not germane to this example, but they are realistic ones.

Interestingly, the larger battalion maintains the same ratio of rifle strength to the total, but only services a similar number of crew-served weapons. The difference between the two battalions is depth. Both battalions would be assigned similar missions. Both operate as part of a larger brigade-size formation. The larger battalion has more depth so it can last longer on its own and absorb more losses. The trade-off is transporting and feeding 50 percent more personnel to cover the same task. In the readiness assessment, both battalions could be fully manned—a P-level of one—but it is not clear that these similar for-

[17] Adrian Goldsworthy, *The Complete Roman Army* (New York: Thames & Hudson, 2003), 47.

Table 11. Weapon density comparison

Weapon system	Density for 650	Density for 950
Medium machine gun (7.62mm)	32	26
Heavy machine gun (.50-caliber or 40mm)	12	16
Light mortar (60mm)	6	9
Heavy mortar (81mm)	4	8
Antitank missile launcher	12	12
Rifle strength (size of squads at 27 per battalion), percent of total strength	243 or 37%	351 or 37%

Source: courtesy of author, adapted by MCUP.

mations have different attributes for just the index assessment. The designer of force structure comes at it from two directions. They do not have the luxury of designing a force from scratch. The designer comes to the table encumbered with force requirements, traditions, recruiting constraints, and equipping constraints. If tradition prefers the bigger battalions, and recruiting has become more difficult, sustaining the larger units could be increasingly challenging. Moreover, smaller battalions may sound like a good option, but having a hollow force of too many undermanned battalions is a risk as the threshold between ready and unready diminishes with a smaller unit.

The Russian Army experienced this problem in the post-Soviet era when they sought to retain as much force structure as possible but could not adequately man it. The situation was so acute that brigades normally fielded two battalions instead of the structure of three or four. Their force structure was very lean in personnel compared to U.S. and North Atlantic Treaty Organization (NATO) counterparts. They maintained the illusion of divisions and brigades by retaining the overhead structure, but each element fielded one-half the battalions. This is a contributing factor to their failure in the opening six months of the Russo-Ukrainian War.[18] The United States suffered a similar fate in

[18] Mason Clark and Karolina Hird, *Russian Regular Ground Forces Order of Battle: Russian Military 101* (Washington, DC: Institute for the Study of War, 2023).

1950 when regiments and battalions were chronically understrength. Regiments would field two battalions instead of three and the battalions had two rifle companies. South Korean troops were attached as whole platoons to U.S. Army rifle companies despite their lack of training or ability to speak English.[19] In both instances, the overhead structure gave the impression of a larger force, but whole elements were missing, which could be misleading to the unwary.

One question that the above chart should also spark is that, in both cases, the riflemen make up 37 percent of the battalion. What are the other 63 percent doing? This illustrates the "tooth-to-tail" problem, or the ratio of supporting troops to fighting troops. With the beginning of modern national armies in the 1630s, an infantry battalion would have officers and soldiers. At that time, officers included all positions (i.e., officers who did not stand in the ranks), which includes what we now call officers and noncommissioned officers (sergeants), as well as musicians, clerks, medical personnel, etc. The ratio of soldiers to officers could fall in the 6–8 to 1 range. With the increasing technical demands of a modern force, the ratio is flipped to 1 to 2 within a battalion. In a full army, it can be 1 to 10. A modern military includes communications, transportation, maintenance, medical, supply, food service, intelligence, etc. The next challenge is that these increasingly smaller percentages of the force support most of the direct combat and by extension suffers the highest casualty rate. The supporting troops do supply the closest and most immediate depth to a battalion, until purpose-trained replacements can be obtained and integrated. The German precursor to the U.S. modern readiness reporting system looked at total personnel assigned to a unit, the ration strength that included all attachments present and needing to be fed, and the rifle strength that was the percentage of actual combat soldiers versus supporting troops in the unit (table 12). It is similar to the modern U.S. version, and since it was used within a given army, it did not have to account for the nuance of applying to a joint force. To compare to a World War II

[19] T. R. Fehrenbach, *This Kind of War: The Classic Korean War History* (Washington, DC: Brassey's, 1963), 148–49.

Table 12. German battalion personnel ratings

Value (German)	Value (English)	Combat strength	P-level
Starkes bataillon	Strong battalion	>400	1
Mittelstarkes bataillon	Medium battalion	300–400	2
Durchschnittliches bataillon	Average battalion	200–300	3
Schwaches bataillon	Weak battalion	100–200	4
Abgekäpftes bataillon	Worn out battalion	<100	5

Source: author's comparison for Niklas Zetterling, *Normandy 1944: German Military Organization, Combat Power, and Organizational Effectiveness* (Havertown, PA: Casemate, 2019), 13; and *CJCSI 3401.02B, Personnel Ratings* (Washington, DC: Joint Chiefs of Staff, 31 May 2011),C-8, adapted by MCUP.

German infantry battalion, according to their system, they calculated the main personnel component on the *kampfstärke* or combat strength of the battalion. This was based on how many soldiers of the battalion type (infantry, armor, artillery, engineers) were present and fit for duty, or in an infantry battalion, how many infantrymen were present and fit for duty.[20]

It is worth noting that battalions would often start a campaign or operation at full strength and degrade through combat over days or weeks. It is also worth noting that their adjectival rating for "average" roughly equates to P-3, which is considered a "not ready" classification. This also reflects a high tolerance for losses that, given the intensity of combat in World War II, was a necessity. It also reflects that the definition of ready is based on the ability to perform all designed tasks for the battalion, including offensive operations that are the most demanding for ground combat units.

The stark reality is that regardless of the size of the unit or its concept of employment, the personnel health is the most foundational measurement. It must include a sense of what the required number of total personnel, leadership, and critical skills is required to be sufficiently useful for military readiness. It is worth noting that readiness

[20] Zetterling, *Normandy 1944*, 13.

is not a functional baseline. During wartime, units often continued to operate well below their establishment. In these instances, such understrength units are not "ready" in the sense of the measurements discussed here, but they perform their wartime mission, often in an exemplary manner. This is the opposite of the classic argument that a full strength "ready" unit can still fail in combat. A truly ready command should train to function if understrength. When the author was a lieutenant, his first sergeant told of their experience in Vietnam. As a young private first class, he helicoptered into an infantry battalion in the field and was assigned to a rifle squad. The squad went on patrol the same night and was ambushed. The private first class was the only member of the squad to not be killed or injured. The next day, six new privates showed up and he was the senior member of the squad and became squad leader on his second day. He remained a squad leader for the remaining 12 months of his tour.[21] The establishment for a rifle squad at that time was one sergeant, three corporals, and nine privates or private first classes. Readiness levels, tables of organization, and staffing goals are personnel management tools. They are not guarantees of success, but a unit with a higher readiness rating tends to do better and can sustain itself longer than an understrength unit.

What we do not measure is unit cohesion. *Cohesion* is defined as "the act or state of sticking together tightly."[22] The adaptation of the general concept to a military context comes into play as the idea of a unit's ability to withstand the rigors of combat.[23] There is much debate on the particulars, but the most effort is expended during training to build cohesive teams and units. For example, the Marine Corps' basic training has a capstone event—the Crucible—to physically and mentally challenge recruits. At the end of the event, the recruits are awarded the Eagle, Globe, and Anchor insignia of the Marine Corps

[21] Personal recollection of then 1stSgt Harold Hofer from his time as a private in Company F, 2d Battalion, 5th Marines, in 1969. It was related to the author in 1988 when he was a platoon commander in Company F, 2d Battalion, 8th Marines.
[22] "Cohesion," Merriam-Webster, accessed 26 June 2025.
[23] Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 201, 231, 241.

and become “Marines.” This ideal is supported by a publication for the rest of the Marine Corps on sustaining this transformation throughout their career.[24] Unit cohesion can be intangible, but we could attempt to measure indications or conditions that are conducive to building higher levels of cohesion. The two best indications of cohesion are the distribution of tenure across the unit as a whole and tenure of the key command billets.

The distribution of tenure can be easily obtained by grouping the length of time personnel have been assigned. A typical unit with three-year tour lengths should have one-third of the personnel each in the first year (0–12 months), second year (13–24 months), and third year (25+ months). Some Services use predeployment stabilization to maximize the length the unit personnel have to train and deploy together without any normal transfer in and out. This technique locks in the personnel five to six months prior to deployment. This prevents normal rotations for a year, but post deployment the rotations are especially heavy with as much as two-thirds rotating out. This would be easily observable with a monthly distribution of tenure. The second key factor is the tenure of the key command staff. This can be determined by careful analysis of which members are key. All members of the staff are important, but a good working relationship between certain key members is needed for the effective operation of the unit. For an infantry battalion, it might consist of the commander, operations officer, and fire support coordination officer. If any one of the key members rotates out, then it resets the clock of key command tenure.

Many critical skills are included in units across the enterprise, but assignment of the appropriately skilled personnel to a unit does not necessarily sustain or improve their skills. The easiest example is medical personnel. The wartime requirement for medical personnel is not practical to staff in peacetime. Medical capacity is very expensive and time consuming to build. It is also a reflection of the medical industry. Simply put, there are no extra doctors sitting on the shelf just in case.

[24] *Sustaining the Transformation*, Marine Corps Tactical Publication 6-10A (Washington, DC: Headquarters Marine Corps, 2024), 3-9–3-10.

For a doctor to be effective, they must be actively practicing medicine. This is similar to other skill sets across all the Services. To have a source for these skills, there is a promissory note from military hospitals and domestic healthcare providers staffed with reserve component personnel to provide doctors and nurses in case of war. These relationships are formalized and can be tracked, but in the classic measurements of operational units, their monthly reporting would reflect that the personnel are not with the unit. The reality is that the Services do not want them there, but they do need the demand signal to know rapidly what is needed. These units will show unready as they are unready in a "fight tonight" scenario, but if the mapping of the required personnel is in place and accurate that becomes an important aspect of their report.

Military institutions must manage the recruiting, training, assignments, career progression, health, and eventual retirement of their personnel. This is arguably the single most important and challenging undertaking in the military enterprise, especially for an all-volunteer force. Measuring the ability of military Services to organize and staff units is a solid start.

Equipment

Current readiness assessment methodology breaks equipment into two components. They mirror the concepts of personnel and answer two questions: Do I have what I am supposed to have? Is what I have in working condition? Interestingly, the personnel rating is built around the same two questions but is blended into a single answer. Equipment remains split in the two parts. The first question builds the S-level of equipment on hand, or the supply level, and the second question is the R-level, or equipment condition. Each component, S- or R-level, is based on the two sets of equipment within a unit. The equipment is nominated by the Service as a readiness reportable or "pacing" item. This allows the readiness to be based on the more important items since a unit may have hundreds or thousands of items in the property management system. The two components are combat-essential equipment and other end-item and support equipment (table 13).

Table 13. Equipment on hand rule

S-level	Combat-essential equipment	Aircraft (for aviation units)	Other end-item and support equipment
S-1	90% or greater	90% or greater	90% or greater
S-2	80% to 89%	80% to 89%	80% to 89%
S-3	65% to 79%	60% to 79%	65% to 79%
S-4	Less than 65%	Less than 60%	Less than 65%
S-5	Not used		
S-6	Not measured (used by units that have no readiness reportable equipment)		

Source: *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 31 May 2011), C-11, adapted by MCUP.

The overall levels are based on calculating each and the lower of the two is used.[25]

Current policy splits out aircraft for different percentage breaks. It also allows for the Services to account for low density differently but does not specify how.[26] It is implied that certain items could have a weighted value to account for the small number of items. This has not been observed in use; instead, the Services carefully manage what items are listed as readiness reportable to ensure the percentages adequately account for low density items. The equipment condition (R-level) continues to use the same list of equipment and calculates the mission capable number, which includes both full and partially mission capable statuses from the maintenance systems and divides that by the total items possessed (table 14). The nuance is that the R-level is based on what the unit has on hand regardless of what is authorized, whether it is more or less than what it is authorized.

The next important aspect of equipment is that we do not look at all equipment. Military units typically possess a large number of items that can range into hundreds or thousands. It is also given that not all items are equally important. A radar or a canteen cup should not have the same weight. The radar may be essential to the unit to perform its

[25] *CJCSI 3401.02B, Force Readiness Reporting*, C8–C13.
[26] *CJCSI 3401.02B, Force Readiness Reporting*, C8–C13.

Table 14. Equipment condition rule

R-level	Combat-essential equipment	Aircraft (for aviation units)	Other end-item and support equipment
R-1	90% or greater	75% or greater	90% or greater
R-2	70% to 89%	60% to 74%	70% to 89%
R-3	60% to 69%	50% to 59%	60% to 69%
R-4	Less than 60%	Less than 50%	Less than 60%
R-5	Not used		
R-6	Not measured (used by units that have no readiness reportable equipment)		

Source: *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 31 May 2011), C-13, adapted by MCUP.

designed mission. We use an enumerated list of readiness reportable items that are deemed essential. This list is then broken into a weighted section of low-density items and a main section of higher-density items. For example, a notional artillery battery has 6 cannons and 20 trucks. If all items were considered the same and all the cannons were broken and all the trucks were functional, then the readiness would be 20/26 for 77 percent. If the cannons and trucks are split between the low-density critical asset list and the high-density critical asset list, then the unit has a 0 percent for the low-density items and 100 percent for the high-density items and its readiness level would be set to the lower of the two categories. In this example, the battery is clearly not ready to perform its mission even if it had all required personnel and all were fully trained. It is even more important that even though the unit is not ready, it has plenty of resources that could be used elsewhere or have cannons redistributed to them and be ready very rapidly.

The mission capable (MC) rate is an important factor that has several common misconceptions.[27] It is not the same as the MC rate for any one item. An aircraft as well as its type has an MC rate, but we are looking at the MC for the items in the given unit.[28] If a squadron has 10

[27] *DODI 3110.05, Sustainment Health Metrics in Support of Materiel Availability* (Washington, DC: Department of Defense, 24 April 2024), 25.
[28] *CJCSI 3401.02B, Force Readiness Reporting*, C-11–C-13.

aircraft and 7 are mission capable, then the squadron is 70 percent or R-2. Note that aircraft have a different set of breaks given the volatility and sensitivity of a smaller population to calculate the index. Given this sensitivity, there are concerns that a change of a single aircraft on a given day could change the unit's overall readiness and necessitate a new report. Part of that is figured into the aircraft-specific percentage breaks for scoring, but it is a valid concern. If a squadron performs a large training mission with its 7 MC aircraft from the example above and 3 aircraft have maintenance faults after the exercise making them not mission capable (NMC), assuming the other factors are 1 or 2, this leaves the squadron with 40 percent MC aircraft and an R-4, making the unit C-4. That triggers a new report within 24 hours. If, during the next 48 hours, 4 aircraft are repaired, the squadron now jumps to R-1 (80 percent) again, triggering the need for a new report. There is a general procedure in current policy that allows units in some cases to use a rolling average for the unit MC rate as that is likely a better planning figure—or in case some NMC aircraft are expected to become MC within a given window. There is no allowance for what items are NMC for scheduled maintenance that could be easily delayed if there was a pressing need. Using averages can open this system up to the "flaw of averages."[29] Projecting when an aircraft will come out of maintenance opens the door to gaming the system. A reasonable approach is needed to prevent the real-time readiness requirement and the administrative overhead of the reporting mechanism placing unit commanders in a dilemma.

Possession may only be nine-tenths of the law, but it is a key tenet to materiel readiness. The first question—"Do I have what I am supposed to have?"—opens the door to the definition of *have*. The simplest answer is if a unit has the items in question on their property book and verify it via standard inventory processes then they *have* the item. For example, a unit has 10 trucks on its property book and can go to the motor pool and count them. General regulations for property accountability have inventory validation requirements and the property is recorded in an

[29] Sam L. Savage, *The Flaw of Averages: Why We Underestimate Risk in the Face of Uncertainty* (Hoboken, NJ: John Wiley and Sons, 2009), chap. 16.

authoritative computer system.[30] This accounts for a solid majority of military equipment even when a given unit is geographically dispersed. Where things become more complicated is when equipment is attached or detached to or from other units, equipment is transferred elsewhere for custodial maintenance, equipment is in prepositioned stocks, or equipment is inducted into higher-level maintenance.

Attaching and detaching equipment to task organized units should function similarly to personnel as it is a similar concept. For example, an infantry battalion may have an artillery battery attached to it for a special mission. This mission could be a tactical attachment during an operation, or it could be attached for a deployment. The key to readiness reporting is analyzing if the attachment or detachment is of sufficient duration to justify the additional overhead of readiness reporting. This can be made easier if the Services lean on authoritative systems. For tactical attachments, the authoritative equipment maintenance systems are not changed. The parent organization still possesses their equipment in their property accountability and maintenance systems. For long-term attachments such as deployments, the gaining unit assumes the accountability and maintenance of the equipment. Personnel receive orders and these can be tracked, assigning them for temporary duty to another unit. Equipment has a custody receipt used to transfer the items to the gaining command. Both personnel orders and equipment transfers are accounted for within their respective authoritative computer systems.

Custodial maintenance refers to when a unit assumes responsibility for equipment on behalf of another unit.[31] If a unit is deploying and does not have room on the ship for all their equipment, another unit is assigned to perform custodial maintenance on the items left behind. Like attachments and detachments, custodial maintenance is recorded

[30] *DODI 5000.64, Accountability and Management of DOD Equipment and Other Accountable Property* (Washington, DC: Office of the Under Secretary of Defense for Acquisition and Sustainment, 10 June 2019).

[31] Custodian for government property is found in *DODI 5000.64, Accountability and Management of DOD Equipment and Other Accountable Property*. Military departments each have detailed instructions on the maintenance expectation of custodians.

in the authoritative system. The gaining unit is only responsible for accountability and the minimum required maintenance. It does impact the gaining unit's ability to maintain the equipment it normally has. Therefore, the gaining unit should report on the status of all the items; their core materiel readiness should only be based on their own wartime requirement.

Prepositioned stocks refer to an equipment strategy to have equipment in important locations or on ships so that only the personnel are needed to fly in versus moving an entire unit with all its equipment.[32] It is meant to jump-start the forces available in a contingency. Generally, it is not affordable to have all the needed equipment for major theaters in prepositioned stocks. There is enough to rapidly build enough force as a deterrent or to buy time for the larger main body to arrive. It can be part of a larger mobilization strategy where an active component unit leaves its gear set at its home station to fall in on a prepositioned stock. A reserve component unit is activated and moves to the active unit's home station and falls in on their equipment set to complete their training. This works well as there is often a limited gear set available for reserve units due to their limited maintenance capacity at their home drill centers.[33] This limited gear set is often called a training allowance in contrast to the full table of equipment. Current policy requires possession of equipment to be the first part of the equation.[34] If a specific unit is planned for a prepositioned stock, a separate readiness level can also be calculated using the prepositioned stock as "possessed." The risks and costs of prepositioned stocks are considerable. The costs of buying and maintaining additional equipment is considerable. The risk is the ability to get units to the prepositioned stocks. Adversaries with the capability to do so could interdict the movement either kinetically with submarines or long-range precision strike or nonkinetically with cyberspace attacks. Historically, prepositioned stocks have provided stra-

[32] *DODD 3110.07, Pre-Positioned War Reserve Materiel (PWRM) Strategic Policy* (Washington, DC: Department of Defense, 18 June 2018).
[33] *DODI 1225.06, Equipping the Reserve Forces* (Washington, DC: Department of Defense, 28 June 2022), 7.
[34] *CJCSI 3401.02B, Force Readiness Reporting*, C-10.

tegic flexibility to react to contingencies besides a major war scenario. Prepositioned stocks were used in Operation Desert Shield (1990), Somalia (1991), and Operation Iraqi Freedom (2003) to build larger forces more rapidly.[35] These were in permissive environments, however. A potential adversary with twenty-first century capabilities will know where prepositioned stocks are held, track those at sea, and have the ability to strike them. Typically, prepositioned stocks are not hard targets like airbases or headquarters, but the potential losses in equipment are worth taking seriously. Designing the approach to prepositioned stocks for the twenty-first century should look at defensibility, dispersion, etc. to improve the survivability until it is married with fly-in forces.

Equipment inducted for higher-level maintenance is a common situation. For many important items there is a depot maintenance float allowance (DMFA) that allows a stock of serviceable (working) items to be exchanged for an unserviceable item, so units maintain their materiel readiness.[36] For example, an artillery battalion turns in a cannon for depot maintenance that can take weeks or months to complete. The DMFA allows the depot organization to exchange a working cannon for the broken one. The artillery units maintain the same number of working cannons. Calculating a DMFA is based on the total number of items to go through the depot per year, how long it takes to perform the required maintenance for a given item, and then constrained by affordability.

A popular scapegoat for equipment management is the acquisition process.[37] In defense of acquisition professionals, the job is incredibly difficult. When a person looks at buying a car, for example, they shop across many vendors. They research its reliability and can find parts

[35] *Prepositioning Programs Handbook,* 2d ed. (Washington, DC: Headquarters Marine Corps, 2009), 2.
[36] *Marine Corps Order 5311.1D, Total Force Structure Process* (TFSP) (Washington, DC: Headquarters Marine Corps, 26 February 2009), 8-4. The definition refers to a quantity of mission essential, maintenance significant equipment developed to permit the withdrawal of equipment from organizations for scheduled repair (performed at the depot level without detracting from a unit's readiness condition) and for aircraft they are referred to a backup aircraft. This is an example, as each Service has its own detailed guidance.
[37] *DODD 5000.01, The Defense Acquisition System* (Washington, DC: Department of Defense, 28 July 2022).

or repairs easily until they put some miles on it and then trade it in. Think about having to buy a car that will be driven for the next 20 years and all the parts needed for the life of the car must be purchased with the car. In this case, the buyer must also never be without a car, so they have to buy spare cars so they always have a functioning car. Then 15 years in, they find out that the next car will not be ready, so they make the car bought 20 years ago last another 5. Congress loves to beat up acquisition for cost overruns.[38] They have every right to do so; but like the car example, suppose the car needs to do things no other car has ever done before. How can one really be expected to accurately perform a cost estimate on that?

In a real example of acquisition complexity, often pushed as the poster child for acquisition dysfunction, is the M2 Bradley infantry fighting vehicle.[39] In defense of the Army, there was an acquisition program for an improved armored personnel carrier (APC) going back to the early 1960s. The Soviets shocked the world in the early 1970s when they rolled out the BMP, which is a Russian abbreviation for infantry fighting vehicle. This was a game-changing piece of equipment for which the Army and American NATO allies had no equivalent capability. The existing APC was the M113, which was a solid, lightweight tracked vehicle that could transport a rifle squad with a .50-caliber machine gun on top. The BMP could also transport a rifle squad but had a turret with a 73mm cannon and could launch an antitank guided missile (ATGM).

The Army was now under pressure to reinvent their program for an infantry fighting vehicle to not only close the capability gap but potentially make something better than the BMP. The result was the M2 Bradley. The Army determined that a smaller caliber, but higher

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[38] The 1982 Defense Authorization Act, Pub. L. 97-86 includes the Sam Nunn-Dave McCurdy Amendment that was passed 96-0 to help control the increasing costs of major defense systems. This provision has led to several high-profile program cancellations or curtailments such as the Army's Future Combat Systems in 2009 and the Marine Corps' Expeditionary Fighting Vehicle in 2011.

[39] James G. Burton, *The Pentagon Wars: Reformers Challenge the Old Guard* (Annapolis, MD: Naval Institute Press, 1993).

velocity, automatic cannon could outperform the Soviet 73mm. The 25mm M242 Bushmaster was selected as the cannon. It could easily outperform the 73mm on the BMP against a variety of targets at much greater range and accuracy. The already fielded tube-launched, optically tracked, wire-guided (TOW) ATGM was selected to meet the missile requirement. Like the 25mm, the TOW outperforms the AT-3 Sagger missile of the original BMP. There were trade-offs. The BMP was lighter and had some limited amphibious (river crossing) capability, which the heavier M2 struggled with, and later heavier models discontinued. The M2 came under scrutiny and came close to cancellation when it was famously taken out and shot with an antitank missile and it naturally was destroyed. The M2 looks superficially like a tank, but it is not a tank. The original armored protection was nowhere near what is found on an M60 or M1 tank. The test was highly misleading as it was a gross overmatch. It was not contrasted with the fact that the same missile would destroy an M60 series main battle tank and possibly knock out an M1 if hit in the right place. It was not contrasted with the M113's protection either. Fortunately for the Army, they suffered criticisms in the press but pushed on and fielded the M2. The M2 so outperformed the BMP that the Soviets went back to the design board and created the BMP-2 that had a 30mm automatic cannon, similar to the M242 25mm, and an improved missile, similar to the TOW.

During Operation Desert Storm and Iraq, the M2 Bradley (and the M3 Bradley Cavalry version) performed well on the battlefield. The Army successfully closed the capability gap, but from when the BMP appeared in 1973 to the production of the M2 Bradley in 1981, there was a real capability gap. The BMP-1 and BMP-2 have seen extensive service in numerous conflicts, and its overall performance is adequate. The design trade-offs can make it a dangerous weapon, but a death trap if hit. It is amusing to see the infantry riding on top of the BMP instead of inside as they judge that their chances are better. The M2 has improved armor protection in current models and is still a potent weapon system.[40] The Ukrainians have highly praised its survivability in direct combat with Russian troops using BMPs.[41] The replacement program is proving to be as challenging as the original. The M2 has remained in service for roughly 40 years so far.

Training

Training is the key readiness metric for a given military unit. It is worth pointing out that the term *training* can be applied widely, but in this context training refers to the collective unit-level training. More specifically it is the collective training to perform the mission essential tasks to the specified standards.[42] Each community within each Service sets the standards and conditions to which a task must be performed. Training is not the output of readiness in itself; it is a core component. To be considered ready, a unit must have personnel, equipment, and be trained to perform the mission essential tasks of that type of unit. The unit command has very little influence on the unit's structure, as it is already designed. The types and amounts of equipment needed and provided are also out of the control of the command. Soldiers, sailors, airmen, and Marines are assigned by headquarters to the unit. It is the job of the unit commander and the subordinate leaders to train to perform the wartime mission and to make the unit ready. What is needed is the time, space, and consumables to conduct the training. Despite its importance, training can be the most difficult resource area to objectively assess. Training should be pervasive and occur concurrently across echelons. Even units in combat zones must still constantly train. Unfortunately, our current assessment of training can be clunky.

The current policy uses two methods to calculate the T-level.[43] The first is aimed at aviation units by dividing the available combat mission qualified crews divided by the crews formed and/or required. This is

[40] Blair W. Haworth, *The Bradley and How It Got that Way: Technology, Institutions, and the Problem of Mechanized Infantry in the United States Army* (Westport, CT: Greenwood Press, 1999).
[41] Alistair MacDonald and Ievgeniia Sivorka, "Meet Bradley, the U.S. Army Veteran Ukrainian Soldiers Love," *Wall Street Journal*, updated 26 September 2024.
[42] *CJCSI 3401.02B, Force Readiness Reporting*, C-14–C-15.
[43] *CJCSI 3401.02B, Force Readiness Reporting,* C-14–C-15.

not a bad way to look at a platform specific unit type, especially where the crews are not linked to a specific platform. Aircrews typically fly in available, ready aircraft. It is also common to have more aircrews ready than aircraft as the aircraft can be used on missions with different crews to allow for crew rest and recovery.

The second method is the percentage of mission essential tasks (METs) trained to standard.[44] Prior to the introduction of capability-based assessments, the T-level was based on days required to fully train the unit for its mission. This was incredibly subjective as well as highly influenced by external resourcing such as training areas, ranges, and consumables. While it made for a great concept to help with time-phasing readiness, it was not anchored in reality. With the MET assessment approach, training was oriented on the irreducible minimum tasks. It did not help as much with time phasing readiness but gives much more visibility into the specifics of what the unit can or cannot do. It is built around the idea of integrating the capability based, task-oriented assessment. So essentially the T-level is based on the percentage of personnel by mission essential tasks trained to standard. For example, for a unit of 200 assigned personnel with 4 METs, and in this type of unit all personnel are required to be trained on all METs, and the personnel x METs is equivalent to 800. In table 15, the unit has tracked how many of its assigned personnel are trained in each task. A unit of the same size, but the number required to be trained for each MET is different (table 16).

The bookkeeping to manage this can be challenging as the number trained may not have done it all at once. The idea is that a training event for a task may be performed over time and the total personnel trained can be aggregated from multiple events. It is difficult to track when proficiency degrades over time. Another issue with this approach is that task two in the second example only requires a few personnel to be trained and it can be completely untrained and the larger unit's training level is not affected (299–18 = 281/395 = 72 percent, which is

[44] *CJCSI 3401.02B, Force Readiness Reporting*, C-15.

Table 15. Personnel trained by collective task

Task	Required	Trained	Percent
1	200	122	61.0%
2	200	155	77.5%
3	200	98	49.0%
4	200	133	66.5%
Total	800	508	63.5%

Source: author's application of the *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 31 May 2011) for a notional unit based on typical U.S. and NATO unit sizes and task lists, adapted by MCUP.

Table 16. Personnel trained by specific task

Task	Required	Trained	Percent
1	55	49	89.0%
2	120	99	82.5%
3	20	18	90.0%
4	200	133	66.5%
Total	395	299	75.7%

Source: author's application of the *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 31 May 2011) for a notional unit based on typical U.S. and NATO unit sizes and task lists, adapted by MCUP.

still above the 70 percent threshold). A simplified version of this is to divide the number of METs trained by the total number of METs. If 70 percent is the training threshold, then in the example above three of four trained above 70 percent and three divided by four is also 75 percent. Interrelating the training of a particular MET with the ability to perform the MET and the overall mission provides valuable insight. In the example of task two not being trained, the overall training percentage may overshadow the larger requirement tasks, but the untrained task can make the overall mission assessment a "No" and the associated narrative can clearly indicate the lack of training in task two is the reason. The percentage breaks for the training calculation are the same for both methods (table 17).[45]

[45] *CJCSI 3401.02B, Force Readiness Reporting*, C-15–C-16.

Table 17. Training percentage rule

Training level	Percent of METs trained (rounded to the closest whole number)
T-1	Greater than or equal to 85%
T-2	70% to 84%
T-3	55% to 69%
T-4	54% to 84%
T-5	* Not used for training
T-6	Not measured for this unit type (used for prepositioned stocks that have equipment readiness but no personnel to train)

Source: *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 31 May 2011), C-16, adapted by MCUP.

The first problem is that for a given task the measurement is binary. The unit is trained or not to perform this task. While not useless, it does not provide for what is widely understood as a continuum of proficiency. The second problem is that the number of tasks is different between unit types and can vary from 1 to 10, though in the author's experience the number averages around 4 to 6. The percentage breaks for the index produce numeric anomalies, such as units that cannot achieve a certain level (T-2 or T-3) mathematically based on the percentage breaks from a task list of four or less tasks. Related to this is that the current percentage breaks do not align with the basic definitions of the levels, specifically the general definition of level three is some capability, but not most. However, the current percentage breaks have 54 percent or less of tasks trained the same as 0 percent. This fundamental flaw makes most units' T-level jump from four to one and back rapidly with very little visibility into a progression over time. It also is inconsistent with the general definitions of the levels (all, most, some, and none). The current binary method answers a basic question, but it does not measure important aspects of the context of the training. When a unit successfully completes a training event that satisfies the requirement for a MET, how long is that event good for? The period between the event and its expiration is referred to as the *sustainment interval*. The Services and their interval training standards divisions set the sustainment interval for training events. In aviation, these intervals are shorter than ground combat units. There is a logical fallacy though as the unit does not magically forget how to perform the task on day 366 of a one-year sustainment interval. A reasonable person would also be hard pressed to perform a task to standard on day 360 without some sort of refresher.

Another problem with the percent of the METs trained approach is that units do not typically train against their METs sequentially. They do not build on each other. An infantry battalion does not have to attain proficiency in defensive operations prior to training on offensive operations. They will typically transition back and forth between defense and offense during any given training exercise. Units train across their mission with MET training occurring concurrently. This forces the T-level to jump from unready to ready with no visibility into training progression. The unit does tend to train at sequential levels of complexity. This is a "crawl-walk-run" approach. This approach often follows the basic echelons: team, squad, platoon, company, then battalion. The T-level is based on the unit—primarily battalions—training. Units may allocate 50–75 percent of their training time and resources to training at these lower levels. These provide a basis for supporting tasks to higher echelon, more complex tasks. However, there is no visible build in readiness assessments. A unit may invest significant time and resources to build proficiency, but it is at T-4 that it starts to complete the reporting unit level of training. In practice, this is observed as units jump from T-4 to T-1 after sitting in T-4 for several months, which undercuts the potential value of a four-point scale.

It is worth noting that the current policy was an attempt to integrate the training resource level with the MET assessment portion of the report.[46] The training resource level went through several other methods in the past. In Richard Betts's book, the method in use was the commander picking a range of training days needed to achieve T-1.[47] The associated remark would allow for some justification of the choice. The challenge was the interpretation of business rules and the sub-

[46] *CJCSI 3401.02B, Force Readiness Reporting*, C-14–C-15.
[47] Richard Betts, *Military Readiness,* (Washington, DC: Brookings Institution, 1995), 137–38.

jectivity of the commander's choice. The business rules for the choice presumed an emergency that would cancel leave and return all assigned personnel to the unit and normal peacetime fiscal constraints would be removed. The problem is that other units would be doing the same thing and there would be a capacity limitation on ranges and available ammunition. The unit commander is not in a position to calculate the extent of these constraints. Thus, the business rule is a "best case scenario" and as such could be highly misleading. The MET approach is more definitive on what is and is not trained to standard and is more objective than the training days needed. What was lost was a single range of days for time phasing ready forces as they achieve their training standards. Commanders do report a forecast of when they expect the unit readiness to change, but it is based on a less definitive business rule. In practice, the commander's forecast is based on their peacetime or day-to-day training and deployment schedule. Therefore, it is not particularly useful for contingency or war planning. An attempt to understand the time phasing of making units ready for a contingency is currently accomplished through a different process.

Whether a unit is considered trained to standard on a given MET is based on an underlying training system. For many decades the underlying training management systems used the TPU assessment that is similar in concept to the "YQN" scale in mission and MET assessments.[48] The T is trained to standard, the P is partially trained or needs practice, and the U is untrained. For readiness reporting, we are primarily concerned with the T and that is what makes a MET considered trained. It is up to Service policy how to treat the P. Keeping in mind that a true MET assessment is resource informed—not just a measure of training—the P and U are mapped to not trained to standard. This scale has some obvious weaknesses. If a "Cs get degrees" approach is in place, the T represents a basic level of training that leaves open the question of proficiency. The U is ambiguous as it provides no understanding if the unit tried and failed or never tried at all. The P is too

[48] *Army Unit Status Reporting and Force Registration–Consolidated Policies*, Army Regulation 220-1 (Washington, DC: Department of the Army, 2022).

broad. To be fair, it is better than no measurement at all. Training professionals within the Services are looking at better ways to evaluate training from the Performance Evaluation Checklist (PECL) of tasks that each have a go or no-go criteria to the Scaled Performance Evaluation Measurement System (SPEMS) that may give better insight into proficiency.[49] As these develop, it could provide a better end product for readiness reporting.

The other problem is capturing the conditions under which the training was conducted. The current reporting system has a wide-open data model. It covers physical (day, night, hot, cold), military (peace, war), and political.[50] A training event can be performed once and have a full set of conditions that were used to conduct the training. The conditions can be incredibly specific or generic, making analysis and comparison difficult. An aviation training event can be as simple as "in the air" or as specific as "above 10,000 feet, daytime, visibility of 10 miles." The conditions model does not take into account that for many training events the conditions are clearly implied. A night attack event must clearly be done at night, and it can also have subsets such as use of illumination or not. Regardless of how specific the conditions detailed in the system, it is unclear if this excludes capability in other conditions. For the specific aviation standard above, what if the task is at 9,000 feet with 8 miles visibility? Is the unit unable to perform the task? Providing all potential conditions is not practical either. Many of these conditions do not speak to the necessary resources, such as range capacity, threat emitters, or adversary role players that are needed to conduct realistic, high-end training.

Ordnance

Ordnance is a resource area that is not measured by all current readi-

[49] Garret A. Loeffelman, "Developing a Scaled Performance Evaluation Measurement System to Evaluate Marine Performance" (master's thesis, Naval Postgraduate School, June 2019); and *Marine Corps Order 3501.1D, Marine Corps Combat Readiness Evaluation (MCCRE)* (Washington, DC: Headquarters Marine Corps, 17 October 2014), 1-3–1-4.
[50] *DODD 7730.65, DOD Defense Readiness Reporting System*.

ness reporting units.[51] It is used to measure certain critical munitions when held by a given unit. This is applicable to units that perform alerts or deployments equipped with these critical munitions. The calculation is simple as it is the quantity of serviceable munitions divided by the requirement. That is then converted to a percentage and then indexed the same as personnel, equipment, and training indices are done. The availability of critical munitions is increasingly important in the long-range precision strike paradigm. The quantity and location of these munitions may be especially useful in evaluating the ability of the current force in time and space to perform components of a war plan. Ordnance readiness is dynamic as, a planned munition to target match can be mitigated by other munitions. For example, a plan calls for 100 missiles, but the unit only has 50 serviceable missiles on hand. This could be assessed as unready, but the targets not "serviced" by the shortfall could be hit with bombs for which there is not a shortage. In the example, the plan is still executable, but the munitions mix will require more bombs to make up for the shortfall of missiles. The ordnance rating for the missiles would be unready, but the overall readiness would still be ready with the qualification that the ordnance mix will not be what is originally planned. If there were not enough bombs to cover the shortfall of missiles and still cover the targets assigned to bombs, then the plan would not be supportable. That kind of dynamic evaluation can be difficult, because the chain of interrelated munitions and targets can be quite large and detailed. It is not possible or practical to determine when filling out a unit-level monthly report.

The locations of munitions, the anticipated consumption rates, production capacity—both day-to-day and surge capacity—are all part of understanding the bigger picture of force readiness, not just unit readiness. Moving munitions around the globe competes with the movement of personnel and equipment. This larger picture is a strategic readiness

[51] *CJCSI 3401.02B, Force Readiness Reporting*, C-2; and *Chairman of the Joint Chiefs of Staff Manual 3150.02B, Global Status of Resources and Training System* (GSORTS) (Washington, DC: Department of Defense, 25 March 2011), N-2.

metric but can have applicability through the operational to the tactical level. A ship must have the needed mix of munitions when underway (at sea) as it is not possible to easily change, and that can dictate the range of different missions the ship is ready to perform.

Mission and Task Assessments

Militaries around the world use some sort of resource-based readiness assessment and have done so in various forms since the 1600s. The resources of personnel and equipment lend themselves to traditional accounting processes. It is related directly to funding and employment. Modern forces are vastly more complex, but at a fundamental level the principle still applies. With older forces, capability was implied. A regiment of horse or a regiment of foot had a well-understood capability by the professional military officers of the day. Today's capabilities are so specialized and diverse that most professional officers cannot realistically know the nuances of the various capabilities during the 20-year career window. Most will spend 10–15 years within their specialty gaining expertise before being assigned to a Joint command. Current readiness reporting added mission and mission essential task (MET) assessments in the early 2000s to provide a capability-based reporting aspect. This addressed a couple of issues. Many modern force elements or unit types are multimission capable and can have a set of capabilities that may have a mix of ready and not ready values. It can potentially help with understanding different unit types with similar capabilities.

Each type of unit should have a designed mission with a set of enumerated METs, or a mission essential task list (METL), and each MET should have an enumerated set of conditions and standards. The mission is just a data structure that is a rollup of the MET assessments, so if a unit assesses all its METs as a "No" then the mission assessment is "No." The level of subjectivity versus objectivity in these assessments is highly dependent on the level of detail the Service loaded into the performance standards. Unfortunately, that means there is a wide range even within a Service and more so across Services as the implementation of capability reporting uses a common data standard. The details and types of the performance standards are very different. The requirement for mission and task assessments did not specify common tasks or common performance or output standards that must be used so each Service has its own interpretation. Many of these differences are perfectly valid. When comparing fighter squadrons, Navy and Marine Corp squadrons include organic maintenance so there are maintenance standards with the tasks, unlike the Air Force that performs maintenance in an external organization. Many differences are semantic or parochial and become a barrier to using the data across unit types and Services for anything useful.

All METs should derive from the Universal Joint Task List (UJTL). The tasks from this list have a flat structure. The tasks range from strategic, operational, and tactical levels of war and then follow a general numbering scheme that follows the Joint capability areas listed in chapter 2. A Universal Joint Task has a brief paragraph describing the capability, the doctrinal references, and a list of possible performance measures.[52] Each Service built out their own task list with Service specific definitions, references, and performance standards. There is a broad misunderstanding of the standards in an MET and with the connection to the training level. It is often thought of as a training assessment. It is meant to be a more comprehensive assessment of the capability encapsulated in the MET, but the implementation has been inconsistent. A major contributor to the inconsistency is the complexity of all the different tasks a modern, high-technology military undertakes. Each Service has thousands of tasks and standards, all of which are traced back to doctrine, training manuals, and school curricula.[53]

Capacity Assessments

This is the next step from unit reporting. Filling out and submitting reports is only a part of assessing the readiness of the force to perform

[52] "Universal Joint Task List," Joint Chiefs of Staff, accessed 9 May 2025. The site offers to export the list, which is updated once per month.
[53] *CJCSI 3500.02C, Universal Joint Task List Program* (Washington, DC: Department of Defense, 19 December 2022).

various tasks. These assessments are performed at various levels from combatant (theater-level) commands to the total force and are highly classified. Capacity assessments compare the number and type of ready forces against various demands. The demand can change from day-to-day deterrence forces to major war plans. Demand for forces are captured in various orders and plans, but all include a list and number of unit types and timeframes for their movement to the desired area of operations. The assessment considers who is already in the area (the value of the forward postured force), the transport capacity to get forces there, and the number of ready forces to be transported over time. The timing of movement can provide more time to make additional units ready. This type of assessment is more complex than an aggregation of unit readiness data. It bridges two datasets, the readiness data (i.e., the supply of ready force) and the demand data. As such, this is done on demand, typically for senior leader meetings that rotate through various types of plans. Improvements in data systems have made this type of analysis quicker. The highest profile of this type of analysis is the statutory Chairman's Risk Assessment.[54]

Successes and Failures

Looking at the current system of assessments, the first lesson is to not throw out the baby with the bathwater. The current system provides a massive amount of useful data. The reality is that the Services produce highly ready forces to do many tasks in peace and in combat. There are certainly areas for improvement. The resource areas of personnel and equipment are largely successful at what they are designed to do. These are backed by information technology systems, so the data is detailed with a variety of internal checks to ensure acceptable accuracy. The training assessments provide a partial answer but have significant room for improvement. The mission assessment is the most complex part of readiness reporting and as such is the biggest shortcoming. The mission and MET assessments are a time-consuming and complex part of report-

[54] Chairman: Functions, 10 U.S.C. § 153 (b)(2) (2023).

ing. It consumes much Service effort and frontline effort. It is difficult to effectively synchronize across the force as the capabilities and force structure changes. The lack of common understanding or requirements make the utility limited to comparison within a given Service unit type. The cost-benefit is not there in the use of mission and MET readiness data. Within the doctrine and training communities of each Service, the utility of enumerating tasks and performance standards is essential. It is important to keep these distinct. Even if the data provided in reporting is not particularly useful, the underlying work is incredibly important.

The next failure is the snapshot nature of the report. It does not perform an inherent trend analysis; that effort must be completed externally. Each unit has context in where it is on the force generation cycle, its planned employment, where it was last month, the last six months, the last three years, etc. It is no different than a stock report. Each stock value is looked at within the context of a quick trend analysis. The score says if a unit is ready and that has value. It has more value if the readiness was on plan, higher, or lower. Once the historical trend is established, what is the unit forecasted to do for the next 6–12 months balanced against what the actual employment plans are?

Current practice described so far does not capture modernization or relative value of the same or similar unit types and if looked at over time can be misleading. For example, we were building a new capability, and the raw analysis showed the readiness of this new capability going down during the next five years. The reality was the capability had improved in real terms during the five years, but scores went down as the Service gained a better understanding of what really needed to be ready. The early numbers were higher but were not truly ready. Modernization is often thought of as major programs such as new types of ships or aircraft. Much modernization occurs below the threshold of a change in ship class or aircraft type. It can include a plethora of equipment such as vehicles, radios, weapons, sensors, or computer systems that do not change the type of unit. Next comes a complex tracking of which of the same types of units have upgraded capabilities and where that capability is significant to unit readiness.

The biggest failure of current methodology is arguably the readiness data for subordinate units. This subject is widely discussed at readiness working groups with each Service having a slightly different take. There is no standard process for capturing the readiness of elements below the reporting unit level. This is the biggest challenge in the twenty-first century as the extensive use of task organization and the outsized effectiveness of smaller forces make the traditional O-5 level (ships, battalions, or squadrons) of readiness reporting largely obsolete.

A larger issue beyond measuring unit readiness is the myopic nature of unit readiness. While not unimportant and representing a significant investment of time and money, unit readiness does not mean the military is ready to deter, fight, and win across the range of military operations by itself. Units can be ready, but is transportation available to get them to the place of need? Are there enough supplies and ammunition so the ready units can stay in the fight long enough for new production to kick in? Is the number of ready units the right number and mix? A nation can have a fully ready force that may be too small or with not enough modern capabilities. Are parts of mobilization thought through, planned, and exercised? How do you balance global posture and active deterrence, such as rotational forward-deployed forces, with building ready capacity for high-end conflict? What if a nation wears out the force in competition and deterrence and have too little left should a larger conflict break out?

The professional military does plan for these situations in various levels of detail and rigor. They tend to be in silos of excellence, and it can be difficult to see a bigger picture of interrelated factors and areas of risk. Decision makers need to understand the implications of their decisions. They intuitively know that these considerations exist and that decisions today have far reaching consequences. The timing, scale, and duration of the impacts need to be quantified. It may not change the decision but can inform the mitigation strategies needed in light of a significant decision.

The deficiencies of current methods do not mean it was a failure. As we learned the art of the possible, the expectations have increased. With the data available, more possibilities are visible; the questions it does answer often opens the door to more questions.

PART 2 ASSESSMENTS

"How should we then live?"
~ Francis A. Schaeffer[1]

Having established the need for readiness assessments to support decision making, we have also covered the inherent complexity of looking at readiness across a range of operations and time, not just ready to fight "the big one." We also looked at the current way to measure readiness. While not as expansive as Francis Schaeffer's book on Western civilization, how do we provide a better assessment of military readiness for the twenty-first century?

The military enterprise is in competition even when not in active combat. The civil servants and contractors doing data science are part of that enterprise. There is a temporal and moral imperative to our work. The technology and data universe is changing rapidly. Political structures in place for generations fade and collapse. If the enterprise is to be effective, it must confront these challenges early and often. The reality is that the data informed/driven world is moving and to deny or retrench is no longer a viable option.

We will start with a discussion of data. The point is not to make everyone a data scientist, but data is such an important aspect of this new world that there needs to be a frank discussion of what it is and is

[1] Francis Schaeffer, *How Should We Then Live?: The Rise and Decline of Western Thought and Culture* (Wheaton, IL: Crossway Books, 1976).

not. It is not in itself a panacea. Without data a comprehensive assessment is not possible. We must take advantage of it; it will continue to grow regardless. We must be clear that our potential adversaries face the same challenge.

Moving from a general discussion of data, the author will look at the logical dimensions of military readiness and then move to a broader framework of how to understand readiness over time. The discussion will then end with some aspects that are difficult to measure. There are aspects of military effectiveness that are difficult to quantify; it would be irresponsible to ignore important aspects that are not measured. There is always room for qualitative assessments beside the quantitative.

CHAPTER 6

THE DATA EXPLOSION

The defining aspect of this age is the data explosion, or the Information Age. Children walk around with handheld computers more powerful than the one used to put men on the Moon in 1969. The ability to capture, store, and share data is growing exponentially. There is a perfectly valid desire to leverage this to drive better decision making. It can also be thought of as a sink-or-swim proposition. The data is geometrically expanding whether it is leveraged or not. The data is growing for reasons unrelated to military readiness. If an organization cannot get on board and ride the wave of data, it will become overwhelmed and lost in a sea of data that can drown the decision-making process. This is the twenty-first century version of the fog of war. Carl von Clausewitz's fog of war came from an environment of too little information or uncertainty, like a physical fog shrouds the world.[1] The new fog is the vast amount and diversity of data. This mass of data shrouds insights in endless spreadsheets, pie charts, and run charts. The upside is that technology and skills among data scientists and engineers is growing.

[1] Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976).

This provides opportunity; however, the military readiness problem is not going to be easily cracked like *Moneyball's* on-base percentage.[2]

What follows covers data and is intended to give a brief overview of what data is and is not and how it is stored and used for analysis. This is not intended to be an in-depth data scientist's discussion of the pros and cons, recommending one approach or another. There will be recommendations on what to measure and what to do with the readiness data once there is a general understanding of the underlying complexity. Today's data universe is far more capable than it was a couple of decades ago, but it still has limitations. The ocean of data is an opportunity but can represent a significant undertaking to bring together data. Bringing data together has shades of meaning; data can be colocated physically or virtually in a single database or multiple databases. However, most of these databases were never designed to easily join or union data with other databases that were built for entirely different purposes. More often than not the ability to bring the data together involves overlaying additional software that can be costly and time consuming to write and can be fragile. This fragility means that long-term sustainment of the linkage software comes along with it. It is not a once-and-done piece of code. Any change to the underlying systems, including unintended consequences of cybersecurity maintenance, can break the linkage.

In the author's work with military readiness during the last 14 years, the author has specialized in bridging the military subject matter experts, the analysts, and data scientists. In many places, these communities come together and talk past each other. The author has spent countless hours walking developers, analysts, data scientists, and data engineers through the military structures shown in chapter 2. Having been a software and database developer helps to speak their language and the author's military experience allows translation of technical issues to the military subject matter experts and senior leadership. If the reader is already versed in databases and coding, fast forward through

[2] Michael Lewis, *Moneyball: The Art of Winning an Unfair Game* (New York: W. W. Norton, 2003).

this chapter, just as military members could skim over the organizational models in chapter 2. For general awareness, the author works with senior leaders, military subject matter experts, and analysts daily who have never written code beyond a spreadsheet formula, and there is nothing wrong with that. There are far ranging efforts in industry, government, and academia to improve the data literacy across the larger base of data consumers.[3] What follows is a simple overview of the technical considerations of why leveraging the amount of information is not as easy as it sounds. Sound bites on data informed and data driven decision making can be harder than is commonly understood. The author has spent many years in the trenches of leveraging data, writing code, and designing databases on multiple platforms. It can be daunting and frustrating at times. Not wanting to be too pessimistic as there are enormous opportunities, but they come with investments of time and resources. They may start wobbly, but given a chance to evolve with the users' input, these projects can reap benefits far beyond the investment.

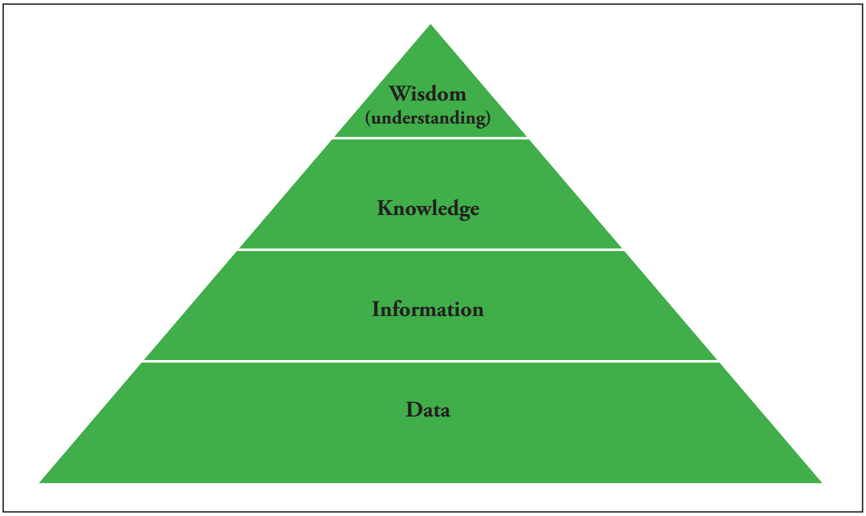
It is worth noting that an information technology system can be constructed and fielded within a few years of focused effort for far less than a ship or a single fighter aircraft. This relatively low-cost system can help to better use the ships and aircraft available and thus can function as a potential force multiplier. A soldier can be trained and equipped at great expense, but that soldier is at best incrementally better than a peer-level adversary. Information can put that soldier at the right place and at the right time to gain a physical advantage from an informational advantage. Information dominance is knowing that right place and time faster than the adversary.

Data

The data explosion is real, but having lots of data is not a solitary solution. There are countless projects driven by the rapid growth of available data. We see this word in nearly every meeting, memorandum, or

[3] Jordan Morrow, *Be Data Literate: The Data Literacy Skills Everyone Needs to Succeed* (London: Kogon Page, 2021), chap. 7, 115–33.

Figure 12. Data-information-knowledge-wisdom (DIKW)



Source: courtesy of author, adapted by MCUP.

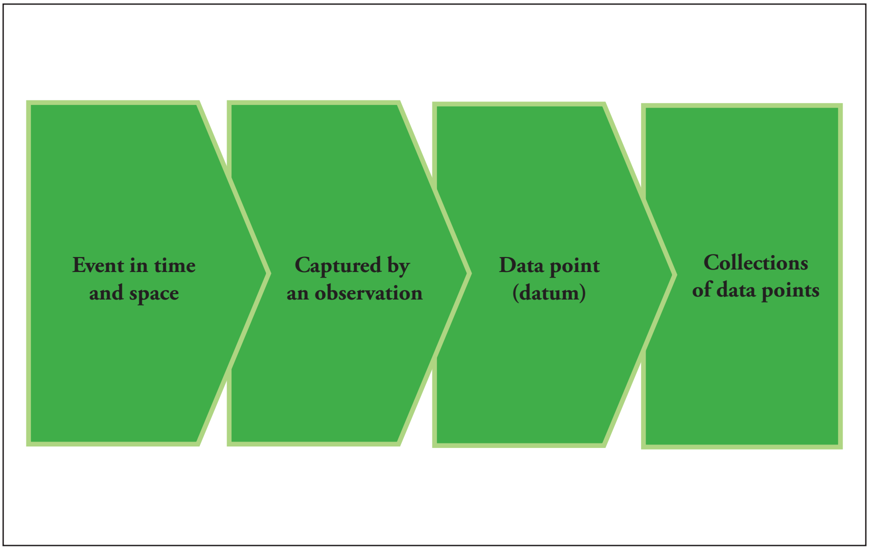
email. We often gloss over the gory details of what we actually mean by data. How it is stored, compiled, analyzed, shared, etc. are all important factors of its utility. Data is not information or insight. Data forms the base of the classic data-information-knowledge-wisdom (DIKW) hierarchy (figure 12). The goal is to figure out how to move data up the pyramid. For a multivariate system like measuring military readiness, this involves bringing data about each of the pillars (people, equipment, training, and capability) together. The data associated with these pillars lives in many different databases. Here is where readiness becomes a data integration problem with all the technical challenges that come with it. Even if each pillar had a single repository for each Service (Army, Navy, Air Force, Marine Corps, Space Force, and Coast Guard), that represents 20 different databases for a single consolidated view of the readiness of units. The number of databases increases with the expansion to installations, munitions, posture, plans, and schedules for a deeper understanding of readiness.

The data discussed here refers to digital data captured in some form of digital storage. Data by itself is a collection of ones and zeros. Events happen constantly and the data explosion comes from a proliferation of ways to capture these events as data points. Prior to computers, a scientist would observe an event in time and space and record it in a journal. That record is now a data point. Manual recordkeeping was still being taught side by side with early computers. A "check sheet" was part of statistical process control (SPC) and total quality management (TQM) of the 1990s.[4] The author used this technique in the mid-1990s as part of SPC and TQM to improve preventive maintenance rates of commercial trucks and determine that driver time-at-home was not the primary factor behind turnover. The journal became a collection of data points, also known as a database. With the invention of the computer, the collection of paper data could be replaced by a digital database. This started with humans typing data into a database. Then they added sensors that would capture the data and automatically input it into the database. Then with increasingly smaller sensors, the number of sensors creating data increases because it is cheap and easy. Automation reduces human error and bias. They also created a myriad of interfaces to share and replicate data across databases. Along with tons of new data points, the same data is often stored in numerous places and different formats for efficiency of use (figure 13).

In the old way, the journal provided the data and the notes in a single object. The object was limited to being in one place, and it could be lost or damaged. Digital versions require an explanation of what the data represents. This is the metadata—the data about the data. The description of a dataset—its metadata—is often called a schema. The schema allows someone to see the metadata and use it to validate new data.[5] Data that has some sort of schema is referred to as structured data and other data like the text on this page is called unstructured data. This text and the images are not organized in a typical database format. Humans are good at absorbing unstructured data; it is the

[4] Douglas C. Montgomery, *Introduction to Statistical Quality Control* (Hoboken, NJ: Wiley, 2005).
[5] Judith S. Bowman, Sandra L. Emerson, and Marcy Darnovsky, *The Practical SQL Handbook: Using Structured Query Language,* 3d ed. (Boston, MA: Addison-Wesley, 1996), 52, 401.

Figure 13. Data creation



Source: courtesy of author, adapted by MCUP.

most common way we communicate. Structured data lends itself to analysis, and structure falls into the few basic ways digital data is stored and displayed.

There are several available methods of creating and storing structured data and the author will look at three of the most popular methods. The method most people think of is tabular data. Structured tabular data has columns, and each record is a row (table 18).

Each column represents an attribute of the row.[6] The schema provides the name and data type of each column. A database is a collection of tables that are interrelated in purpose or physically with cross references with related tables. The commercial version of this is called a relational database management system. The relational part of the title is from the ability of the schema to create a relationship between tables. The more rigid the schema, the higher the fidelity of the data it contains for analysis, but that can make the back end more complex. Tables do support easy data entry and support rapid searching and grouping of

[6] Bowman, Emerson, and Darnovsky, *The Practical SQL Handbook*, 54–61.

Table 18. Tabular database

Car number	**Type**	**Make**	**Model**	**Year**	**Seats**
1	Sedan	Toyota	Corolla	2020	4
2	Van	Toyota	Sienna	2021	8
3	Truck	Nissan	Frontier	2019	2
4	Sedan	Nissan	Versa	2021	4
5	SUV	Ford	Explorer	2022	6

Source: courtesy of author, adapted by MCUP.

data. A couple of newer ways to store data are documents and triplestores (database) that open some opportunities that were not easy or practical before. Documents are not unstructured text documents that many may associate with the name and triplestores are sets of three values that are associated with large data file systems and cloud computing. These three methods are explained in more detail and compared in examples below. A document uses a file with a set of name-value pairs that work like a column and its corresponding value. The number of pairs can be spelled out in a master schema that specifies a valid set of pairs. Much of the internet uses name-value pairs and that is part of the growing popularity of that style of data storage. It can be more flexible than tabular data in many respects.

Looking at a simple set of items, we can provide a simple example of the differences. In this example, there is a dataset of five cars (table 18).

With this table, the user could search by any column or set of columns and group by any column. So, using structured query language (SQL) one can easily summarize the data (table 19).[7]

Most structured readiness data exists in a tabular format. Other formats may facilitate modernization of the collection, storage, marshaling, and analyzing of readiness data.

Another approach is the document or "NoSQL" approach. The common commercial versions are extensible markup language (XML),

[7] "What Is SQL?," W3 Schools, accessed 13 May 2024.

Table 19. Car make and count

Make	Count
Toyota	2
Nissan	2
Ford	1

SQL command: select count (*) from cars group by make
Source: courtesy of author, adapted by MCUP.

Java standard object notation (JSON), and binary standard object notation (BSON). A document approach using JSON looks like this:[8]

{“Car Number”:”1”, “Type”:”Sedan”, “Make”:”Toyota”, “Model”:”Corolla”,”Year”:”2020”,”Seats”:”4”},
{“Car Number”:”2”, “Type”:”Van”, “Make”:”Toyota”, “Model”:”Sienna”,”Year”:”2021”,”Seats”:”8”},
{“Car Number”:”3”, “Type”:”Truck”, “Make”:”Nissan”, “Model”:”Frontier”,”Year”:”2019”,”Seats”:”2”},
{“Car Number”:”4”, “Type”:”Sedan”, “Make”:”Nissan”, “Model”:”Versa”,”Year”:”2021”,”Seats”:”4”},
{“Car Number”:”5”, “Type”:”SUV”, “Make”:”Ford”, “Model”:”Explorer”,”Year”:”2022”,”Seats”:”6”}

At first glance, the document approach appears wordier, so it takes more space to store. In this example, the first row in the table has 24 characters versus the document, which has 75 characters (not counting the quotation marks and colons). The advantage is that each record in the document can stand on its own, unlike the row in a table, which must have the column definitions to know what the data means. Rapid growth of computing power and the power of parallel processing means that these documents can be physically distributed across a large number of connected storage devices for rapid search and retrieval. To

[8] “What Is JSON?,” W3 Schools, accessed 13 May 2024.

be fair, the power of parallel processing also helps large tabular databases too. This brings up an important point in large and/or complex databases. The weak point of anything stored on a computer is the ability of a computer to read it into memory. It becomes a physical limitation, but the answer is not a bigger and better reader. Computers can use many readers at once and each can pull relevant data into the same memory pool for analysis, editing, or visualization. The faster system will have dozens or hundreds of readers working together to give the illusion of a single cohesive dataset to a user. These technological improvements enable the data explosion. Not only can we store more information, but we can also process it faster than ever before. However, many large systems still take hours to perform complex operations, but many of these operations were not even possible 15 years ago.

The third way of looking at data is a graph-based approach that opens the door to semantic queries. A semantic query looks at explicit and implicit data based on the context. There are many variations, but the most well-known is the resource description framework (RDF) triplestore. A triplestore organizes data in a subject-predicate-object format.[9] The automobile data in triplestore format looks like this:

:Ben :IsOwned :Car1
:Car1 :IsType :Sedan
:Car1:IsMake :Toyota
:Car1 :IsModel :Corolla
:Car1 :YearMade :2020
:Car1 :HasSeats :4

The goal of organizing data this way is to use human-like inference. However, the computer must have the vocabulary to work from, which is captured in an ontology. This functions similarly to a schema to validate the data and provide the search engine with an understanding of the interconnected aspects of language. For example, a watercraft can include canoes and ships—oceangoing ships are watercraft but can be

[9] Arto Bendiken, "How RDF Databases Differ from Other NoSQL Solutions," *Datagraph.org* (blog), 22 April 2010.

commercial, private, or military. A destroyer is a military ship but not all watercraft are destroyers. The person writing the query or performing the analysis needs to have some knowledge of the extent of the ontology or a search engine may give unexpected results. For military readiness, an ontology can be reasonably built with a broad set of interrelated concepts that can support analysts, because we have a sufficiently specific context that it is manageable. With the triplestore, each record is a combination of the row, the column, and the field from the tabular structure. This means the sample of five rows and six columns would make 30 triplestores. In a more realistic example, if a military has 1,000 units of all types and each submits a readiness report once a month, they have 12,000 rows per year. If each row has 200 attributes or data elements, they are adding 2,400,000 triplestores per year. This sounds very inefficient, and it was 20 years ago; but with newer technology, it opens new avenues of understanding relationships across the data. RDF triplestores support some types of analysis more than others. There is software that can take tabular or document data and "shred" it into triplestores, so one does not have to reinvent their entire data collection and storage system if there is a need to expand the analytic space. There are also hybrid options that create a triplestore layer on top of a tabular database to try and have the best of both approaches.

Tabular data is very good at analysis of complex data. For example, tabular data could analyze a row with many attributes, such as a unit readiness report. The report is a row that has dozens of attributes that can be grouped into nodes such as data about the unit; data about the time, location, and reason for the report; and data about the personnel, equipment, and training. Triplestores are very good at looking at relationships between items. This inference can be powerful so that if a particular item is identified, then its relationship to what a unit owns or operates within the time and place can give clues as to who and what is going on. The rigidity of the schema of tabular data is both its strength and weakness. This rigidity helps it search and group across large, complex datasets rapidly but does not handle change well. The triplestore is very flexible, but classic statistical data within a complex dataset is not as easy to perform. The document style is a middle ground for flexibility. It supports similar documents well through polymorphism.[10] Polymorphism allows for a general template for a type of document record that can change some of its attributes and still retain linkage to its original document type, or class. It inherits the base attributes and can add or change them as a derivative instance. This lends itself in many ways to some of the basic readiness data problems. There are many different types of units and ways to consider common readiness metrics. How these metrics are calculated may be unique to the unit type. A base class of a readiness report can hold the common metrics that can be derived into subclasses that capture the unique attributes of aviation, ground, and vessel based units.

Regardless of the method of storage, it is important to retain each snapshot. Like a movie that runs at 24 frames per second, a monthly status report is one frame and looking at them across time shows the trends (e.g., readiness in motion over time). The current status answers the first question: Can I fight tonight? The next question is: Can I fight tomorrow and every other day after that? Without understanding the trends, one cannot perform a forecast or build a model that supports understanding the likely outcomes.

Unstructured Data

A mountain of data sits out in cyberspace in formats that are not easily analyzed collectively. Documents, spreadsheets, and slideshows are the big three, but there are also unstructured remarks that exist as columns in databases.[11] Altogether, this data amounts to more raw storage than structured data. Unfortunately, it is incredibly hard to analyze in bulk, but there are some newer technologies that can rapidly search these data types and provide weighted relevance to a complex search context.[12] It is

[10] Luca Cardelli and Peter Wegner, "On Understanding Types, Data Abstraction, and Polymorphism," *ACM Computing Surveys (CSUR)* 17, no. 4 (December 1985): 471–522, https://doi.org/10.1145/6041.6042. This provided the academic background to the implementation in many programming languages such as C++ and Java.
[11] "What Is Unstructured Data?," Geeksforgeeks.org, updated 26 September 2024.
[12] Bernard Marr, "What Is Unstructured Data and Why Is It So Important to Businesses?: An Easy Explanation for Anyone," *Forbes*, updated 10 December 2021.

similar to how Google's algorithm searches across millions of websites and can provide a result set stacked by relevance. A complex search context is aided by the same type of ontology as triplestores that provide a manageable and understandable vocabulary. Even with relevant items, each unstructured file is difficult to perform any sort of statistical analysis other than frequency analysis. This type of meta-analysis of frequency of topics occurs for example with trends on Twitter or X, TikTok, Instagram, etc. It is difficult to know what the X content is without looking at each one, other than if it relates to a particular context. Human understanding of text and images can be exceedingly complex. Even the best ontology would struggle with sarcasm, irony, and idiom. Trending looks at relationships, or a buzz, but if that is negative, positive, or neutral it is very difficult to tell with reliability. Even with a subset of vocabulary, it can be confusing. For example, an ocean-going vessel is generally called a ship, and a submarine is referred to as a boat, not a ship. A U.S. or NATO corps is a different echelon than the Russian use of the word corps. In Russian, army and corps refer to what the United States would call a corps and a division, respectively, but the Russians also employ divisions, just to confuse things further.[13] Emerging generative artificial intelligence technology is rapidly emerging as a promising approach to this problem. OpenAI's ChatGPT has blown open the barriers in a very short time, though there are some safeguards necessary for use in military applications. These include elimination of the "hallucination" problem, consistent answers to the same questions, and copyright protections.

Artificial Intelligence and Machine Learning

The subject of artificial intelligence (AI) and machine learning (ML) sparks many imaginations. The possibilities are endless. The explosion of data is part of the key to truly opening the door to AI. AI is not

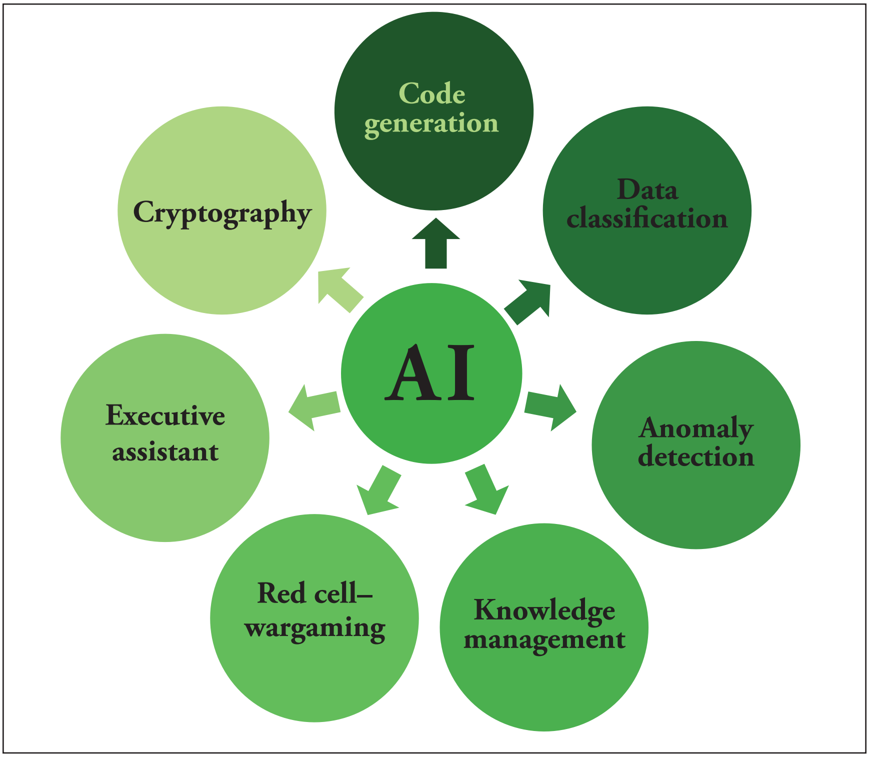
[13] Mason Clark and Karolina Hird, *Russian Regular Ground Forces Order of Battle* (Washington, DC: Institute for the Study of War, 2023), 13–14.

inherently military; it is a general-purpose technology.[14] For the human brain, natural intelligence is immersed in experience for years. The human senses are in full receive mode throughout their lives. The number of fine adjustments to crawl, run, jump, read, write, and build are immense. For AI, it must have a massive amount of data to truly learn. When the author was working on logistic algorithms, well before AI, computers were good at math. They could solve math problems and provide a physical diagram to users. The human brain is a powerful spatial optimizer. Presenting potential solutions in a way that best uses the human computational engine was very effective. There may be a general misunderstanding with many who look at AI. It can make a computer better at things that they are not already good at such as simple, highly iterative tasks or complex math problems. One vendor the author evaluated recently pointed their AI at the most complex part of their business, the customer. The AI engine they built interacted with a user to gain a better understanding of what they want. This was brilliant, as the last 30 years of software development was a constant battle of trying to get a decent understanding of what users really wanted. It is similar to keeping track of user preferences, but automatically and in detail. Even the smartphone does this to some extent as it generally knows what phrases users are more likely to use in a text message, or it knows when someone gets in the car at home, as they will want to know how long it takes to get to work, or vice versa. This may be the key to unlock the treasure trove of unstructured data.

Figure 14 contains a set of AI-ready tasks that are related to work in military readiness metrics and assessments. There are many other potential tasks beyond this scope, so this is not intended as comprehensive. *AI ready* refers to tasks where there is data to train an AI with or where generative AI has demonstrated to the author as having utility. Some of these tasks are being pursued and may be fielded in some form by the time this book is available.

[14] Paul Scharre, *Four Battlegrounds: Power in the Age of Artificial Intelligence* (New York: W. W. Norton, 2023), 3.

Figure 14. Artificial intelligence-ready tasks



Source: courtesy of author, adapted by MCUP.

AI needs input to learn from, and it needs a feedback mechanism for what is good, bad, or better to refine data into a digital form of the DIKW pyramid.[15] Much of human learning is initially experiential. For example, gravity provides continuous feedback and spatial relationships, and heat and cold all have built in feedback mechanisms in humans. With higher-order knowledge, we have human feedback in the form of parents, teachers, and peers. Could an already established AI teach a new AI if there were not enough humans available to provide constructive feedback? The possibilities are endless. Without guidance, however grounded in human understanding, an AI could evolve in a

[15] Scharre, *Four Battlegrounds*, 14–15.

way that most cannot understand. To be useful, users must be able to understand the output from an AI. The ability of an AI to learn from data is its ultimate limitation. The extent of the data fundamentally sets the boundaries of AI's potential understanding. For good or ill, it suffers from the limitations of human understanding. Where it does excel is that it never sleeps or eats and can continuously process additional data. It takes a human a couple of years to walk and interact with their environment, many years to master a musical instrument or a sport, and many more to gain wisdom and insight. Having a massive encyclopedic knowledge base may not make an AI wise—that remains to be seen.

The author has seen the application of an AI that used 3D computer modeling to create a massive amount of image data for an AI to learn from where the necessary real data did not exist. This ingenious technique bridged a data gap and demonstrated another aspect of the data explosion. Users can create even more data artificially.

AI in the readiness domain has great potential in the near term to take over repetitive tasks. A generative AI, such as the much lauded ChatGPT, could take on knowledge management and help write structured comments consistently that may make text input more useful. It can learn anomaly detection to help commanders know when there is something in the underlying data that requires attention. It can help process the massive amount of readiness data faster to help with forecast modeling. It could make the readiness professionals and the reporting units more productive, focusing more time and energy on cognitive skills and decision making. As with any technology, there is intense competition with other nations and their military enterprises. It is not a choice of *if* we should adopt AI; we *must* integrate AI as fast as peer competitors are investing in it. If they harness its potential faster, they will drive the initiative, and it will be very difficult to regain superiority.

In Paul Scharre's *Four Battlegrounds: Power in the Age of Artificial Intelligence*, he makes a case that AI is a new industrial revolution and control of it is vital.[16] He outlines four pillars of AI competition: data,

[16] Scharre, *Four Battlegrounds*, 11.

computing, talent, and institutions (table 20).[17] Data, fueled by the data explosion, is what AI learns from. Computing power is the highly specialized microprocessors at scale to provide the massively parallel computational ability to run the AI. Talent is attracting and retaining the skilled scientists, engineers, and developers needed to program and run AI. Institutions provide the funding, governance, opportunity, and collaboration needed to realize AI power. These are bigger issues than the software and data. This involves limited worldwide capacity and intense competition for control of that capacity. That alone could drive conflict as a competition for resources, like oil, food, or water. AI could be so important that it is a component of strategic readiness.[18]

ML, or more explicitly machine learning algorithms, is not as exciting as AI but has been around longer. They have become, during the last several decades, indispensable for analyzing large datasets. There are numerous varieties.[19] They are regularly used for analyzing large datasets in the military readiness community. Varieties can be easily downloaded as libraries in various programming languages and are integrated into most analytical tools. In the defense world, there are some barriers to their use. The first is cybersecurity, as the ease of obtaining code libraries creates a vulnerability. These code libraries must be scanned to ensure there is no malicious code. This process can be laborious, and the cybersecurity folks often appear to be waiting out the analysts for the need to elapse. Popular ML algorithms include, but are not limited to, decision trees, various clustering methods, and various types of regression. The important point here is that ML algorithms form the foundation of AI. It is the talent component of the four areas above that write and apply these ML algorithms.[20]

Consolidating Data for Analysis

The data explosion is manifested in not just an increase in raw data, but the increase in the containers of data. There is a rapidly expanding uni-

[17] Scharre, *Four Battlegrounds*, 11–24.
[18] Scharre, *Four Battlegrounds*, 69–76.
[19] "Machine Learning Algorithms," Geeksforgeeks.org, updated 3 September 2024.
[20] Scharre, *Four Battlegrounds*, 30–32.

Table 20. Pillars of artificial intelligence power

Pillar	Description
Data	• The data explosion was the precursor • Some describe data as the "oil" of AI, but this analogy breaks down under scrutiny • Data is critical to teach the AI a task • Data is critical to teach the AI a task • Data is task specific and requires intensive "classification" to provide the AI with the appropriate information about the data. It is not easily fungible between different tasks • Data can be created by making synthetic data
Computing	• Measured in graphics or data processing units (GPU/DPU) as opposed to a central processing unit (CPU). These use massive parallel computing to iterate over the data to learn, mimicking human learning • Famous chess and Go AI experiments require thousands of GPUs • GPUs have increasingly specialized chips with very limited sources of manufacturing and supply chains
Talent	• Finds the use cases • Writes the algorithms • Trains the AI • Controls the fitness function
Institutions	• Combination of academia, commercial industry, government, and military labs • Provides the work environment: the significant resources but also the soft factors of collaboration and opportunities • Capital • Incentives

Source: author's compilation of requirements from *CJCSM 3150.02B, Global Status of Resources and Training System* (*GSORTS*) (Washington, DC: Joints Chiefs of Staff, 26 April 2013); and *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 17 July 2014).

verse of databases, data repositories, data warehouses, and data lakes.[21] During previous years, someone could conduct analysis on a single database. As the number of databases grew, the need arose to consolidate data to enable analytics. Even with a single database, a technical problem occurred. Databases that did a large number of transactions (inserting new records, updating existing records, and deleting records) were slow at analysis. Databases that supported lots of analysis were slow at transactions. This dichotomy gave birth to the data warehouse.[22] A highly transactional database could be left to its optimized speed and would dump data into the warehouse periodically. The warehouse was optimized to support analytics. As other databases came online, the data warehouse could also ingest data from multiple transactional systems to make for a one-stop-shop for analytics. A large data warehouse often implemented user facing data marts that allowed for a prepackaged subset of the data or related sections of the data to be used easily.

The data warehouse for a single transactional system was only the start. As additional databases were ingested, the specter of compatibility raised its head. An often heard complaint when building data analytics is that the underlying authoritative systems do not talk to each other. The author spent decades working though this for multiple systems. Databases do not really talk to each other—what this means is that they are not easily compatible. There are databases of personnel, equipment, and training and all three were built in different decades of different technology stacks and different vendors. They were built to perform their primary task, and linking the data together with other systems in the future was a distant second. For the data to "talk" or be linked together, a software program must be written to get the data, change it into a compatible format, and then load it into the data warehouse for analysis. This is commonly known as an extract, transform, load (ETL) process. This can be custom code written specifically for that purpose, as in the past, or it can be configured in an off-the-shelf

[21] Scharre, *Four Battlegrounds*, 18–19.
[22] "Difference Between OLAP and OLTP in DBMS," Geeksforgeeks.org, updated 2 September 2024.

tool kit designed for that purpose. Compatibility issues can be as mundane as date and time formats or lack of data standardization. The best example of data standardization issues is something as simple as an address. If the address is 2301 5th Street, PO Box 5, Washington, DC, the street could be written as fifth or 5th and street could be written out or abbreviated as St. or Str. An ETL process can scrub the data to enforce standard notation of uniqueness. All this involves transferring the data from multiple databases into a single compatible, albeit large, database. A couple of decades ago, this was an expensive undertaking. To support analytics, one is storing another version of the transactional data, which can be quite large. The storage and servers for a data warehouse could be very expensive.

Enterprise Resource Planning Systems

Enterprise resource planning (ERP) systems then came onto the information technology market.[23] The marketplace was struggling with the lack of compatibility of systems across business units. The idea was to adopt an all-encompassing system that had modules for each business unit. In one respect, it is a brute force approach to get all of an enterprise into a single massive database that was preconfigured to support resource management from the start. The implementation of these systems can be painful, as custom but incompatible systems were often well liked by the various business units and forcing them to adopt what is often a suboptimal module is tough. In some respects, to the core business units, it can become a "tail wagging the dog" situation where the financial business is forcing operations to use clunky software to make their financial planning easier, but at the same time causing inefficient operations. This becomes an existential question for an enterprise. Does the need for efficient financial management outweigh the need to efficiently perform the core business operation? Is the value of the analytics worth changing the enterprise infrastructure or can efficiency in ETL processes be found? Much of the author's background

[23] Piper Thomson, "The Complete History of ERP: Its Rise to a Powerful Solution," G2, 23 January 2020.

started with the do-no-harm approach and the author's recommendation is to let the core business units optimize their function and use the low cost and speed of software technology to bring the data together for analytics. The process of building the ingestion business rules provides the additional benefit of learning more about their data. Data elements do not always mean what you think they mean, and gaining that insight early in the analysis can save enormous amounts of time later when validating the output of a data warehouse based analysis project. An interesting variation on the ERP approach is a partial adoption.

The author has observed several instances where ERP software was adopted by enterprises, but only across certain aspects. This approach had two options. This included a hybrid option where parts of the ERP were adopted and the value of the other systems was determined to be too great to force them, so an ETL was used to then load their data in the ERP system for analysis. The final option had a partial adoption with the financial areas as the financial tools in the ERP systems, which were better. This is not really a true ERP at that point, but one may encounter this and wonder where the rest of the enterprise is in the data.

Federated Data

The idea of federated data is to allow a user to see multiple data sources at once that may be different databases in different physical or virtual locations.[24] The key difference of a monolithic database is that the monolithic database can have thousands of different datasets in it, although it is all within one database. Federated data allows direct access to multiple databases. This approach is considered a low-cost approach as all the data is left where it is and can interact with it across databases. The problem with this approach is twofold. The compatibility problem is still there, and the user must be able to navigate through it. The second issue is that in practice it is slow. Going through the security and permissions layer is costly in processing time and doing it multiple

[24] Amit P. Sheth and James A. Larsen, "Federated Database Systems for Managing Distributed, Heterogeneous, and Autonomous Databases," *ACM Computing Surveys 22*, no. 3 (September 1990): 183–236, https://doi.org/10.1145/96602.96604.

times means that it is always going to be slow. Security and permissions are an imperative and cannot be compromised.

Data Lake

The latest and very promising approach to consolidating data for analysis is a data lake.[25] This approach leverages cloud style computing to consolidate multiple databases into a large enclave, the "lake." The lake provides a common environment and can host a variety of tools for data scientists and analysis to work with different data sources. While it can host multiple databases, it does not inherently solve the data compatibility problem. It does make it easier for a data scientist to access a variety of data sources and give a workspace to build clean or normalized data objects. It can also provide the workspace to convert data from SQL or documents into triplestores.

Readiness Data

As mentioned earlier, the basic building blocks of readiness data come from force structure management, personnel, equipment management, and training systems. To make a readiness report, data from five distinct systems needs to be brought together. Some of the underlying data is stored in the report. New data is created in the report from scoring parts and the overall readiness, which is applying the assessment criteria. The user is asked to validate the underlying data or provide the correct data if the underlying data is not accurate. The user adds explanatory comments to both changes and the context of the assessment. The report is validated against the business rules and submitted. Starting with the first step, the data from the underlying systems has been staged already for us to save time. There are some very logical reasons to do this. First is that a significant majority of the underlying data resides in the unclassified domain. Readiness reporting is inherently classified. Second is the compatibility issues are already resolved, saving the user time. The logical underlying data with explanations is found in table 21.

[25] "What Is a Data Lake?," Microsoft.com, accessed 13 May 2024.

Table 21. Unit readiness data

Underlying data set	Data provided	Expanation
Force structure	Unit information	Information about the unit, its name, unique identity, location, status, and command hierarchy
	Table of organization	The list of required personnel by job (billet), rank, and skill designator. The denominator of the personnel assessment
	Table of equipment	The list of required readiness reportable equipment. The denominator of the equipment on hand assessment
Personnel	Assigned personnel	Rank, skill designator, duty status of all assigned personnel, both permanent and temporary
Equipment management	Equipment possessed	The list of equipment possessed. The numerator of the equipment on hand assessment
	Equipment condition	The list of equipment maintenance status. The numerator of the equipment condition assessment
Training	Mission essential task list	Defines the designed and assigned mission tasks and standards. The denominator for the training and capability assessments
	Training status	The list of completed training events that correspond to the training standards. The numerator in the training assessment
Activity	Current command and location information	The operational command chain and current location of the unit
	Deployment/employment	Current and planned deployments or alerts for the unit. Where is the unit in a force generation cycle?
	Assigned mission(s)	If the unit has an assigned operational mission(s) and its associated tasks and standards

Source: author's compilation of requirements from *CJCSM 3150.02B, Global Status of Resources and Training System* (*GSORTS*) (Washington, DC: Joints Chiefs of Staff, 26 April 2013); and *CJCSI 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Chiefs of Staff, 17 July 2014).

This is the key data to a given report. There is assessment supporting data for decision making. It falls into two broad categories. First are units not in a high state of readiness and what is needed to become ready. Second is what is available to make another unit ready. In simple terms, it is how many resources are available to make a unit ready. The Services make ready units out of unready units. The previous reports are needed to establish trend analysis and anomaly detection. Is the report data normal, expected, or trending up or down?

In addition to unit reporting, to have a true understanding of operational and strategic readiness, the user must also have institutional reporting. So much of readiness is focused on units, which has value, but the institutional reporting gives the big picture on the ability of the institutional Services or the department to deploy, employ, sustain, reconstitute, or expand the force (table 22).

This readiness data presents a challenge as it is not easily loaded into a single place. A dedicated effort is underway and can be strengthened to get this data into a data lake to support a wide variety of analyses. To be clear, it is not a once-and-done effort. It will require a team of dedicated data engineers that can keep the interfaces working, add new data sources, and adjusts ETL as the underlying data systems go through their own changes. There is no simple solution to this problem. As technology improves, the level of effort may decrease but so much of the effort is working with the inherent complexity and incompatibility of these different data sources, an understanding of what the data means is inescapable. Each system has its own set of business rules and definitions. Just to keep things lively, the analysis produces its own data. There is metadata about an analysis or a model, and the data it produces must be versioned and available for audit.

To bring it together, a periodic readiness report is an observation of many attributes of a unit, installation, or institution. It provides a topline index for rapid decision support. It also holds the details behind the scores for further analysis. A set of concurrent observations provides a descriptive analytical view of the current readiness of the force. The data moves up the DIKW pyramid into the information space.

Table 22. Institutional readiness data

Underlying data set	Data provided	Explanation
Equipment	Total overall asset inventory (TOAI) location	The full breakdown of all the major end items (aircraft, ships, vehicles, weapons systems) in the various buckets such as in operational units, in storage, prepositioned stocks, in deport maintenance, etc.
	TOAI status	By location, current status of mission capable, partially mission capable, and not mission capable
	Maintenance data	Reliability, repair rates, costs, depot maintenance. Industrial and shipyard capacity
	Planned deliveries or divestment	Plans and schedule to receive new or additional items or divest older items. Industrial capacity
Munitions	Total munition requirement	The full breakdown of the required munitions for training and war reserve
	Inventory	Quantity and location of full inventory
	Industrial capacity	Actual and surge capacities, planned deliveries, costs
Installations	Capacities	Breakdown of actual capacity to support war plans, including housing, training, storage, distribution, airfields, ports, and railheads
Strategic lift	Capacities	Maritime, airlift, rail, and road capacities
Recruiting	Throughput	Planned, projected, and actual recruitment data
Entry-level training	Throughput	Planned, actual, surge capacity, backlog, washout rates
Selective Service	Registration data	Registered and associated demographics to determine mobilization depth beyond guard and reserves
Allies and partners	State of cooperative agreements	Status of forces agreements, overflight, basing. Sustainment opportunities. Exercises and data sharing. Combined HQs, order of battle, capability assessments by liaisons, attachés, and foreign area officers

Source: courtesy of author, adapted by MCUP.

Saving these sets of reports to establish trend analysis allows for a deeper understanding of the ability of the complex process to produce ready forces. Information becomes knowledge as users understand what is normal, abnormal, or an anomaly. The trends then facilitate forecasting and modeling future outcomes. This process exposes the levers to adjust potential outcomes, and therein lies wisdom.

Inference

Even with the exponential increase in data, users sometimes do not have the data they want. They can only put data together so much. There are legitimate gaps in the data collected. The old way to solve the gap is to determine how to collect the data you want and build a collection plan with a way to implement. This can be very time consuming if it involves having people do extra work to collect this data. Some data can be difficult to collect through any conventional means. A different approach is inference. An analogy is when astronomers are looking for certain bodies in space that do not emit light. They can then learn about these bodies by the gravitational effect on observed bodies. Machine learning can be used to determine a range of the probable "unobservable" data based on the "surrounding" data variance. This approach can be much faster and still produce reliable results. It must be tested against observable outcomes as they happen to validate the inference as part of a robust data quality review process.

Variance and Optimization

Once data is assembled over time, a trend analysis is undertaken to understand the context of a current data point. A common mistake is to display current data and confuse it with descriptive analytics. Current data to be considered analytics must be informed with context. If a chart says a Service is 50 percent ready, without context the user might come to an erroneous conclusion that this is bad. Intuitively, people think in terms of academic scores where As and Bs are in the 90 percent plus and 80–89 percent range. Looking at the aggregate readiness of a Service is very different than the readiness of a single unit. To be useful, the percent must have several supporting data points. The percentage must be accompanied by an upper and lower limit. Calculating these limits for complex systems such as readiness generation is a significant undertaking but is essential. Leadership must know that the system can only get so good or sink so low. For readiness, the lower limit is the minimum ready deterrence requirements, and the upper limit is the institutional limits of force generation based on structure, personnel, equipment modernization, and task organization. This is an enumeration of Richard Betts's actual versus potential readiness capacity, but at the operational and structural levels without national mobilization.[26] Based on the 50 percent example, if the calculated upper and lower limits show a lower limit of 25 percent and upper limit of 60 percent then 50 percent looks much different. The next part of context is the trend. The trend ranges should be standard over time, like the near term trend in the last six months and a long term trend during the last three years. This shows the 50 percent number as indicative of steady, increasing, or decreasing. Once that context is provided, the leader knows if the news is good or bad. Monitoring the various component parts then helps in understanding the sensitivity and velocity of changes as leadership wants to know what they can do (i.e., what decision is needed) to affect the numbers. This is the classic "so what" of many readiness reviews. The data scientist/analyst owes the answer of what are the levers, such as those controllable variables that make a measurable difference like "if you want an improvement of 5 percent it will take $20M per year more in certain accounts to buy x and you will see the change start in FY xx and continue to FY xx + 4 and then level off at roughly the 5 percent improvement averaged over the FY."

The use of detailed data goes down two paths. The difference is a path where the user knows where it goes and the other they do not. To illustrate the paths, if a leader says, "how do I get to 50 percent readiness for the force?," this is the known destination. The other path has an unknown destination but has two branches. The two branches are "if I change x where will I end up?" and the second branch is "what is the best destination?"

A solid understanding of the variables and their sensitivity can provide the guide to the known destination. It is limited to the known variables as the user cannot model the unknowns. Modeling does not necessarily know what lies outside the system it models. For example, when working in the transportation industry, they had really good

[26] Richard K. Betts, *Military Readiness: Concepts, Choices, Consequences* (Washington, DC: Brookings Institution, 1995), 40–41.

models of variables and sensitivity, but it was all based on the details of the business they did. When they wanted to expand business into profitable areas, they could not model the total size of the market, the market share, or the full range of rates the market was willing to pay. The model would say accurately that, if we did more of a given business, it is more profitable and thus could support incremental changes as there was generally enough depth in a given market region to support incremental growth. It would fail if there was a need to look at large changes without introducing a broader understanding of the marketplace. It is similar to labor statistics for recruiting into the military. To model it, it requires a larger body of knowledge outside the recruits. All resources are ultimately finite and there is active competition; the more they are wanted the greater their relative value, thus the variables may change.

For the path of the unknown destination, the first branch of determining what the impact, or variance, to what is known is based on a given decision or input. When looking at a graph where time is the x axis (horizontal) and the zero is the planned supply of ready forces, a variance plot shows when, how big, and how long there is a change (above or below the zero line). Much of the work to date looks at this variance. Much effort was put into building out a forecast and understanding the significant variables. Like the example above, the data science allows us to determine the sensitivity of the variables and model the change over time against the baseline. This can be done by a series of data excursions. An excursion is a "what-if" analysis that includes multiple simulations that are then looked at as a range of possible outcomes. For very complex models, this is an efficient approach as users do not have to explore the entire result space. The data scientist or analyst performs an experiment of changing the variable and then observing the results. If the results are not what is needed, then the analyst performs another run until the desired results are achieved. This is like a rheostat light switch that gets adjusted until the preferred light level is reached. If the model does not take long to run, an analyst can iterate over a series of changes until they hone in on the desired result. In indirect fire control, there is a process called bracketing the target, where shots are placed long and short of the target at an unknown range and the adjustment is halved until the target is hit. This rapid halving of the range can provide an effect on a target very rapidly (less than 10 minutes during combat conditions).[27] Some models take many hours to run, and the iteration process takes longer but can still be a viable option if there is sufficient time allowed to get to the answer.

Using models to determine an ideal or best answer is mathematical optimization.[28] The field is to use applied mathematics to determine the best solution with the given inputs. For complex, nonlinear problems it can involve calculus. Simple optimization can be solved with algebra. Readiness generation is a complex, nonlinear problem and can be computationally intensive. The author worked with two fundamentally different optimizers in the transportation industry that performed the same function of optimizing work assignments. The two approaches were an "on demand" and a "constant" optimizer. The on demand optimizer would take a set of work orders and a set of available trucks and optimize the work assignments. The constant optimizer ran all the time and continuously updated the recommended work assignments. The on demand approach ran quickly and would return an answer in a few seconds, but it was a much easier math problem as it took a user selected subset. This could be inherently suboptimal for the total set. The constant optimizer was running at all times and would be asked what the current recommendation was for a given truck. Any changes to order or truck availability went to the optimizer. If users took its recommendation, it would immediately begin updating the set of recommendations for everyone. Both approaches worked for their purpose. Optimization can be a trap, however, as it really depends on what the engine is set to optimize for. For trucking, it could be optimized for on-time pickup and delivery and the least amount of nonrevenue miles.

[27] "Adjust Indirect Fire, TRADOC Common Core TSP 061-D-6003" (presentation, Officer Candidate School, Department of the Army).

[28] "Introduction to Mathematical Observation," Stanford.edu, accessed 13 May 2024. This is a class on mathematical optimization from Stanford that covers terms and teaches the basics. It is a large area of applied mathematics. The author worked with several proprietary commercial optimizers in the transportation industry.

This may have a negative impact on paid miles per driver or not getting a driver home for the weekend. To shift to military readiness models, if a schedule or force structure is optimized for equipment maintenance, it could negatively impact training or personnel. The goal is to obtain the combination of the best version of each variable that still produces the satisfactory outcome. Given the premise of an unknown outcome, optimization would still need to iterate to learn what outcome is satisfactory. It is an analytical version of finding the win-win. It is more likely that the user could see on-demand optimization of discrete portions of readiness in the near future with the data everyone possesses. A full constant optimization of military readiness across all pillars may take a bit longer.

Death by Dashboard

There is an ongoing move in analytics and leadership expectations to pull together data and analysis outputs into easy to digest collections of interactive dashboards.[29] This takes the screen size real estate and divides it into areas, like the dials of a dashboard in a car, and displays various data sets. Dashboard type applications have been around for decades, and the author has used several really good ones over the years in different roles. One dashboard application the author used as a database administrator was very useful in showing the various performance areas of the database engine as it operated and had all sorts of functions that allowed drilling into details of a potential problem. When the author was in Iraq, there was an operations dashboard that included the current weather at the key airfields, the daily air tasking order, the status of route clearance, and current enemy activity reports. All these data points allowed for rapid planning and execution of missions. In both instances, the data existed in different areas and the dashboard brought the key top-line data together into a small space but supported

[29] *Data Visualization Tools Market Size, Share & Trends Analysis Report by Component (Software, Service), by Application, by Organization Size, by Deployment, by End-users, by Region, and Segment Forecasts, 2023–2030* (San Francisco, CA: Grand View Research, n.d.). This report shows the global data visualization tools market size was valued at $9.22 billion USD in 2022 and is expected to grow at a compound annual growth rate of 11.4 percent from 2023 to 2030.

drilling down into more detail if needed. In both cases, the dashboard was the starting point for the larger work the author had to do on a daily basis. The trend now is to look at building this type of application for senior leaders. On its face, it seems straightforward, and in some cases it is. The author has operations data, financial data, personnel data, and equipment data of institutional metrics in databases—and showing these data points is a dashboard application. To show each dataset as a "dial" in a dashboard is straightforward. At the level of showing each as a stand-alone dataset, it is still descriptive analytics. What it does not show is the correlation of the datasets, the sensitivity of change in one, and how it manifests in the others. In simpler systems, a dashboard could show descriptive data that is being observed over time and trains the users on what changes other data. The user performs analysis in their head by observing the changes in the dials. Most senior leaders do not have the time to log into a dashboard on a daily basis to understand the correlation of different data streams intuitively. Often what happens is it is seen once or twice and since it is descriptive it does not immediately provide insight into what happens if something changes. It is the data scientist or staff analyst who would observe descriptive analysis over time and gain understanding that when an anomaly occurs it can be studied and courses of action would be developed for the senior leader decisions.

A variation on the theme is to use dashboards in standing meetings to present live data. Using live data is not bad but can distract from the focus if one drills down into underlying data that no one is prepared to answer for. Data rarely stands on its own. It needs the accompanying contextual narrative to know if it is good, bad, or normal. Is a decision needed or a planning team convened to develop potential solutions or mitigations? Dashboards cannot perform analysis on demand but can display prebaked analysis. Performing a new excursion to the data is a very different application. Taking user input, calculating a new dataset, then presenting this to the user requires much more complexity behind the scenes. Such excursions would also need to be saved and recalled as needed as they become key artifacts of decisions. Using live dashboards also makes the read ahead and prep sessions for senior leaders much more difficult. Many senior leaders prefer to use printed slides and video conferencing to see the faces of the participants over the slides. There are many important visual cues from the people who are often as or more important than the data.

There is a stated desire in many forums from senior leaders to "see ourselves." In open sources, this includes Deputy Secretary of Defense Kathleen H. Hicks, former Chairman of the Joint Chiefs of Staff General Charles Q. Brown Jr., and former Commandant of the Marine Corps General David H. Berger.[30] The implication is that this is to see the totality of the enterprise "warts and all." A well designed dashboard may advance that basic desire. A dashboard does not give insight; it provides descriptive analytics. The display of many metrics may provide a comprehensive status report, but then what? That has been the author's experience as the immediate next leap is to ask, how does this help me? At the Service and department level, the military enterprise is too large to know it all. It is recommend to use dashboards for staff analysts as time savers and for helping to train them for anomaly and problem detection. They would work with data science and data engineers to evolve the metrics, build models for the correlation of the different areas, and build the "what if" machine that can perform excursions on demand. This is what we are doing now—we are building that machine.

What Does the Data Say?

People often ask, "What does the data say?" This is an important point as data does not say anything; it is just data. Analysts interpret information from the data. They then present their findings to leadership in a clear, understandable format. Modern military data analytics in the United States can trace its lineage to the Statistical Research Group (SRG) during World War II. This group of 18 hand-picked research-

[30] Kathleen Hicks, "Creating Data Advantage," memorandum, Department of Defense, 5 May 2021; Kathleen Hicks, "Implementing a Strategic Readiness Approach," memorandum, Department of Defense, 13 May 2022; Gen Charles Q. Brown Jr. and Gen David H. Berger, "Redefine Readiness or Lose," *War on the Rocks*, 15 March 2021; and Kimberly Jackson and Gen David H. Berger, "Readiness Redefined: Now What?," *War on the Rocks*, 12 June 2023.

ers was brought together at Columbia University in New York and included two future Nobel laureates.[31] In the United States, there is a career field among military, civilian employees, and contractors known as operations research and systems analysis that can be found across the departments working on all sorts of problems. Some of these work in the readiness arena. Added to their roles is the newer role of data scientist and data engineers. These occupational fields are supported by higher education conferring degrees from bachelor's degrees to doctorate levels. Douglas W. Hubbard indicates that what he refers to as "war quants" and actuaries provide the best opportunity for improving risk management.[32] In addition to people in dedicated career fields, there is a multitude of general-purpose analysts. For the sake of this point, this chapter refers to this broad workforce as the analytical community. They are charged with making sense of this data. This basic dynamic gives the analytical community enormous potential power to influence decisions based on their analysis. Not to impugn the analytical community, but this reality is a source of tension or friction in the process. It can lead to skepticism and derail analytical support to decision making.[33] Beware of gatekeeping in the analytic community. If organizations put up barriers to entry and consolidate and prioritize analytic capacity under a single office or an oligarchy of sorts, there is real danger of losing the multidisciplinary and diversity of input needed to prevent an echo chamber of a monolithic analytic approach. The key to staying on track is building trust through transparency. Analysts may be well educated and very bright but should not ever underestimate their audience. The author has been accused of telling someone how to build a watch when they ask the time. It is a learning process, so in a refined approach give them the time and be prepared to tell how the watch was built. That is what backup slides are for. Clearly state the assumptions and limitations.

[31] Sam L. Savage, *The Flaw of Averages: Why We Underestimate Risk in the Face of Uncertainty* (Hoboken, NJ: Wiley, 2009), 265.
[32] Douglas W. Hubbard, *The Failure of Risk Management: Why It's Broken and How to Fix It*, 2d ed. (Hoboken, NJ: Wiley, 2020), 90.
[33] Hubbard, *The Failure of Risk Management*, 195. Hubbard dubbed this "algorithm aversion."

Hubbard also provided good general guidance on data: it has been measured before, you have more data than you think, and you need less data than you think.[34] These provide some words of wisdom when applying this to readiness. Everything we need is being measured somewhere. There is already a vast amount of data. Given proper use of statistics and models, we have more than enough data to delve into the world of uncertainty. One may ask then why is the author proposing changes or additional data in the following chapters. This book contends that all the data is already being collected and that the changes will facilitate a better analysis by bringing it together.

[34] Hubbard, *The Failure of Risk Management*, 272.

CHAPTER 7

DIMENSIONS OF READINESS

Part I provided an overview of what the current readiness reporting concepts are. This chapter builds on that idea to gain an understanding of what people should consider measuring. The author does not recommend tossing it all out and starting over. There is enormous value in the current process, despite its detractors. On 13 August 2018, the John S. McCain National Defense Authorization Act was signed into law. In Section 358, the first three paragraphs dealt with the physical consolidation of the Defense Readiness Reporting System (DRRS) into a single information technology system.[1] Previously, several Service operated systems collected and prepared the reports and submitted them into the DRRS "Strategic" or DRRS-S system for a consolidated database. In paragraph (d) it called for several Department of Defense (DOD) agencies and military departments to convene a study group and deliver a report to Congress "to assess the current process for collecting, analyzing, and communicating readiness data, and develop a strategy for implementing any recommended changes to improve and establish readiness metrics using the current DRRS-Strategic platform." The report was due to Congress no later than 1 February 2020. The working

[1] John S. McCain National Defense Authorization Act for Fiscal Year 2019, S. 358, Pub. L. No. 115-232.

group was called the Readiness Reporting Reform Integrated Planning Team (R3IPT). Many of the subjects that follow were discussed at length but did not make the report to Congress in much detail. These ideas were shelved but not forgotten. The DOD directive and instructions for DRRS came due for update. A key aspect was to integrate some of the items from the R3IPT as well as address the legal authorities for tasking certain parts of the department. The *DOD Directive 7730.65, The Defense Readiness Reporting System* completed updates and was signed in May 2023.[2] This immediately started the update of the *DOD Instruction 7730.66, Readiness Reporting Guidance for the Defense Readiness Reporting System* with informal staffing in December 2023 to January 2024. The DODI effort was much more detailed as it incorporated several directive type memorandums, updates from the *DOD Directive 7730.65*, and shifting of tasks from the *Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3401.02B, Force Readiness Reporting*, to the larger set of DOD components that can only be legally tasked by the under secretary for personnel and readiness.[3] The involvement of the Joint Chiefs of Staff, combatant commands, and military Services was detailed with more than 250 comments adjudicated. The formal staffing process involved more than 100 additional comments adjudicated during months of sometimes tense negotiations. This work across the department lays the foundation for what follows, but there is much still to resolve—and what ongoing policy and system changes would ultimately look like is unclear.

Defining What Is Being Assessed

It is popular to link all things in the military enterprise to readiness. This builds a general sense of contribution and usefulness to the activity. It is not untrue but not helpful when assessing the readiness of the enterprise. If everything is readiness, no meaningful assessment could be digested regularly. Each level of readiness can be assessed once it is

[2] *Department of Defense Directive 7730*, *the Defense Readiness Reporting System* (Washington, DC: Department of Defense, 31 May 2023).
[3] *Department of Defense Directive 5124.02*, *Under Secretary of Defense for Personnel and Readiness (USD[P&R])* (Washington, DC: Department of Defense, 11 December 2024).

Table 23. Levels of readiness assessments

Levels of readiness assessment	Components
Individual	Medical: periodic health Assessments Physical fitness: semiannual fitness tests Legal and administrative: periodic review of records and current legal status Skills: successful completion and sustainment of skills training Experience: rank, skill credibility (time working with the skill)
Tactical: units at the lowest designed level of employment	Resources: personnel, equipment, training Capability: demonstrated ability to perform enumerated designed or assigned tasks to standard
Operational: intermediate formations Regiments, brigades, groups, naval task forces, divisions, wings, corps, fleets, numbered forces	Subordinate units: unit readiness of subordinate units under operational control of the formation Capability: demonstrated ability to perform enumerated designed or assigned tasks to standard
Operational: installations	Capacity and capability: housing, training areas, storage, transportation facilities, airfields
Strategic—Institutional	Scoring of the enumerated dimensions

Source: courtesy of author, adapted by MCUP.

defined as to its composition and requirements. The author defined three levels of war: tactical, operational, and strategic in part 1. Readiness exists at each level and can be assessed at each. Adding an individual readiness level is necessary and represents a significant investment in a finite resource and should be included (table 23).

A holistic view of readiness includes all four levels and associated assessments and can traverse them on demand. This involves tying together data, both preexisting data for day-to-day processes and new assessment data, into an analytic environment that facilitates providing the requested assessment at the level requested to provide input to a decision-making process. We build and maintain the body of assessment data to understand trends to make forecasts and better assessment data, which is readily available to support leadership decision making.

Individual Readiness

Understanding readiness at the individual level is fundamental. Individual readiness is a compilation of aspects that make an individual person ready to perform their duties and consumes many resources for training, housing, health, pay, and benefits. In training alone, there are numerous skills for all similar servicemembers and skills specific to this person's function. The impact of individual readiness on unit readiness can be described as the price of admission that qualifies an individual to count against the personnel requirement, because the unit has a significant effort in integrating individuals into a cohesive whole. It is an arena of readiness where the units and Services must work through myriad criteria. If an individual does not meet the various standards, they do not count toward the personnel rating of a unit despite occupying a space. The current approach is to look across factors that make someone "deployable."[4] Deployability is a binary measure. Someone assigned to a unit who is not deployable does not count toward the strength of the unit. Given its importance and cost, there are a number of policies, processes, and business rules governing deployability. The author will not cover them all in detail but provide a general overview. Starting with uniformed servicemembers as the key population, the author was told that as his career progressed, he had an obligation to maintain eligibility for worldwide deployment regardless of the various roles he was assigned. The understanding of this was that the author would manage his own progress through the annual checklist of individual requirements.

Units that typically deploy also track their assigned personnel against this same checklist normally. The health of the servicemember is the safe place to start. Over time, the level of scrutiny on servicemember health has ebbed and flowed. When the author started, there were annual physicals involved. This was determined to be too much for the primary demographic. This is based on the understanding that all were rigorously screened before entry into the Service, the average age is low, and the odds of serious illness are accordingly low. The injury rate is high as the work can be physically challenging. For specific

[4] *Department of Defense Instruction 1332.45, Retention Determination for Non-Deployable Service Members* (Washington, DC: Department of Defense, 27 April 2021). This policy originally from 2018 and updated in 2021 finally standardized key definitions across all the Services.

roles, there are still physicals such as for pilots, but for everyone else it is more cost effective to do an annual screening looking for changes, such as injuries, unexplained weight change, etc. This screening is called a Periodic Health Assessment (PHA).[5] The basic requirement is annual, however, when someone is ordered to deploy, they do a pre- and post-deployment health assessment. A full physical is not performed, only follow-on tests based on the PHA screened by a doctor. As mentioned, serious health problems are uncommon with young, healthy servicemembers but injuries related to their work are common. They have a measurable impact on unit readiness across the Services. It is a small percentage, but in aggregate it is significant, and the medical costs can be very high. These are often referred to as "sports" injuries such as broken extremities, muscle strains, pulls, tears, joint sprains, torn ligaments, shin splints, and dislocations.[6] The author experienced his fair share and progressing in a career is often an exercise in injury management. Many Marines made it through taking "vitamin M" as Motrin brand ibuprofen was commonly called. Identified injuries that do not recover rapidly lead to potential separation for medical reasons. Part of personnel readiness is managing injury recovery. The Services have invested in several ways to reduce injuries and maintain standards. The recruiting of more sports medicine oriented medical personnel as well as partnering with world class sports medicine clinics can impact proper injury care and physical therapy. This includes the use of better equipment for running to build endurance and rethinking the amount of running in combat boots when building endurance as well as changing the types of exercises when certain ones are prone to injury and providing safer alternatives.[7]

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[5] *Department of Defense Instruction 6200.06, Periodic Health Assessment (PHA) Program* (Washington, DC: Department of Defense, 18 April 2025).
[6] Joseph M. Molloy et al., "Musculoskeletal Injuries and United States Army Readiness Part I: Overview of Injuries and their Strategic Impact," *Military Medicine* 185, nos. 9–10 (September–October 2020): e1461–e1471, https://doi.org/10.1093/milmed/usaa027.
[7] Joseph M. Molly et al., "Musculoskeletal Injuries and United States Army Readiness. Part II: Management Challenges and Risk Mitigation Initiatives," *Military Medicine* 185, nos. 9–10 (September–October 2020): e1472–e1480, https://doi.org/10.1093/milmed/usaa028.

Fitness is the next physical aspect of individual readiness. Fitness in military terms is strength and cardiovascular endurance as measured in a set of events while incorporating injury prevention.[8] Individuals are well acquainted with the events and have months to prepare. The scoring of these events are based on age and gender and often have levels of scoring, such as first or second class, beyond just pass or fail. There are always controversies when a long-standing set of events is overhauled and a new set of events is introduced.[9] Exercise and fitness trends can be very faddish. The underlying requirement is that servicemembers must have the requisite strength and endurance to accomplish their tasks in a combat environment. Fitness events should have some logical basis in the tasks required. The author's experience across three combat deployments is that the wartime requirement is for sustained moderate intensity activity. Sustained means 4–8 hours, and moderate would be moving with 40–60 pounds of equipment at a walk, with sort rushes from time to time, and finally lifting of items in the 30–60 pound range like ammunition cans, machine guns, and heavy weapon components (barrels, tripods, baseplates, and mortar cannons). That type of activity can be accomplished with a more time focused assessment during an eight-hour event. This was for infantry; similar general requirements can be derived from each Service and major skill area. There is no need for a one-size-fits-all approach other than simplicity of implementation. The most common aspect of each military skill set is mental endurance, specifically the ability to operate with little or no sleep for extended periods.

Regardless of these recommendations, each Service spends time and energy evaluating and evolving their fitness standards. Performance on fitness tests can be components of promotions and advancement as well as a condition of service. Members are incentivized to stay in good physical condition. Here is where there is a crossover with injuries. Promotion is competitive and the incentive for performance can be

[8] "Army Fitness Test," Army.mil, accessed 19 May 2025. This is the Army's fitness test website that describes the event components and background.

[9] Douglas Winkie, "Senate Committee Advances Bill that May Kill Army Combat Fitness Test," *Army Times*, 26 June 2023.

high. Injuries often happen during the preparation for a test, not as often at the event. Services should be careful to guard against "one-upmanship" that raise the bar for fitness requirements over the years. This can increase injury rates and create artificial barriers to entry. Barriers to effective entry can come with two meanings. The most obvious is the one for new recruits. Holding high standards in an all-volunteer force that meets its recruiting goals consistently is perfectly acceptable, however, if there is a protracted conflict the Services may not have that luxury. Lowering standards is one answer but the real challenge is how to take a lower starting point and build them effectively to a higher standard without an outrageous injury rate and still produce effective servicemembers, including examining how this would work for a conscription model. The second barrier to entry is the subtle use of artificially high fitness standards to exclude female servicemembers. The standards must be realistic to what the job actually requires.

The fitness test model has some challenges in practice. There has to be an involved waiver system to account for serious injury recovery, post pregnancy recovery, combat deployments, or austere environments that preclude regular physical training necessary to pass or score competitively for a fitness test. These add a layer of complexity in managing individual readiness across the force as it becomes intertwined with promotion, rotation, retention, as well as deployability. Newer fitness tests adopted by some Services involve elaborate equipment and courses that can make it more difficult for the broader force to stay current.[10] This can reduce readiness overall as it gets administratively more difficult to conduct the test. Simple tests have shown to be good indicators of overall fitness and can be performed in many more locations with minimal overhead. These can be conducted more frequently to ensure all members are assessed in a timely manner, giving more opportunities as servicemembers recover from the various waivers.

[10] "Army Fitness Test," This describes the necessary equipment for the Army Combat Fitness Test (ACFT); and *Marine Corps Order 6100.13A, Marine Corps Physical Fitness and Combat Fitness Tests* (PFT/CFT) (Washington, DC: Headquarters Marine Corps, 23 March 2022), chap. 3. The Combat Fitness Test includes the equipment needed for the Marine Corps' Combat Fitness Test.

Staying healthy and fit can be reasonably accomplished by all uniformed servicemembers for active, reserve, and National Guard. There is time built into the schedule for active component members to stay in shape, not so much with reserve and guard members. They require self-discipline to stay in shape on their own time. The hidden cost is that if they are injured, those injuries are not covered by military healthcare.

There are other parts of individual readiness that a servicemember requires support for in order to stay current. Periodic certification for weapons, swimming, martial arts, and chemical warfare are part of the normal training requirements to continue support of units and installations. Keeping up with these certifications and still having time to do unit training is a challenge. As with health and fitness, these basic certifications are considered baseline requirements for a deployable servicemember. When a unit is identified for a deployment, there are often an additional set of individual requirements such as vehicle rollover trainer, water egress training, personnel recovery, and cultural orientation.

All this provides the basic numerator of the personnel assessment of deployable personnel divided by the total required strength. With this one numerator, we can have 80 percent or more of the personnel assigned to a unit but be much lower in deployability due to playing catch up on the checklist of individual requirements. Theoretically, these requirements could be waivered away and the readiness score could improve overnight. The actual readiness did not change. The danger is requirements creep. The individual requirements can become incrementally more difficult over a long time and manifest in a slow decline in readiness. Periodic review of individual readiness requirements should be conducted to check requirements creep and validate the checklist by DOD and Congress.

Building Unit Readiness

So much of the discussion of military readiness focuses on unit-level readiness. Traditionally, that is where we start with formal assessments, which include aspects of individual readiness. It is also the more difficult and expensive undertaking. Analogies for building ready units can range from a production line case where like cars parts are bolted on and a car rolls out the other end. A baking analogy also works as it takes ingredients mixed properly and then heat and time makes a cake. The car can be driven but eventually will need repair and become obsolete. The cake can be eaten or it becomes stale. The military Service has the organizing, staffing, equipping, and training responsibilities. This process can be depicted in logical steps; however, the reality is that there is a body in motion. We are not starting from scratch with each iteration.

1. Organize: Conduct analysis to determine the requirement for personnel, equipment, and training to produce the needed capability. This is an ongoing work performed by subject matter experts in each military Service with a variety of inputs.
2. Resourcing:
    a. Installation: The unit needs a location. The location should have space for physical security, training spaces, barracks, family housing, workspaces, storage spaces, and transportation.
    b. Staffing: Assign personnel to the chosen location in the correct mix of ranks and skills. Manage the building and distribution of trained/qualified personnel.
    c. Equipping: Assign the equipment to the unit.
    d. Sustainment: Provide food, water, clothing, electricity, data networks, health services, and maintenance—and the distribution of each.
3. Training:
    a. Establish training requirements.
    b. Provide physical training space.
    c. Provide instructor cadre or trainers both externally and within units.
    d. Provide consumables such as food, fuel, and am-

munition needed to support training in addition to the resourcing requirements of the unit.

e. Employment: Employ the unit for its designed or assigned mission as needed.
f. Assess: Assess the effectiveness of the institution to build forces capable of performing their designed and assigned missions. This then is a key input into step one for the next iteration.

Keep in mind this process is not singular. The Services run this loop in dozens or hundreds of instances. The Air Force may have a loop for fighters, another for bombers, another for transports, and another for reconnaissance. Each loop is running at its own pace. How fast the loop works bumps up against the physical world. The reality is that even if the analysis was instantaneous, the ability to equip, train to standard, and assess the effectiveness takes time. There is a minimum amount of time it takes to train servicemembers to perform a task, and the ability to perform these training tasks to standard should be obtainable within the time personnel are assigned to a unit. Aside from objective failure, which is difficult outside of combat for most units, it takes months of data to establish sufficient volume to supply useful results. As such, iterations of this loop realistically take two to three years minimum, often more, especially with new equipment fielding. There are shortcuts, but that generally involves high risk, which is more associated with wartime operations. That is a "make it up as you go along" approach. The basis for that is evolving rapidly from a known point and using traditional military structures. For example, an amazing new fighter is fielded that could be substantially more capable than the previous fighter. To provide a similar capability as the legacy fighter squadron, the number of aircraft and training could be very different, but to move things along it is easier to use the same number of aircraft and aircrew as the old squadron. The second-order effect is that you now have the problem we discussed in an earlier chapter when similar organizations with substantially different capabilities train. To be clear, a fourth-generation fighter squadron may have the same number of aircraft and aircrew as a fifth-generation squadron, but even the less ready fifth-generation squadron is more capable than a fully ready fourth-generation squadron.

The third-order effect of evolving from existing and/or traditional structures is that the personnel system still uses familiar patterns to assign personnel and manage the rank structure. If the new fighter, instead of using the traditional structure, made more numerous squadrons, but was as effective as the larger old style, the personnel system would need to accommodate more unit commanders. Could the personnel system generate the sufficient number of command qualified lieutenant colonels in time for the new squadrons? In rapidly expanding forces, large exceptions were made with more junior officers being entrusted with higher responsibilities. This approach also comes with risk.

Over time, there is a shift from the larger traditional formations to either slowly shifting to smaller formations or having the traditional larger formation morph into a force provider that employs detachments or subelements. This is the crux of much of the current angst with unit readiness reporting. Unit-level reporting focuses on the battalion and squadron level, but less and less of the force is employed at that level. There is a desire to capture readiness at this employment level, but a conflict arises. The battalion and squadron levels have a staff that can take the time and energy to fill out a readiness report. Smaller subelements have no staff, little access in many cases to classified computers, and traditional metrics such as percentage index thresholds are incredible clunky for small elements. The second tension is that the level of employment has two meanings. The Services have a designated level of employment that is reflected in force structure, and a parent battalion or squadron can provide readiness data for those subordinate entities as part of their readiness reporting as they have the information, capability, and capacity to do so. For example, a squadron that breaks down for employment into a headquarters and three detachments. The report filled out can still include an overall assessment but also includes an assessment of each detachment and the headquarters. The contentious meaning of lowest employable entity is that in practice many units can employ a single servicemember, such as an interpreter or highly skilled cyberspace operator. There are ad hoc elements pulled together for all sorts of missions. The Services are frequently asked by the Joint Chiefs of Staff to perform all sorts of missions for which they are not expressly designed.[11] Examples include artillery units used as provisional infantry battalions in Iraq to using combat aircraft in humanitarian and disaster relief missions both domestically and abroad.[12] The issue of trying to report readiness should not be interpreted as inability or lack of commitment to do what is asked. The ability to assess the readiness of an ad hoc capability that has not been composited is asking the impossible. The other issue is that doing missions for which the units are not designed reduces their readiness to do what they are designed to do.

Raw Materials

At the risk of sounding old-fashioned by speaking of building readiness from an industrial age point of view in this new information age, an assembly line process is described. However, this process is deeply imbued with an Information Age touch. Do not imagine the large brick factories making cars with hundreds of workers sweating to keep up. Think of high-tech factories with clean rooms making finely tuned electronics. The complexity of modern units is a move from mass production to an artisanal approach. That is part of the twenty-first century challenge—Can highly complex formations be produced in sufficient mass?

Personnel

First and foremost is people. The United States has consistently raised the bar for entry over generations. To operate a sophisticated weap-

[11] *Chairman of the Joint Chiefs of Staff Memorandum 3130.06D, Global Force Management Allocation Policies and Procedures* (Washington, DC: Joint Staff, 20 June 2024), 2.

[12] Wesley Morgan, *United States Advise and Assist Forces in Iraq: Iraq Order of Battle* (Washington, DC: Institute for the Study of War, 2011). This has an example of four Army field artillery battalions: 2d Battalion, 222d Field Artillery; 1st Battalion, 5th Field Artillery; 1st Battalion, 82d Field Artillery; and 3d Battalion, 82d Field Artillery deployed in nonfield artillery missions in 2011. LtCol Douglas Thumm, "I Commanded a Marine V-22 Squadron. Here's What I Learned," *Military Times*, 13 March 2024.

on system, the educational level is higher, the fitness requirements are higher, and the length of service requirements are higher. The Service must be sufficiently attractive on various levels to ensure enough volunteers. The volunteers go through long and arduous entry level training. The training is so difficult that enlistees often attend extensive prep sessions and pre-boot camp boot camp programs that improve the rate at which they successfully graduate. The requirements of service are high in operational tempo, deployments, and rigorous training such that people without exposure to the military lifestyle struggle to understand. This means that over time a majority of enlistees have at least one family member in the military or a veteran. Military service is becoming a family business. This subject has whole studies on it, but in a readiness aspect, the military is getting highly qualified people overall.[13]

The true key to measuring the personnel of units is the "faces-to-spaces" work. A crew or unit has a set of billets (spaces) that establish the skills and experience required for that billet. Accurate management ensures the appropriate personnel are assigned to each billet. The technology exists to manage this data in a drag and drop interface on a mobile device. There are multiple ways personnel readiness should be considered. First, an aggregate strength can be highly misleading. The personnel index should include the qualified billet fill by enlisted ranks (E1–E3), noncommissioned officer ranks (E4–E6), senior noncommissioned officer ranks (E7–E9), warrant officers (WO1–WO5), company grade officers (O1–O3), and field grade officers (O4–O6). A qualified billet fill is skill indicator match, grade match, and any additional skill qualifiers. The current system where each Service sets its own business rules considers a "near miss" as good enough in some cases and will often allow a grade mismatch of plus or minus one or two grades, but it is worth strongly disagreeing with this practice. A partial fill should be included to show assigned personnel that are undergoing post-assignment skill progression, thus indicating the potential for the fill to become qualified. An unqualified fill cannot be expected to become qualified but

[13] "Facts and Figures," Army.mil, accessed 19 May 2025.

is assigned to the billet pending reassignment. The second aspect is that personnel are setting the conditions for unit cohesion by including the tenure of the assigned personnel. With the faces-to-spaces approach, this type of data can be captured daily. The same faces-to-spaces data can feed the training management system to keep track easily of who completed each training event. Daily accountability can capture the appropriate duty status. The duty status categories can be kept simple (table 24).

The personnel report may look more complex, but the underlying "faces-to-spaces" management user management tool can make it a value add by simplifying daily accountability, training management, ordering of supplies, as well as readiness reporting metrics. Figures 15 and 16 depict a notional user interface for managing faces to spaces on a daily basis via a mobile device or laptop. The first image depicts a notional squad organization of 10 billets and 9 available unassigned soldiers. The billets are color coded black to indicate they are vacant. The user then drags and drops the soldiers against the billets and the billets are automatically color coded to indicate to the user if it is a qualified fill by grade and skills (green), partial fill that can grow into the billet by promotion of skill progression (yellow), or mismatch pending reassignment (red).

The user, the platoon leader, or platoon sergeant has some tough choices as the nine available soldiers have a mix of grades and skills that do not exactly match.

In the current system of measurement, the squad would be considered a ready squad with 9 or 10 personnel with a basic skill qualifier match and plus or minus one grade match. With the more nuanced data management tool, the squad leader is a partial fill as the Squad Leader Course is required and can still be covered later. The other noncommissioned officers are fully qualified, which helps balance partial qualification of the squad leader. There is an extra E4 that is a mismatch for the automatic rifleman billet; this soldier is pending reassignment as once the Advanced Infantry Course (AIC) is completed the soldier should be reassigned to a fireteam leader billet in another squad. The two E2 partial fills can grow into the qualification with a promotion to E3 when it is

Table 24. Recommended duty status categories

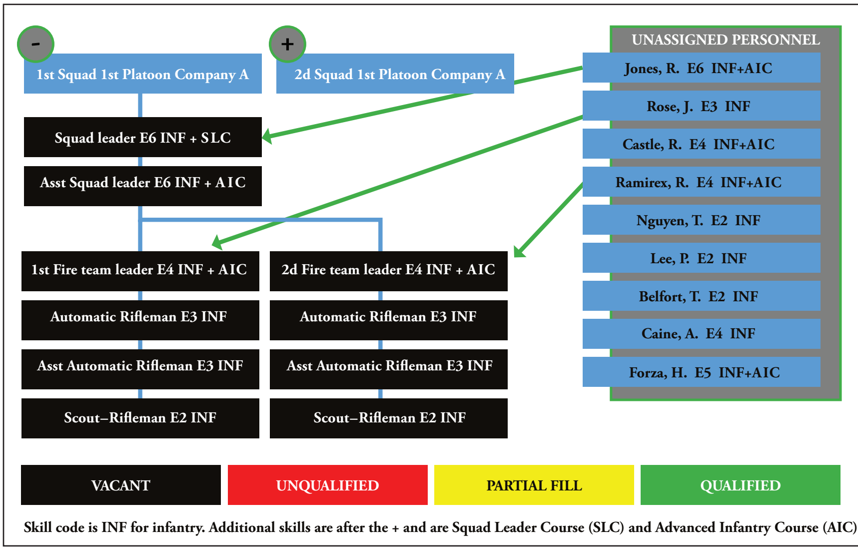
Duty status	Description
Available/full duty status	The servicemember is present and available for full duty and is deployable (if required). Any training events for the unit will include all members available for training by default.
Temporary limited duty	Light duty or "profile" or sick-in-quarters (SIQ) is still considered deployable, but not available for training.
Temporary additional duty (TAD/TDY) for school	The servicemember is attending a school or course of study that is required for skill progression and will be recalled to the unit for deployment if needed.
Nondeployable medical	A long-term medical duty limitation.
Nondeployable legal	The servicemember is on a legal hold.
Nondeployable administrative	A set of conditions including pending discharge and some special cases that make a service member nondeployable.
Detached	The servicemember is detached individually or as part of a larger detachment from the unit to another unit. Ideally the other receiving unit is identified. The detached personnel still holds a billet at the origin unit.
Barrowed military manpower (BMM) or Fleet Assistance Program (FAP)	The servicemember is detailed to the host installation to provide general support to all tenants and is not available for unit training. The servicemember can be recalled and is considered deployable if needed.

Source: author's simplified list of many different duty status descriptors across the Services, adapted by MCUP.

earned. This provides a deeper understanding of the squad that has 5 of 10 qualified, 3 partials, 1 mismatch, and the vacancy, not just 9 of 10. A duty status would then be available to each soldier once assigned. The platoon sergeant can then mark the squad leader unavailable for training while they attend the Squad Leader Course. Each assigned soldier in their underlying record has their join date that can be used to calculate the tenure of assigned personnel by grade band to help understand the conditions for unit cohesion and the sustainment of collective training.

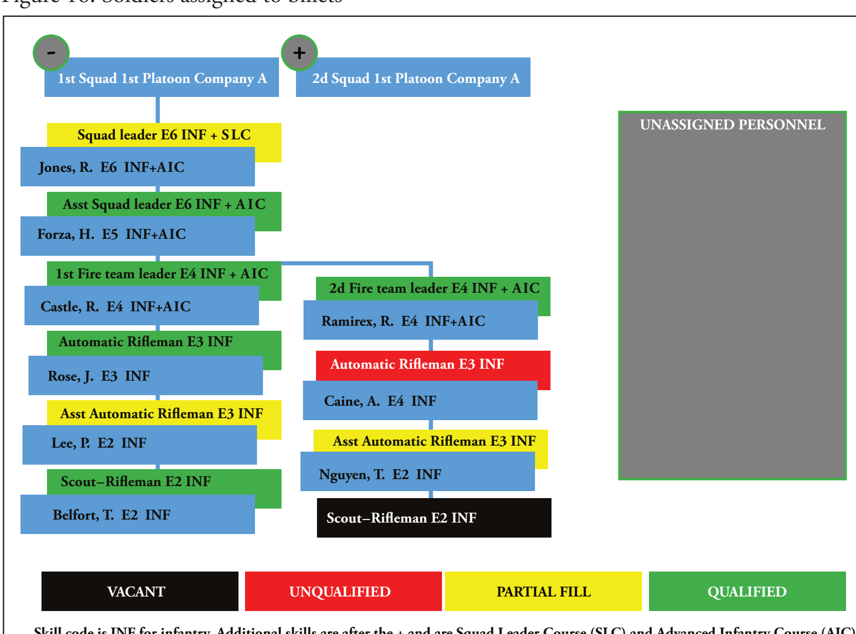
Unfortunately, all this matching of skill codes and rank is a substitute for actual skills and experience. There is an assumption that someone that has attained a given rank with the appropriate skill code

Figure 15. Initial faces-to-spaces tool



Source: courtesy of author, adapted by MCUP.

Figure 16. Soldiers assigned to billets



Source: courtesy of author, adapted by MCUP.

is actually qualified. There are many reasons that a person with the correct rank or skill code may not be the best fit. There is much more to talent management than a rank and skill code. This is a general understanding of this issue within units. There is a concept of military occupational specialty (MOS) credibility. This concept considers the time spent in a position or progression of positions using that skill. This is not a simple calculation, but it is considered by the personnel management team when making assignments. While this sounds promising, it is a two-edged sword. It tends to favor time within certain jobs and discounts the value of broader experience in leadership positions. A rigid position progression can create a "ticket punching" mindset, and a lack of diversity of experience can fuel a groupthink mentality that may limit the creativity of leadership to solve nonstandard problems. MOS credibility can be valuable for roles requiring hard skills like maintenance, cyber warfare, or signals intelligence.

Equipment

The current pillars have two pillars that measure equipment: the S-level (equipment on hand) and R-level (equipment condition). This skews the options for readiness degradation toward materiel readiness. The twenty-first century force is more personnel skill focused than in the past. This is an easy area to rebalance the measurement. The Services still retain the authority and responsibility for establishing the mission essential equipment by unit type, and these can be weighted so low density equipment can show its outsized impact. A numeric weighting would allow for a single list to perform the calculation instead of the two categories in use now. The two categories can force the Service to manage some wonky math to get the numbers to show an accurate representation of their equipment readiness, but a simple integer weighting criteria is easy to implement. The data would include the item identifier, nomenclature, weighted value (1 to *n*), required amount, possessed (a.k.a. on-hand amount), and mission capable amounts. The S- and R-levels should be consolidated into a single equipment or E-level. This would be the amount of mission capable equipment divided by the requirement. Supporting information would be equipment that was possessed and equipment that was not mission capable for supply (NMCS) or maintenance (NMCM) factors. Also important would be items that were not mission capable for greater than 30 days. The combination of these maintenance metrics allows for analysis of supply chain or maintenance capacity factors in degraded readiness. There are also linkages to resources behind those factors. Leaders do not need to know why items are NMC, just the observable rates of change for readiness reporting. This can be analyzed for trends and fuel predictive analytics. The assumption is that the items are under analysis specific to their supply chain and reliability.

Training

Training is a critical component of military readiness; it is not the result or output. Training is a continuous process within military units as they build and maintain the ability to perform the tasks needed of each type of unit at each echelon. Training does not end when conflict begins. New or reconstituted units must train up to the necessary level to reliably accomplish their tasks. It is important to also include the sustainment of skills. Units in conflict must train for the next specific mission. They must train when not in active operations to sustain and improve their skills, and they must continuously train on updated techniques, tactics, and procedures to adapt to adversary changes.

Training must capture currency, proficiency, complexity, and pace. These four pillars take the binary understanding of the need for a crew or unit trained to perform its designated mission to standard to a different level of understanding while remaining measurable. The Services must enumerate the tasks and standards just as they do now. These serve as the baseline for understanding the three components. Currency consists of two subcomponents, which are the last time the training was done and how often it has been done in the last 12 months, or since the last reset. The training value degrades over time on a sliding scale that can be balanced against the repetitions. The following table provides a notional rubric for the training currency score. In this chart, like other aspects

Table 25. Training currency scoring

Training level	Last time successfully performed	Successful repetitions
1	Less than 90 days	4 or more in last 12 months
2	91–120 days	3
3	121–180 days	2
4	>180 days	1

Source: courtesy of author, adapted by MCUP.

of readiness where the lower of the two drives the score, both aspects are evaluated and used to score that training. For example, a unit that just did an event successfully within the last 90 days, but this was the only time in the last 200 days, has a one for last successful performance and a four for repetitions, so it will still have a four as the overall score. There could also be different scales for highly perishable skills that can be established as a unit attribute.

The next component of training is proficiency. This is often considered to be the most subjective. More granular measures are often subject to "grade inflation" that can become a new version of binary scale. Putting a clear rubric for scoring proficiency in policy is helpful as are systems of quality assurance, such as using certification of evaluators to provide an objective grading system. The currency score is interrelated as the proficiency must be a one or two to count against success and repetitions. A notional approach is provided in table 26.

The third aspect of training is complexity. One of the previously mentioned factors of U.S. tactical overmatch was the integration of highly rigorous training events such as the Army's Combat Training Centers (CTCs) or Air Force's Exercise Red Flag.[14] Highly complex training produces highly skilled servicemembers, but that comes at a cost. Showing the impact of highly complex training as a qualitative factor that relates to the resources needed helps both war planning and

[14] Matthew Cox, "Headed to the Army's National Training Center?: Here's What You Need to Know," Military.com, 19 May 2019; and Walter J. Boyne, "Red Flag," *Air & Space Forces Magazine*, 1 November 2000.

Table 26. Training proficiency scoring

Training level	Description
1	Able to adapt to changing conditions and still complete the task
2	Able to complete the task to standard without prompting
3	Unable to complete the task without prompting or notes
4	Not proficient/untrained

Source: courtesy of author, adapted by MCUP.

budget planning; personnel see in data the impact of that training. Complexity related data is most useful in a support role to provide a sense of the quality of a trained unit. It should not be considered a gateway to certain levels. This could create an artificial roadblock to unit training progression. A notional list of complexity factors is provided as an example, not as a comprehensive list (table 27). However, the list should be limited to have value.

There certainly could be a linkage between proficiency and complexity as the enumerated factors could demonstrate the changing conditions necessary to achieve top level proficiency.

The pace of training refers to the training time allocated and the relative amount of flexibility. During a normal predeployment preparation period, there is an allocation of available time. If there are 180 days for a unit to get ready, these total days are first reduced by leave and liberty. Units typically grant block leave prior to deploying and will allow normal weekends and holidays to maintain morale. The 180 days is reduced to about 110 working days. Working days are then allocated administration and maintenance activities, which take up to 40 percent of available workdays depending on the type of unit. Using the 40 percent allocation leaves 66 working days for training. Within that set of days, it is typically allocated to building complexity, so in a simple "crawl-walk-run" this gives 22 days for each stage. If the schedule is compressed, then some slack can be taken up by reducing the leave and liberty bucket and then administration and maintenance. An indication of the pace the unit is training on or operating under gives

Table 27. Complexity factors

Complexity factor	Description
Live fire and maneuver	Integrated live fire and maneuver
Live air support	Integrated training with actual aircraft for lift, sustainment, casualty evacuation, or close air support
Joint, allied, or partners integration	Integrated training event with other Service, allied, or partner nations under a unified command
Extreme cold weather	Operate continuously in sustained below freezing temperatures for 10 or more days
Chemical, biological, radiological, nuclear	Integrated detection, protective measures, and decontamination for a minimum of 72 consecutive hours
Command and control contested	Integration of limited, jammed, denied, or contested radio, satellite, and cyberspace communications. Forces use of all parts of primary, alternate, contingency, and emergency (PACE) communications plan
Distributed operations	Unit operated multiple subordinate elements across greater than 50 plus mile radius, or multiple installations under a single command, beyond standard radio communications range
Dense terrain	Urban or jungle terrain limiting maneuverability, communications, or visibility for a minimum of 72 consecutive hours
Night	Training conducted in less than 25 percent natural illumination
Live adversary	Training against a live adversary force includes full time aggressor units, allied, or partner forces. Excludes "shadow boxing" with like formations. Must present a different set of tactics, techniques, and procedures
Service-level training event	Army Combat Training Centers (CTCs), Air Force Exercise Red Flag, Navy Composite Training Unit Exercise (COMPTUEX), Marine Corps Integrated Training Exercise (ITX). This will typically cover several factors in a single event

Source: author's notional compilation.adapted by MCUP.

insight on its ability to compress its schedule or not without directly reducing training days. Assessments are not meant to be prescriptive, but we need to better understand what is happening, and measuring training pace can be applied to any unit type.

Understanding the allocation of training time is important but there is more to training. In the cases it has been observed, the total training body of knowledge is too much to cover in a reasonable amount of time. Training must cover the mission essential tasks (METs), but time is included for remediation and covering those training tasks beyond the METs that the commander wants to include. Training time is allocated for subordinate units to address their perceived shortfalls. The time needed to gain MET proficiency is also a function of the inherent complexity of that unit type. Having 66 training days may be adequate for some unit types; others may not be able to gain MET proficiency without increasing the pace within the allocated time (table 28). Platform-based unit types, like aviation, ships, or armor will have a higher pace for the same training period to build the necessary proficiency, and these units are more vulnerable if a schedule is compressed. Increased pace may lead to increased mishap or injury rates, which can impact unit morale and increase wear and tear on equipment.

A comparison of pace versus general complexity build can provide a useful index (table 29). A standard pace should allow a unit to achieve proficiency at complexity level 1 in the allocated time with a very high probability of success. The probability of success degrades as the pace increases. Not only could this give an indication of potential impact but can help depict how far a unit has progressed below the level of current measures.

Subordinate Units or Elements

A key feature of modern capabilities is the highly capable distributed combat power in smaller packages. There is a lowest designed employable entity where employable is defined as operating independently or tasked by a major command. There are still many units that operate at the battalion and squadron level where readiness data is collected, but the proportion of units that provide subordinate elements is now much larger. There are two types of entities that are employed below the battalion or squadron level. Many are standing structures within the parent unit, meaning the unit table of organization has that subordinate element defined and it is staffed as part of the parent unit. These include companies, troops, platoons, squads, teams, and detachments.

Table 28. Notional pace levels

Pace level	Description
1- Standard	Leave-liberty are not impacted; there is sufficient administrative and maintenance time. Training time is sufficient to become T-1 when planned or sustain T-1/T-2
2- Accelerated	Reduced leave-liberty (longer hours, some weekends). Reduction of leave-liberty between 10–50 percent. Sufficient administrative and maintenance time. Training time sufficient to become T-1/T-2 when planned or sustain T-1/T-2
3- High	Leave-liberty reduced by greater than 50 percent, administrative and maintenance time reduced up to 50 percent (will result in lower R-levels). Training time may not be sufficient to become T-1/T-2 when planned or sustain T-1/T-2
4- Unsustainable	Leave-liberty reduced by greater than 50 percent, administrative and maintenance time reduced by greater than 50 percent (will result in lower R-levels). Training time is insufficient to become T-1/T-2 when planned or sustain T-1/T-2

Source: author's notional rubric on a four-point scale, adapted by MCUP.

Table 29. Pace versus general complexity build

Pace level	Description
1- Integrated unit level complete	Completion of capstone integrated unit level events, and completion of the "run" phase Battalion, squadron, ship, or air mission level
2- Subordinate level training	Completion of the "walk" phase Company, battery, aviation elements (flights, sections, divisions), or ship departments
3- Small unit level training	Completion of the "crawl" phase Platoons, squads, crews, teams, ship divisions, sections, and watches
4- Reset	Unit is beginning the complexity build with training reset and unit building

Source: author's notional rubric on a four-point scale, adapted by MCUP.

These are much easier to obtain readiness data as part of the parent unit's report.

Unfortunately, the methodology and format of this readiness data is not standardized across the Services and there is some experimentation going on. One approach is to provide a mini version of the standard report based on data from the parent unit that produces a calculated C-level so the data can fit into the existing reporting format.

This does not require much additional effort from the parent unit and can feed existing reporting and forecasting processes. The other type of entity that presents an interesting problem is the task-organized element. This element does not exist in structure and is formed as needed and the precise organization is customized. These can be sourced from within a single unit or from parts of multiple units. An example of sourcing a task-organized element from a single unit is a maintenance battalion that has a company for each type of maintenance (general support, electronics, motor transport, ordnance, and engineering) but can form a task organized intermediate maintenance activity with elements from each of the companies as needed. A task-organized unit from multiple units includes an air expeditionary squadron for the Air Force that is aggregated from around 18 elements pulled from multiple standing squadrons. The Air Force does track the readiness of each of these element types so there is an ability to assemble a data set for the readiness of a potential squadron that has not been aggregated from the readiness of its component parts.[15] What is not assessed is the actual readiness of the composite squadron working together as a unit until it is actually pulled together. Standing units could include the ability to generate task-organized elements as a provide task-organized forces MET. The standards within that MET should enumerate what is to be provided and if it has been exercised. It is always said that there is no actual capability until it is trained and demonstrated in a relevant environment.

Mission and MET Standards and Conditions

The mission and MET assessments are collectively known as capability assessments. A unit type has a designed mission that is developed and maintained by the Service. Units can also be assigned missions as needed that can be very specific and run the gamut from a subset of the capability or a superset that is based on the unit receiving additional elements. Most readiness analysis and planning is based on the designed

[15] *Air Force Instruction 10-201, Force Readiness Reporting* (Washington, DC: Department of the Air Force, 30 July 2024), chap. 10.

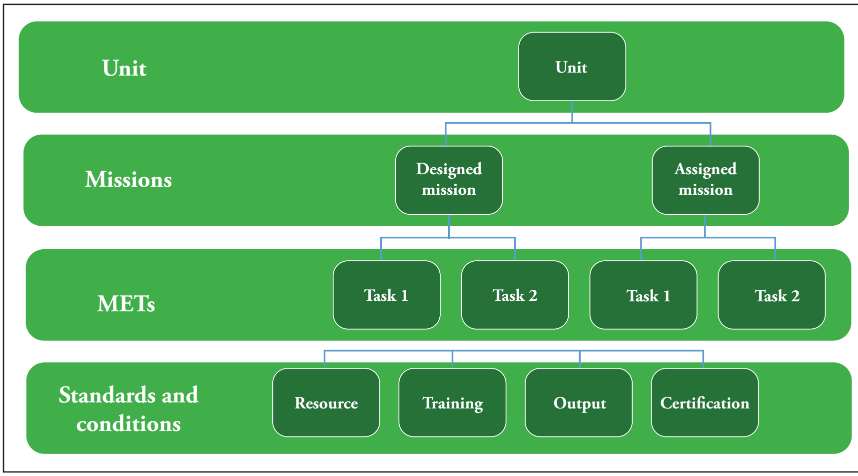
mission. This construct has been in place since 2005 and is flexible if implemented properly, however, implementation was inconsistent.[16] To make the data more useful for planning and analysis the construct must be a bit more prescriptive for decentralized implementation. This can be accomplished with minimal extra effort and open opportunities to automate significant portions. The initial problem is applying an open-ended data model to units that span from 30 people to a 4-star command. For unit-level readiness, reporting an open-ended data model is too hard and too detailed for practical use. The mission, tasks, conditions, and standards are structured to facilitate training and help establish an analytical baseline. Because the Services are customized, the ability to compare across the Joint Force is very limited.

Missions are standardized in the DOD and Joint Force, but this standardization is little more than nomenclature. The mission assessment is the unit, mission, assessment, and remarks. There is no supporting data other than the associated set of METs. Each MET has standards and conditions child data sets (figure 17). Every unit must have a designated mission but will only have an assigned mission if required. Assigned missions should cover deployments and alerts. An assigned mission should be given to the unit in advance to gauge the ongoing preparations for the deployment or alert period. A mission may have as little as one task (MET), but the average is five to six. Each MET may have 1–10 standards. Each MET also has a set of conditions. Conditions are a wide open data model that covers physical conditions (day, night, hot, cold, jungle, mountain, in the air, on land, or at sea), political conditions (wartime, peacetime, or hostile local populace), and operational conditions (chemical, electronic warfare, etc.). The conditions model is exceedingly broad and flexible, but it is too broad to be practical in its current incarnation.

There are several problems that come from having a task with flexible conditions. Most tasks, especially when associated with a mission, have many implied conditions. Conducting a night attack for an infan-

[16] James G. Herrera, *The Fundamentals of Military Readiness* (Washington, DC: Congressional Research Service, 2020), 5–7, 18–21, 43, 46–48.

Figure 17. Mission-MET framework



Source: author's depiction of the data hierarchy in *Chairman of the Joint Chiefs of Staff Instruction 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Staff, 17 July 2014), adapted by MCUP.

try battalion has many possible conditions such as on land, at night, or in wartime conditions. These can be made very specific as to the level of natural illumination or the sophistication of the enemy defense. Whole sections of the conditions model are illogical or irrelevant. At what point do the specifics invalidate the accomplishment in other conditions? Some conditions require special equipment and training, such as chemical or extreme cold. Training conditions from the Services' various training and doctrine sections can be very specific and can be adjusted frequently. A reasonable recommendation is the use of a short, enumerated list of special conditions that are the complexity qualifiers from the training section and simplify the whole conditions element.

A general task has at least one output standard, something measurable so the ability to perform the task can be demonstrated and indicates what the Joint Force gets from the task. The current list is long, and each general task has a set of example outputs. The Joint Force should consider some specific standards for special cases, especially one where the Joint Force needs a common frame of reference across multiple Services or the Services provide a like capability. Two examples are installations and tactical aviation. Installations provide common services to the Joint Force and the need to look at the operational and strategic warfighting contribution of installations with a common set of tasks and standards should apply to all DOD installations. For tactical aviation, there is a Joint air tasking cycle that looks at aircraft sorties as the base number for the process. The Joint Force should consider a required output standard for the sustained sortie rate for aviation units that would allow the tracking of the readiness in terms of sortie rates to compare against a war plan's required sorties. Most units do not require Joint standards, but for analysis all unit level tasks should include at least three standards: resources, training, and output. This minimum allows for the basic analysis in data instead of text fields of why a MET is not accomplished, which then drives a descriptive analysis of a breakdown of how many units have accomplished a task and the distribution of resources, training, or outputs that are driving underachievement. Services can certainly have more than the required minimum of three and can differentiate personnel and equipment with resource standards. Services should also be permitted to include certification standards if they have a process that requires certain certification exercises to achieve full capability. Services should be allowed to weigh standards to help them establish an objective and consistent assessment criteria. Having a reliable set of standards allows for automation. The Service already collects a great deal of resource data in that section of the report that can be referenced in the standards reducing workload.[17] Training data can be provided from the Service's underlying training management systems.

The goal is to be less subjective by providing more data to allow the capability data to be more useful. None of these recommendations would prevent the current use from changing at higher level assessments.

Guard and Reserve Missions

As noted, every unit has a designated mission, also called its core mis-

[17] *Chairman of the Joint Chiefs of Staff Instruction 3401.02B, Force Readiness Reporting* (Washington, DC: Joint Staff, 17 July 2014).

sion. National Guard and Reserve component units typically mirror active component units, that is they have the same or similar functions with the same or similar organization. It should follow that the core mission for such units have the same standards as the corresponding active component units. Given that National Guard and Reserve units are not resourced to the same levels as active units, it follows that these units would be perpetually unready. That is by design.[18] The gap between their current status and the standard is a key component of understanding the depth and breadth of the hole that the institution must fill. The gap comes from two key components. Guard and Reserve units are often not fully equipped; they have what is known as a training allowance. This is because they do not have sufficient full time staff to maintain the full complement of equipment. Enough is allocated to sustain the training. The delta between fully equipped and the training allowance should be held in properly maintained storage so the equipment can be drawn with the expectation of it being serviceable. The other reason for the gap is less training time available. In a peacetime environment with normal liberty on weekends and holidays, an active unit may have about 247 days available for training in 2024. A guard or Reserve unit in the United States is typically funded for 48 drills and 14 days for the annual training. A drill is a half-day increment so a drill weekend that is Saturday and Sunday is four drills. There is no hard requirement to do four drills during a given month. To get more focused training, units can do five to seven drills for a longer drill period by skipping a month or two in the year. Either way, the 48 drills provide roughly 24 training days, and adding the annual "summer" training that gives 38 training days or just more than 15 percent of what the active component has available. The core mission report will show an unready unit but does not give a sufficiently complete picture of residual readiness within the unit. More is needed for

[18] *National Guard Regulation 71-1, Army National Guard Force Program Review* (Arlington, VA: Headquarters National Guard, 27 February 2023). This is an example of how the Army National Guard, the Air Guard, and Reserve components for the Services have similar policies implementing any updates to the Service force management or generation plans. This example integrates the Army's Regionally Aligned Readiness and Modernization Model (ReARMM).

these units. In addition to the core mission, a guard or Reserve unit that is not currently activated should have an inactive duty for training mission assigned and assessed in addition to its core mission report.

Guard and Reserve units do have an essential task to perform that is unique from an active counterpart. They have to train to activate and deactivate the guardsmen and reservists from individual augments to external units, subordinate elements of the units, or the unit as a whole. This skill has training and output standards and is exercised and inspected, so it lends itself to the MET. This activation-deactivation task should be the first MET in the inactive duty for training mission. A subset or modified standards to the core mission's mission essential task list (METL) should be included so the unit can assess measurable progress against a tailored set of standards that are achievable in the limited training time available. This mission can capture the health of the training allowance equipment and its sufficiency to enable training. The mission can capture the guard- and Reserve-specific metrics on drill percentages, that is the percentage of the personnel that report for drill. This is a key indicator of unit morale and activation readiness. Many guard and Reserve unit types routinely activate detachments to support the active component. The key difference between active component units that provide forces via subordinate units or elements is the need to activate the detachment or element prior to using it. Activation readiness has some similarities to general individual and unit readiness, but there are enough differences to make tracking it distinctly worthwhile. The inactive duty for training mission can provide the number and health of the detachments and activation timelines (e.g., a unit has 4 detachments, the mission may require 1 be ready for activation in 10 days, another in 30 days, and the other 2 in 60 days). Unfortunately, much of this information exists, but it is captured in the unstructured comments. The detachments, requirements, and distribution of actual readiness can be captured in data that is machine readable for trend analysis and rapid evaluation of the readiness of the force to perform a specific plan.

Assessment Scaling

In a previous chapter, the current grading scale of readiness assessments was provided. If there is to be a better understanding of readiness or rather to support decision making, assessment scaling must be clear and useful. The purpose is to collect readiness data to help senior leadership make better decisions. Decision support gets into the nuances of how to score or present data that is understandable, informative of the trade-offs or trade space for decisions, and not telling leadership what decision to make. This is the shift from descriptive and/or predictive analytics to prescriptive analytics. This concept is often called the "so what" of an assessment. To help this process along, we use assessment scoring to rapidly bin lots of readiness data points to support decision making. There is not enough time to read all the details of hundreds of reports. As previously discussed, there are two competing methods in use and others waiting in the wings. Any scale must be easy to understand, so large or highly granular scales are not helpful, like a percentage scale. The logical options are binary, three, four, or five levels. The scale only helps so far regardless of its granularity, but a key differentiation between the options is the trigger point for conducting additional analysis. The basic logic train asks if there are enough ready units, and if not then how far into the less or not ready inventory can we go?

Binary is either ready or not ready. It is very easy to display and understand. The trigger for additional information is very high and the not ready bin makes no differentiation how far down the readiness scale a not ready unit is. By itself, the binary assessment is not recommended.

The three-level scale is in common use with mission and MET assessments and aviation maintenance. In the mission and MET assessment, the three levels are "Yes" (Y), "Qualified Yes" (Q), and "No" (N). This is often referred to as YQN. For equipment maintenance the levels are fully mission capable (FMC), partially mission capable (PMC), and not mission capable (NMC). The two scales are very similar, and the maintenance version predates the YQN and was likely its primary influence. This is an improvement on binary as it has a middle ground. The Y and N can be rapidly understood. The Q or PMC then is the trigger for additional analysis. The Q in mission definition is based on the ability to perform most tasks under most conditions. This background policy indicates the Q/PMC bar is high enough that the unit can be employed for most tasks. Further analysis would indicate if the degradation applied only to certain tasks or all tasks in most conditions. In practice, the middle ground can be very broad, which then raises the trigger for follow on analysis higher than intended.

The four-level scale is a one to four scale used in resource reporting (with two optional levels five and six for special purposes). It has been around for more than 40 years, so it is well known in military circles. The granularity is still simple enough to easily understand. The top two and bottom two levels can be easily divided to support a rapid binary look. The four levels equate to the descriptive terms all, most, some, and none. Level one can perform all its tasks and equates to FMC. The level two unit can perform most of its tasks and is employable and equates to PMC. Levels three and four differentiate the units in NMC bin in depth. The four levels dovetail nicely into the standard risk assessment categories of low, moderate, high, and significant that would go with using a unit at that corresponding level. This only works well if units can flow between all four levels, but there are some mathematical anomalies in assessment criterion especially as the levels were designed for larger units. Today's smaller units often jump between levels one and four due to outdated thresholds. These could be easily revised in policy to ensure smoother transition between levels for smaller units to give the needed insight.

The five-level scale is not in use with military readiness, but it is deeply ingrained in culture as the academic scale of A, B, C, D, and F. In academic standards, it gives more differentiation as the "ready" areas of A, B, and C. It only provides two levels of unreadiness, so it is similar to the four-level scale. There are five-level scales in use in military training as a reflection of academia. The academic scale struggles with either grade inflation or with "Cs get degrees" mentalities over time and some of that perception would come with it if it were adopted in readiness reporting.

Anything over five levels does not support the "simple to rapidly understand" principle, so the author does not recommend anything beyond five levels. The recommendation across all areas of readiness reporting is the four level scale and retaining the two optional levels for the special purpose of showing the unit as unavailable for tasking (level five) or the particular resource area is not measured in this case (level six). Having two different scales inside a single report is confusing and produces some inconsistent data.

Below the MET assessment is a set of performance standards. At that granular level, the approach returns to binary. If these items are standards, they are either achieved or not. We avoid saying we have met the standard and say achieved to avoid confusion with the MET acronym. A MET can have from 1 to n performance standards. Performance standards should capture all the required resources and training. In practice, this is not universally applied, but it is worth discussing. Some encapsulate the performance standards in training only. For a task that requires the full unit, this is defensible as the resource reporting already provides for that information. For METs that require a subset of the total resources, this is not true. The current performance standard data model allows for standards to have a "type" of standard. These are personnel, equipment, training, output, and certification. It also allows for some system of weighted standards. One implementation in use is grouping standards into two either baseline or advanced categories. That baseline captures standards that should be obtainable without external resources at home station but represents a combat credible level. The idea is that this grouping standardizes what must be achieved to advance from the N to a Q under the current scoring. It also differentiates the level and quality of resourcing and training needed for a high-end threat as those types of standards can be associated with the advanced level. This advanced level equals the Y, which allows for linking the necessary resources to measured readiness levels.

Converting the mission and MET assessment to a four-level scale is as easy as implementing the information in table 30 in policy.

Table 30. Mission and mission essential(MET) assessments on a four-level scale

Mission or MET level	Rubric
Mission level 1	Completion of capstone integrated unit level events, and completion of the "run" phase Battalion, squadron, ship, or air mission level
Mission level 2	Completion of the "walk" phase Company, battery, aviation elements (flights, sections, divisions), or ship departments
Mission level 3	Completion of the "crawl" phase Platoons, squads, crews, teams, ship divisions, sections, and watches
Mission level 4	Unit is beginning the complexity build with training reset and unit building
MET level 1	All performance standards achieved
MET level 2	All baseline standards achieved (if designated) or more than one-half (51 percent +) of performance standards achieved
MET level 3	Any baseline standard not achieved (if designated) or some performance standards achieved, but less than 51 percent
MET level 4	No performance standards achieved

Source: courtesy of author,, adapted by MCUP.

Regardless of how assessments are scored, the underlying data used to determine the score is stored for analysis. The underlying data is essential in supporting a more in-depth understanding of related issues across different unit types, mapping dependencies, grouping like capabilities, managing resource allocation, and building sets of units for operational capabilities.

Reason Codes

For those who have filled out a readiness report, they learned rapidly there are an extensive number of reason codes. If something is not at the highest level, one must provide a reason code as to why it is not, and in many cases there is room for primary, secondary, and tertiary reason codes too. For an analysis point of view, this is very helpful in concept as it can support rapid grouping. As often happens over time, there is a proliferation of reason codes that dilute the effectiveness of the data. Someone could easily argue that it does not support key decision-making processes. The focus has been on why a unit is not ready when the resource and capability scores make it fairly obvious. That plus the schedule of units make it clear that the primary reason a unit is not ready is that the institution has not resourced it to make it ready at that time. For senior-level decision makers, they already know why a unit is not ready, what they need to know is if there is any usable readiness left. The bar for readiness is set fairly high and it is not clear in resources alone how far deep the unit is in the hole. If unready is anywhere from 0 to 50 percent, there is a significant difference between 5 percent and 48 percent. This is often referred to as residual readiness. Decision makers need to know if there is any ready capacity available within unready units. A much easier set of reason codes appears in table 31.

Inventory and Shelf Life

A military enterprise makes units ready to do things. Readiness is something to be consumed by a deployment or employment of the unit for a period of time. Even if a unit is made ready at home station and not deployed or employed, will its readiness last? Readiness is perishable. It is perishable across the layers from unit to institutional readiness. Entropy cannot be avoided. It is helpful to understand why it is perishable and the half-life of readiness so the reality can be built into the process. It also then opens a discussion on the three conceptual models a nation or military enterprise can consider: steady-state, rotational, and tiered readiness.

Starting at the unit readiness level, once built into a ready state, several factors that are measured for establishing readiness have rates of decay. Personnel have tours of duty that drive the foundation aspect of staffing a unit. In the United States, 36 months is roughly the amount of time that an individual is assigned to an operational unit. For specialties requiring long training pipelines, that tenure at the operational unit

Table 31. Reason codes

Reason code	Meaning
1A	The unit is unready due to task organization (detached subordinate elements/ detachments), but it has ready elements/detachments available
1B	The unit is unready due to task organization (detached subordinate elements/ detachments) and has no ready elements/detachments available
2A	The whole unit is present but not resourced to be ready, however, there are ready subordinate elements/detachments available
2B	The whole unit is present but not resourced to be ready and there are no ready subordinate elements/detachments available
3A	The unit is unready due to task organization (detached subordinate elements/ detachments) but has sufficient ready capacity to perform its core mission. This is for units that are designated as hybrid units that have additional capacity designed to be detached and still perform a designated core mission
3B	The unit is unready due to task organization (detached subordinate elements/ detachments) and does not have sufficient ready capacity to perform its core mission. This is for units that are designated as hybrid units that have additional capacity designed to be detached and still perform a designed core mission
ER	Error condition in underlying data that shows a false unready state when the unit is ready. Additional information must be provided to help resolve the error
EN	Error condition in underlying data that shows a false ready state when the unit is not ready. Additional information must be provided to help resolve the error

Source: courtesy of author, adapted by MCUP.

may be longer based on the enlistment contract.[19] For other militaries it varies. Militaries that are built around conscription have well known cycles of induction, training, and assignment to operational units. Some are as little as 12 months, like Russia that has two drafts a year during peacetime.[20] Some are 18 months and a few use conscription for 24 months or more.[21] Even with all-volunteer forces, a Service must rotate the personnel for workforce development or end of contracted service.

[19] *Department of Defense Instruction 1315.18, Procedures for Military Personnel Assignments* (Washington, DC: Department of Defense, 24 June 2019), 13–25.
[20] Mason Clark and Karolina Hird, *Russian Regular Ground Forces Order of Battle* (Washington, DC: Institute for the Study of War, 2023), 11.
[21] Katharina Buchholz, "The State of Military Conscription Around the World," Statista.com, 9 January 2023.

Even with personnel assigned for up to 36 months to a unit the next factor is the sustainment of individual and collective skills. The time that training is considered effective is the sustainment interval. Especially with high-end technology, the training is not a once-and-done thing. Many skills require certification and recertification. Some skills such as pilots and aircrew often have small sustainment intervals. Many unit types experience a drop while being employed or deployed as their operational mission may use a subset of their full task list and over that time the sustainment interval lapses for the tasks.

Equipment does have physical limitations on usage. It wears out, and there is a known mean time between failure and average repair times. Units possess equipment and use it in training. Typically, equipment does not get used as much in training as it may get used in operations, but to build highly proficient personnel, the training demands are considerable. There is a finite number of hours a piece of equipment can be used regardless. Equipment degrades over time even if it is not used. Storage still requires upkeep to ensure it will be usable when needed. Aircraft, ships, and vehicles degrade rapidly if not used. Maintenance float and secondary repairable components are techniques to maintain higher materiel readiness for longer periods. Despite these strategies, they only delay the inevitable. Aside from mechanical failure, there is the modernization requirement. Across a longer stretch of time than personnel rotation is equipment modernization. Modernization can cover software upgrades and technology inserts to completely new items. Some modernization is so complex, such as modernizing a fighter squadron to a new type of aircraft, that it will require a full turnover in qualified personnel and months to train to standard.

The training standards and the underlying tactics, techniques, and procedures are changing over time. These are constantly evolving based on a dynamic feedback loop from the understanding of adversary capabilities, training after-action, equipment modernization, and experimentation. The current pace of changing standards is driven by the rapid incorporation of new technology and the expansion of warfighting capabilities into the space and cyber domains. This period of rapid change will likely last for the next decade at least. The evolution of capabilities and the associated training standards tends to go through a process of punctuated equilibrium instead of a slow and steady march. Periods of status quo happen through periods of peace, limited budgets, and distractions with other world or military events. Periods of rapid change happen as there is a perception that the balance of military capability is changing.

The three conceptual models of steady-state, rotational, and tiered readiness share the basic problems of readiness shelf life, and each deals with it differently. The steady-state model describes a force where a steady level of readiness is maintained. This is common with militaries that perform their mission from their home station. The unit remains in place permanently and individuals and equipment are rotated or provided as needed to maintain its desired level of readiness. It is susceptible to slow degradation if resources become tight and there is a political reluctance to reduce the number of units accordingly. This is the normal approach for militaries that defend their own borders. Overall readiness has cycles of degradation and improvement based on manpower rotation such as the twice annual conscriptions. This allows an adversary to follow the cycles and plan accordingly.

Rotational readiness is familiar to the U.S. military. As mentioned before, a fundamental component of U.S. strategy is to fight in an expeditionary mode. It is much less dangerous to the United States to fight somewhere else than in its front yard. The trade-off is that it is expensive and complex to build and deploy ready forces. There is a force generation cycle for the Services where units are reset, staffed, built up, trained, certified, and deployed. This is also referred to as phased readiness. This provides fewer ready units, but they are highly trained and well equipped. The Navy and Marine Corps have been doing rotational readiness since their inception. The Army and Air Force have used both steady-state and rotational approaches when needed. Both are currently using forms of a rotational readiness model to support ongoing deployments around the globe. The wars in Iraq and Afghanistan used the rotational model at a large scale that had never been done before. The inefficiency is that there are one to three units for every deployed unit. These other units do provide surge capacity as major conflicts would likely necessitate a steady-state model to have sufficient forces to defeat a peer adversary.

Tiered readiness is where units are assigned to a predefined tier, and each has a unique table of organization and equipment and staffing goal. This was used in the Soviet Union and made their army appear much larger than it was.[22] Tier I units had the current modern equipment set and sufficient staffing to perform its mission, subject to conscript rotation cycles. Tier II had an older equipment set and was only half-staffed; it was intended that mobilized reservists would round out these units. Tier III had an obsolete equipment set and a skeleton crew. Much of the tier II and III equipment was in storage and over time became increasingly degraded. Their definition of a reservist was someone who had served their 24-month conscription within the last 10 or more years. This definition made for a large pool of barely trained personnel, which is very different than the U.S. definition of reservists. In many circles, there is some confusion between tiered readiness and rotational readiness. However, there is a reflexive negative reaction to the suggestion that we have tiered readiness. The U.S. version of tiered readiness is the National Guard and Reserves. There has been significant investment over the years to make guard and Reserve units better equipped and as well trained as possible given the constraints.[23] The United States used guard and Reserve units throughout the wars in Iraq and Afghanistan and continues to mobilize guard and Reserve units in support of global force management requirements, ostensibly to relieve pressure on some active component force elements. It also exercises our ability to mobilize and deploy guard and Reserve units. This makes the U.S. National Guard and Reserve units some of the best-equipped and trained reserve forces

[22] Richard K. Betts, *Military Readiness: Concepts, Choices, Consequences* (Washington, DC: Brookings Institution, 1995), 144–45, 160–63.
[23] *Department of Defense Instruction 1225.06, Equipping the Reserve Forces* (Washington, DC: Department of Defense, 28 June 2022).

in the world.[24] Due to the high commitment required, the overall pool is smaller, but the quality of the pool is superior. If someone was to assign a tier label to U.S. forces, it would be: tier I is the active component, tier II are the guard and reserve units, and tier III is the individual ready reserve (IRR), which is the pool of personnel that completed their active duty commitment and remain in the IRR for four years in case of emergency.

Sustaining the current inventory is a challenge, but in a strategic readiness context we must expand beyond the current inventory of forces across each component and understand our ability to generate new forces. This can be exceedingly difficult, but fortunately we have lots of historical precedents worth reviewing. The biggest expansions in U.S. history after the Civil War are the two World Wars. Each started with the existing force structure, then time phased by component. New units were formed by active first, then guard and Reserve, and then followed by volunteers and conscripts. Of the 91 divisions fielded by the Army and 6 by the Marine Corps during World War II, 25 were Regular Army, 20 were National Guard, and the remainder were made up from volunteers and conscripts. By 1946, the Army retained 17 active divisions, and the Marines retained 2 (though could only fully field 1 in 1950).[25] Of those divisions, only three saw no action, so the U.S. Army and Marine Corps successfully built, deployed, and employed a large number of new formations. The 1st Marine Division landing at Guadalcanal in 1942 was the first employment of a Marine division ever.[26]

The generally accepted approach is the creation of a cadre (French for frame) of leaders pulled from standing units to create new units. The frame is filled in with new personnel and given equipment and time until a new unit is made. This can be compressed into months, but in practice, based on the World War II experience, a year is more realistic to build a unit capable of effective offensive operations. The

[24] "History of ARNG 4.0," NationalGuard.mil, accessed 1 January 2025. This site gives a concise history of the phases described as versions (1.0, 2.0, 3,0, and 4.0) of the National Guard from 1973 to present.
[25] "US Army Divisions," Armydivs.com, accessed 1 January 2025.
[26] Gen Merrill B. Twining, *No Bended Knee: The Battle for Guadalcanal* (New York: Ballantine Books, 1996), 10, 63–72.

Russian experience in Ukraine to date has confirmed the difficulty as they attempted to create the *3d Army Corps* (a division-size unit in the U.S. style of military organization). While creating the structure and personnel (by their reports they formed 40 recruit battalions of up to 400 from 19 regions that would yield up to 16,000), the availability of the necessary cadre to train was low, so the performance has been poor.[27] After World War II, the United States did have some experience with creating new units. In Vietnam, the Marines reactivated the components of the 5th Marine Division using a cadre pulled from the 1st and 3d Marine Divisions already there and replacements to fill it out.[28] Even during the Operation Iraqi Freedom era, the Marines reactivated three battalions using the same method.[29] Performance of new units can be challenging even if properly resourced. It is highly dependent on the cadre. The basic behavioral problem is the units that must source the personnel for the cadre are reluctant to give up their best, so the tendency is to provide to the cadre the ones they would rather part with. The second source of the cadre is from replacement leaders, either newly minted from training or returning from injuries (in wartime). This subtle influence can sabotage the new unit from day one. By contrast, a study on a highly successful new division in World War II indicated that a highly skilled cadre, even if it was basically an unintentional luck-of-the-draw, provided the leadership that built a successful unit. Knowing the difficulties, it is important that there are plans and people assigned to do this in peacetime so the process can be expedited when needed. These plans should be sufficiently detailed so that they can be implemented rapidly (numbers of personnel by skill for the cadres, locations, and resource requirements) to include updated cost estimates to facilitate contracting, orders, housing, etc.

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[27] David Axe, "The Russians Spent Months Forming a New Army Corps. It Lasted Days in Ukraine," *Forbes*, 15 September 2022.
[28] "History of the 5th Marine Division," Fifth Marine Division Association, accessed 19 May 2025.
[29] Jose Menendez, "3/9 Deactivates for the Fifth Time in Battalion History," Marines.mil, 16 August 2013.

Coherent Intermediate Formations

The author has spent a significant amount of time discussing unit readiness. Militaries, as indicated in part 1, are hierarchical structures with levels of units. Readers need to be clear on who reports what. Different levels of the hierarchy should be addressed distinctly. Current practice jams units of various levels into the same assessment, which can be confusing. There may be good reports of battalions, squadrons, and vessels, but we do not fight with a collection of units; each belongs to a coherent intermediate formation. These intermediate formations are also nested within each other. These formations are how operations, campaigns, and wars are fought. The fluctuation of the composition of these intermediate formations can be the source of much consternation. In the U.S. Army, the brigade or brigade combat team (BCT) is an intermediate formation with several battalions. A battalion is the unit level of readiness assessment to which most people are accustomed. However, the battalions within a BCT rarely change and BCTs assigned to a division (the next higher intermediate formation) also rarely change. It is convenient for the Army to look at the BCT as their building block. If cross-leveling between formations to make a ready BCT rapidly ready, the Army would typically move personnel to the underlying battalions versus trading out whole battalions from a different BCT. The readiness of an intermediate formation is clearly a function of the readiness of its underlying units, but most understand that the whole is more than just the sum of its parts. It has a distinct mission. In current practice it can be confusing. Should an intermediate formation total the personnel and equipment use either the same business rules as a regular reporting unit, or does it use a rubric based on the mission of the formation? Looking at the brigade, it has several singular elements (headquarters, fires, reconnaissance, and sustainment) and has multiple primary function elements. An intermediate formation rubric could cover the lowest of singular elements and then cover the ability to perform the mission with two of three primary function elements (table 32).

Table 32. Brigade overall readiness rubric

Overall	HQ	Recon	Fires	Sustainment	Manuever 1	Manuever 2	Manuever 3
1	1	1	1	1	1 or 2	1 or 2	1 or 2
2	2	2	2	2	1 or 2	1 or 2	3 or 4 or Detached
3	3	3	3	3	1 or 3	1 or 3	1–4 or Detached
4	4	4	4	4	1 or 4	1 or 4	1 to 4 or Detached

Source: courtesy of author, adapted by MCUP.

This will show that a brigade cannot function as such even when all the maneuver elements are ready if it cannot perform the brigade-unique functions of the singular elements. It also allows for the ability of the brigade to obtain a level of readiness even with one maneuver element unready or detached. This can easily be populated from the underlying reports by time sequencing submittal windows by command echelon. Battalions would submit reports in the first five to seven days of the month, then brigades, regiments, and groups the following five days, followed by divisions. The highest echelons would submit their reports at the end of the month. The capability assessment portion functions in the same way, but the resource standards of each task are based on the capability of the subordinate units. There needs to be unique training standards for the intermediate formation. Each element can be trained in their function, but that does not mean the team has trained to work as a coherent formation. The standards for the mission essential tasks appear in table 33.

A similar set of standards can be generated for divisions, naval strike groups, air groups, air wings, etc. Each is customized to their particular set of standards. The task performance standards should clearly indicate what the formation provides to the Joint Force.

This works nicely for standing formations; it gets harder for generating task organized forces. Understanding the readiness of intermediate formations that are built from many units that are not always grouped

Table 33. Brigade performance standards

Task: 3.2.1 Conduct offensive operations	The brigade is capable of sustained offensive operations against a peer threat combined arms battalion task force	
Standard 1. Resources	Ready HQ element for offensive operations	1–4
Standard 2. Resources	Ready fires battalion for offensive operations	1–4
Standard 3. Resources	Ready recon battalion/cavalry squadron for offensive operations	1–4
Standard 4. Resources	Ready sustainment battalion for offensive operations	1–4
Standard 5. Resources	No. of ready maneuver battalion of three (Ready = C1 or C2)	1, 2, or 3
Standard 6. Training	Brigade offensive operations exercise At CTC in last 180 days 1 Other location in last 120 days 2 Home station training exercise in last 60 days 2 Else 3 or 4	1–4
Standard 7. Output	Sustained, continuous offensive operations for 96 hours	# hours
Standard 8. Output	Execute a hasty attack from receipt of mission < four hours	# hours
Standard 9. Output	Execute a deliberate attack with external supporting arms from receipt of mission < six hours	# hours
Standard 10. Output	Execute a contested wet gap crossing	Y/N
Standard 11. Output	Execute a relief-in-place in contact	Y/N
Standard 12. Output	Commit the reserve to exploit success at effective time and place	Y/N
Standard 13. Output	Transition from/to offensive from defensive operations	Y/N
Standard 14. Certification	Brigade was certified by authorized third party in the demonstration of the output standards in a relevant environment	Y/N

Source: courtesy of author, adapted by MCUP.

together can be accomplished through a couple of methods. To understand the readiness of an intermediate force once it is composited is captured through changes in the operational control of the subordinate units. For some Services, these intermediate formations have a standing headquarters or commend element. When no other forces are assigned, the intermediate formation would show as unready, but the command element should have a distinct report that shows its readiness like any other headquarters unit. The command elements indicate if it is staffed, equipped, and trained to perform its function regardless of the assignment of other forces. This lets the leadership know that if the unit has forces to assign, assign them to a formation with a ready command element. This approach gives the current state of readiness, but the often more important question is the ability to generate the intermediate formation at some point in the future. If the number of potential subordinate elements is small, an analyst could determine the potential composite formations from ready capacity manually. An algorithmic approach could take a predefined set of unit types, a case, and use case-based reasoning (CBR) to determine potential solutions. In general terms, case-based reasoning is using a case known to be a solution to then solve a new problem. In human cognition it is a key problem solving process. It can be programmed into a computer system. It can take readiness data to then perform CBR (table 34). Potential cases can have variations that can be weighed and returned as a weighted set of potential combinations. A simple example is a ground combat division. For example, there is an urgent need for a division-size element for a crisis, and no standing divisions are completely ready or in position. Looking across the force for the ready brigades of different types, one can see there are many permutations of a division. The table is a set and a scoring relative to the requirements determined as needed to respond to the crisis. Scoring could also be multifactored based on relative combat power, threat, or mobility.

Table 34. Case-based reasoner example

Case	Composition	Relative score
Heavy division	HQ, 3 x armor brigades, 1 x aviation brigade, 1 x fires brigade	100
Mixed division	HQ, 1 x armor brigade, 1 x motorized infantry brigade, 1 x infantry brigade, 1 x aviation brigade, 1 x fires brigade	90
Heavy division (-)	HQ, 2 x armor brigades, 1 x aviation brigade, 1 x fires brigade	85
Motorized infantry division	Ready sustainmen HQ, 3 x motorized infantry brigades, 1 x aviation brigade, 1 x fires brigade t battalion for offensive operations	75
Infantry division	HQ, 3 x infantry brigades, 1 x aviation brigade, 1 x fires brigade	60

Source: courtesy of author, adapted by MCUP.

A case-based reasoner could look across the ready capacity and return the ability of the force to compose a potential solution. In table 34 if no heavy division could be composited but the force could provide a heavy division (-) and an infantry division, the combined score may make it a viable solution. There are many more potential solutions, and this could easily be constructed as an artificial intelligence algorithm if provided a fitness function to provide feedback on the relative usefulness of the cases. This approach is easily adaptable to maritime, aviation, or multidomain planning. There are several supporting algorithms that can be teamed up to make a fast and flexible CBR for multidomain war planning.

While there is a better way to calculate a readiness level for intermediate formations, they should be kept distinct in summaries from the regular reporting units. If someone presents regular reporting units and intermediate units together, they are double or triple counting goodness (readiness) or badness (unreadiness) of the underlying units. If a battalion is low on the readiness level, it is also reflected at the brigade and division levels. Separating the battalions in data from the brigades and divisions supports a horizontal look at the health of each type of battalion as well as the vertical look at the health of intermediate formations. This can help identify if a lack of needed readiness is with a division or brigade or across the whole community like infantry, armor, artillery, or sustainment logistics. This can also support analysis of which communities are more costly, take longer to train, or have retention issues to help synchronize the activities to produce the correct mix of units needed to make the required intermediate formations.

Moving from operational to strategic readiness is a bigger leap that necessitates a new chapter. Individual, unit, or intermediate formation readiness have many quantitative aspects that can be scored, compared, and have trend analysis performed. The move into the strategic readiness arena involves balance.

Installation Readiness

Readiness reporting for individuals, units, and intermediate formations is all predicated on the physical installation network. Current readiness reporting does include installations, but it has been left to the Services to meet the broad requirements, and the result is a mixed bag. To understand the ability to sustain current force generation and the ability to expand in the event of major conflict, a consistent set of metrics needs to be collected for readiness reporting. One of the challenges is that the commands running the installations have many responsibilities. Readiness reporting as part of war planning and decision support is a more discrete set of questions. Their concern is that this would overshadow their day-to-day challenges. Their concerns are not without merit as running bases is not as glamorous as operational units. They are often lower on the resource priority lists. The need for war planning data needs to overcome their concerns and could possibly help their resourcing challenges when the linkage to war plans is clear. Current policy has installations reporting a mission assessment at least annually.[30] This does not include the resource section, deliberately,

[30] *Chairman of the Joint Chiefs of Staff Instruction 3401.02B, Force Readiness Reporting; and Department of Defense Instruction 7730.66, Readiness Reporting Guidance for the Defense Readiness Reporting System* (Washington, DC: Department of Defense, 10 December 2024), 25.

as the installations have more civilians and contractors involved. The staffing of these units is not the same priority as operational units and the corresponding levels would score them as "not ready" in most cases, thus creating a long-term false negative. Much of their equipment is not military equipment and is not in the same supply, maintenance, and accountability systems. Staffing and equipment can be included in the capability assessment to indicate if there is a problem in that area. The United States spent decades fighting in Iraq and Afghanistan where installations were havens for training, staging, and shipping forces out. This function still exists, but in a broader sense, many installations are vulnerable to direct attack, while all are vulnerable to cyber and space domain attacks. New technology has removed the protective buffer of distance. While installations are owned and run by the Services, they serve a Joint function in the sustainment of the force. Supplies will flow through Army and Navy bases to whatever forces need them. This very fact is the imperative to have a singular set of tasks and standards that all installations report against, so the Joint Staff has a common picture of the capability and capacity of the full infrastructure.

The metrics to be considered need to be made practical for easy consumption. Barracks capacity is a good example in that a raw bed count is not useless, but a unit must have a headquarters, armory, and motor pool as well as beds to be fully useful. A metric of housing can be made as simple as counting how many battalion areas there are, in what condition, and what is occupied at present. A battalion area includes beds for roughly 800, plus the aforementioned headquarters, armory, and motor pool. This is helpful to understand where mobilization can occur for guard and reserve units. Supply storage comes in four basic types: petroleum, oil, and lubricants (POL, or fuel), ammunition storage, dry storage, and refrigerated/temperature controlled storage. The metrics are gallons for liquids and fuels, square footage for all else including condition and how much is in use at present. Airfields need to be clearly classified as to size restriction such as helicopter only, Lockheed C-130 Hercules capable, Boeing C-17 Globemaster III capable, or Lockheed C-5 Galaxy capable, including tarmac space, hangar space, and opera-

Table 35. Example installation report

Housing	Battalion equivalent areas	Total 12 Occupied 9 all in good condition Open 3 with 1 in substandard condition
	Transient barracks	Total 400 average occupancy 120
Supply, storage, distribution	Rail	One line with siding and ramps for 12 railcars with X railroad
	Dry storage (feet^2) Total/in use/average monthly turnover	Total (feet^2): 400k/240k/80k
	Refrigerated storage (feet^2)	Total (feet^2): 5k/4k/3k
	POL storage (gallons)	Gas 12k/8k/8k Diesel 20k/12k/11k Aviation 40k/25k/25k
	Ammunition storage (feet^2)	10k/9k/6k
Training	Training areas	Four brigade-size areas 2.5k acres, each subdivided 4 x 640-acre areas. One is open for mechanized maneuver, two are heavily wooded with dirt trails, one is limited use wetland
	Ranges	One multipurpose range complex for tank gunnery qualification, one company-size fire and maneuver range (direct fire only), one 100-acre impact area with 10 artillery/mortar firing points, with max range 12km, max 155mm HE. One static firing range for .50-cal to 25mm. One squad attack fire and maneuver and one squad defense. One small arms qualification course, one close-quarters battle small arms course, one antiarmor rocket range, one grenade range, one demolitions range with 20-lb C4 limit
Airfield	Facility	Limit use in hours of darkness, normal operations 0600–1700, small aircraft and helicopter use only
	Hangars	Four with space for two Sikorsky H-60-size helicopters, all in current use
	Runway	One 2,500 ft
	Tarmac	30 Sikorsky H-60-size spots with 22 occupied
Communications	Telephony	Fiber/T1 lines
	Data center	Unclassified/classified Capacity
	Satellite	X SATCOM Antennas
	RF	VHF range control 50w UHF airfield 30w
Physical security	Access points	Three entry control points, one is operated 24 x 7, two are M–F 0600–2200, three is closed, only opened on order from base command. Level of protection at each
	Quick reaction force/incident response force	1 x 8 person detail 24 x 7 in nontactical vehicles with x cUAS capability
	Radar	Only air traffic control radar at airfield operating during flight hours

Source: courtesy of author, adapted by MCUP.

tional limitations. Health services capacity should include whether there is a clinic or hospital and along with its capacity in beds and capability (these have predefined levels or roles). Training areas should indicate number, size, and environmental restrictions. Ranges should indicate number, size limits, munition limits, and maneuver limits. Table 35 offers an example installation report for a division-size unit.

Table 35 covers an installation designed to sustain a division in late twentieth-century configuration. A more modern ground maneuver division, though roughly similar in size, may have a difficult time training to employ the full range of capabilities. Modern capabilities can cover far more space and have significant impacts to the surrounding areas that make training constrained. Because tenant force protection is a growing concern as conventional long range precision strike becomes more of a threat, the counter small drone capability, air and missile raid shelters, and physical security could be included. The Services cannot afford to pretend that adversary special operations forces would not attempt to disrupt installations in a time of conflict, no less so than we would.

Readiness Cost

Readiness is not free. In fact, it is very expensive. Cost and people are the two ultimate limitations. There are only so many people and only so much money. In some respects, the total defense budget is the cost of readiness, but that is too simplistic to be of any use. As mentioned earlier, readiness is not an accident. Units are resourced to be ready to do things, such as deployments or alert periods. The ultimate resources are people and funding. The single most expensive part of the budget is the people. That is figured in the force structure. The Services are allocated an end strength, and they figure out how many units of what types they make out of that number. It is a zero-sum game. Keep in mind that they do not do this from scratch every year. Force structure is well entrenched over time. Managing the cost of this structure is done annually by taking from one and giving to another. This can make significant changes such as adding a new type of unit or capability challenging. Building readiness within the existing force is more flexible. The first basic given is that it is not possible for all units to be ready to fight now all the time. There is always some sort of rotation of readiness among a population of units. This concept permeates the military hierarchy. To understand what it costs for units to be ready at a given time, we need several data sets that often do not reside together. We need to have the schedule of when units are needed to be ready, the actual dollars expended, and the actual readiness achieved. From there, an activity-based cost model can be constructed. The approach is possible because units are not allocated their budgets arbitrarily. There is a top-down allocation of funding to meet the schedule. Start by asking the comptrollers at the level that allocates the funding how they do it, then run that against the data to then tune the performance.

The allocation of funding achieves four key activities within a given fiscal year. First is the sustainment of unready units. Unready units still have personnel and equipment and will continue to train. Second is the sustainment of existing readiness. These are units that were already ready when the fiscal year started but are planned to be sustained through their required ready phase. The next activity is the making of an unready unit into a ready unit. This appears as a discrete event on the timeline, but that event represents months of additional activity needed to achieve the event. This activity is hard to detect in readiness reports by themselves. Readiness data joined with schedule data will reveal that the unit was building readiness below the measurement threshold of the reports. Especially in smaller, resource sensitive units they will often jump between unready to ready states as the underlying activities are small and the completion of a single training event or the fixing of a single aircraft may be all that is needed. The fourth activity is the sustaining of new readiness, that is units that became ready in that fiscal year. This approach can be very effective at determining what it would cost to build more readiness at a similar quality. It is less effective at determining the impact of a reduction in funding, that is the system may still produce the same readiness, but the cut will be absorbed in sustainment of unready units or in reduced quality of training. Training quality is not a simple number and can only be shown relative to some standard; for example, during the last five years, the Service invested x million dollars in the training of y unit type. Today, the Service has an x percent reduction in the training investment but still achieves the training standards. The assumption is that the average amount spent during the last five years represents a desired qualitative level. There are some external breaks to buying additional ready capacity such as platform-based units like aviation or ships. Their capacity is bound to the materiel readiness of the platform. They still have similar cost activities, but the ability to buy more can be no more than the upper end of the materiel availability through the training, building, and the ready phase for employment.

A variation on this theme is National Guard and Reserve units. These units are not resourced to be ready in the same cycles as an active component, nor should they be. They build what readiness they can, given the limited resources allocated. Theoretically, this should be sufficient to support force mobilization timelines. The Reserve or guard cost of sustaining unready units is less, but the cost to make a ready unit may be significantly higher than an active component unit of the same or similar unit type. This is a cost-effective approach to having greater capacity, which is a deterrent to aggression. The cost model works but must be considered over more time to calibrate. The payoff is if some level of deterrence is achieved without full-scale mobilization. Some mobilizations throughout can build readiness as the ability to mobilize is exercised and the process is validated. It also provides cost input to help gauge the potential costs of a larger mobilization. The more technologically advanced the active force becomes, the bigger the potential gap between the sustained level of unreadiness and the cost of making a unit as ready as an active component unit.

CHAPTER 8

THE BALANCED READINESS FRAMEWORK

The author has established some of the challenges and opportunities the evolving data environment offers. They have also established what should be measured. The text walked the reader through levels of readiness from individual through unit level to intermediate formations. Now, the reader will enter the strategic domain. Readiness clearly has a temporal aspect as well. If the military were a living organism, readiness statistics are like taking its temperature. The deviation from the norm indicates that possibly something is wrong that may require further tests to determine a diagnosis and prognosis.

The former chief of staff of the Air Force, General Charles Q. Brown Jr., and the Commandant of the Marine Corps, General David H. Berger, cowrote an editorial in the *Washington Post* that discussed the need for a new readiness framework to better balance the readiness presently against future readiness.[1] Fortunately, when this article and

[1] Charles Q. Brown and David H. Berger, "To Compete with China and Russia, the U.S. Military Must Redefine 'Readiness'," *Washington Post*, 1 February 2021.

the *War on the Rocks* companion piece were published, this framework was already in the works.[2]

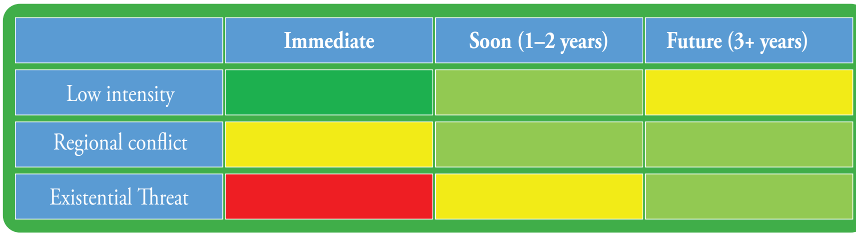
This new framework has two pieces. The first is the force generation cycle and the forecasted ready capacity. This then leads to the ability to put these components together to see the Joint Force as it is and as it is forecast to be across the budget horizon. This relates directly back to the definition of readiness in chapter 1: "The military capability and capacity to deter, fight, and win across the full range of armed conflict with the appropriate personnel, equipment, and training to produce the desired results from now through the foreseeable future."

Building the Balanced Readiness Framework

The first part of determining the balance between present and future is to define how much readiness is needed now so we can determine the trade space between actual current readiness and the required current readiness. This would show if we were indeed overinvested in current readiness. A simplified matrix that follows is an example of providing a readiness assessment across the range of operations and time horizons (figure 18). In this notional example, the assessment shows high readiness for low intensity conflict now, but lack of readiness for the existential threat may require shifting resources from the other categories. Translating each block to actionable trade-offs is the key to achieving balance or at least assuming risk in accordance with senior leadership guidance. It may not be a simple shift of financial resources; the time horizons may be a function of limited capacity to affect change. It may seem like a simple matrix, but building the data behind it is a significant undertaking. What leadership wants is the distillation of complex

[2] Gen Charles Q. Brown Jr. and Gen David H. Berger, "Redefine Readiness or Lose," *War on the Rocks*, 15 March 2021; and Gen David H. Berger and Kimberly Jackson, "Readiness Redefined: Now What?," *War on the Rocks*, 12 June 2023.

Figure 18. Readiness across range of operations and time



Source: author's matrix of threat and time window, adapted by MCUP.

information into an easy-to-understand graphic to help them understand the risks inherent in the decisions they must make.

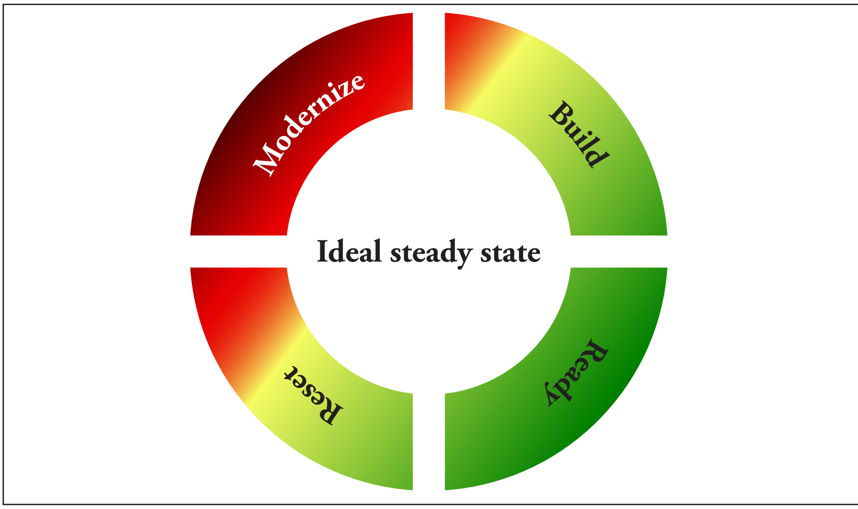
The author and the readiness branch at Headquarters Marine Corps looked at current readiness goals at the direction of then-Commandant General Joseph F. Dunford, followed by General Robert B. Neller as the work proceeded, including examining what they were and how they were determined. This was started for the Marine Corps initially after the end of major combat operations in Iraq and Afghanistan. There was a reorientation of the institution from generating ready forces for the current fight and maintaining the deterrence in other theaters back to a "peacetime" military. The initial task was a basic reset of equipment that was being returned from overseas that was well worn from years of use. Equipment sets did not rotate every six months with the troops. For efficiency, the United States left equipment and rotated personnel, except for aircraft. This left part of the fleet of ground equipment overused and part of it underused. The equipment needed to be assessed for what was beyond economical repair and what was retained and fixed. This was expensive.

As the force was reset, the Commandant of the Marine Corps (CMC) asked that an overall readiness goal be set. Initially, the starting request was fairly arbitrary, but this set off an analysis of the capacity of the force to obtain the initial goal. This analysis determined the mathematical maximum the force could obtain. This was less than the initial goal, but not low by historical norms. The next step was determining the minimum required readiness. This is more straightforward as this is derived from the Global Force Management Allocation Plan (GFMAP) for each fiscal year signed by the secretary of defense. It is the day-to-day requirements the Services must provide the Joint Force. Now, we have the three needed data points for present readiness: minimum, maximum, and actual. Next, the required future readiness must be established. Fortunately, the Marine Corps had two major force structure update initiatives that gave a planned future force in detail. The first was *Force Design 2025*, which had a focus on building capability in information operations. The second, more ambitious was *Force Design 2030* (FD2030).[3] This was a comprehensive force structure change that created new types of units, divested several unit types, and reorganized nearly every other unit type to some extent. Similar initiatives were kicking off in the other Services as well. The readiness branch created a chart to articulate what was going on, which was affectionately called the "Wheels of Woe" in reference to the mill in the 1982 film *Conan the Barbarian*. The chart had four wheels. The first depicted the ideal state of any military enterprise that has a force generation cycle. The cycle has four quadrants of build, ready, reset, and modernize (figure 19).

The cycle time of the wheel is not set; the full cycle for a given unit could cover one and a half to three years. A given unit could bypass modernize and go straight into the build phase if there is not an applicable modernization effort to undertake. Modernization can include broader modernization of tactics, techniques, and procedures as well as just equipment. The color coding of the wheel depicts the unit-level readiness associated with each phase. This shows that the ready capacity is not restricted to just the ready phase. The ready phase is the planned and expected ready period and illustrates that there is ready capacity before and after to provide surge capacity in the event of emergency. A large-scale conflict or a protracted medium-size conflict will produce a different cycle. The version below depicts the Marine Corps from 2001 to 2015 during Operations Enduring Freedom and Iraqi Freedom. These operations were conducted as a protracted medium-size conflict

[3] Ryan Pallas, "Marine Force Design Is Four Decades in the Making," *War on the Rocks*, 1 July 2025.

Figure 19. Ideal force generation cycle

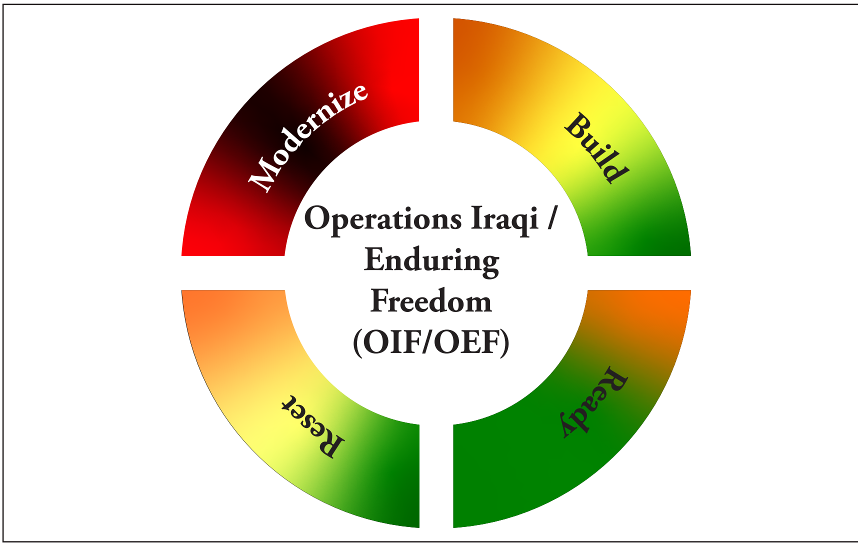


Source: author's illustration of steady state readiness generation, adapted by MCUP.

with combat units rotating every 6–7 months and headquarters every 12 months (for the Marines).[4] As the wheel indicates, the emphasis was on generating ready forces for the Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) rotations and the ongoing deterrence forces in other theaters (figure 20). Even the ship-based Marine expeditionary units would venture for part of their deployments to Iraq or Afghanistan. The modernization was limited to long-term aviation modernization programs that predated the conflict, and equipment focused on the specific fight that would have limited utility elsewhere such as the Mine-Resistance Ambush Protected (MRAP) vehicle program. Given the complexities of counterinsurgency warfare, a detailed and specific predeployment training program (PTP) was developed that was a full six month work up for a six-month deployment. Having gone through this program, the author can fully attest that it was well

[4] Nicholas Schlosser, ed., *U.S. Marines in Iraq, 2004–2008: Anthology and Annotated Bibliography* (Washington, DC: History Division, U.S. Marine Corps, 2010), 1–9.

Figure 20. Operation Iraqi Freedom/Operation Enduring Freedom force generation cycles



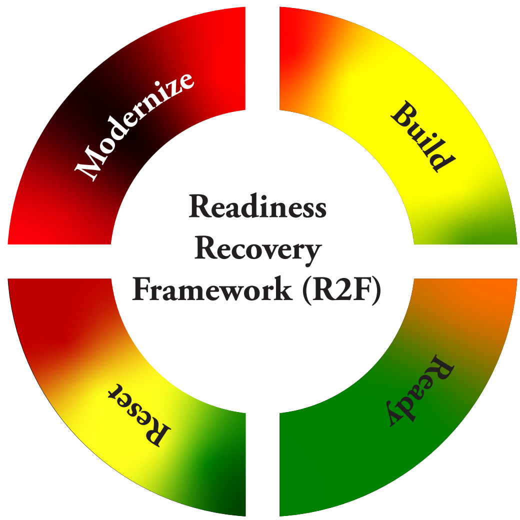
Source: courtesy of author, adapted by MCUP.

designed and executed to prepare fellow Marines and sailors for our specific mission in Iraq.

OIF/OEF went on longer than anyone expected, which is one of the major risk factors in armed conflict. Once the shooting starts, getting to the end can be very unpredictable. As Mike Tyson said, "Everyone has a plan until they get punched in the mouth."[5] Once OIF/OEF ended, then the United States was faced with the reset. The key here was how far to take the reset before realizing that they were resetting gear that would be divested soon anyway. This period was the genesis of the articles by Generals Brown and Berger and was known as the Readiness Recovery Framework (R2F) (figure 21). During this period, the famous "80%" memorandum was published that required the Services to get a specific set of aircraft types to 80 percent mission-capable

[5] Anweesha Naq, " 'Everybody Has a Plan Until They Get Punched in the Mouth'—How Did the Famous Mike Tyson Quote Originate?," Sportskeeda, updated 5 January 2021.

Figure 21. Readiness recovery cycle



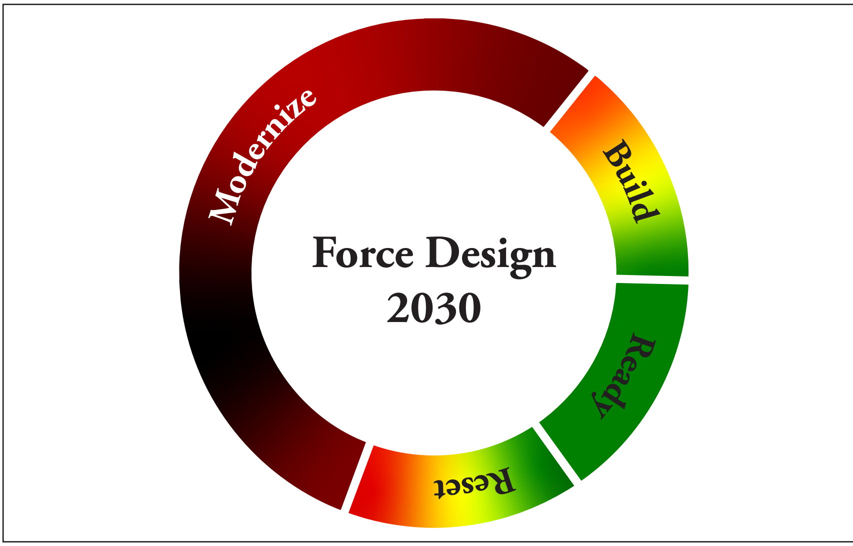
Source: author's illustration of readiness generation during the Readiness Recovery Framework, 2017–20, adapted by MCUP.

rate.[6] This arbitrary goal setting can be incredibly expensive as many of these aircraft were later in the lifecycle. Each had their own unique set of problems that money alone cannot fix. After spending a lot of money that could have helped modernize the aircraft fleet, mission-capable rates did improve, some making it periodically to the 80 percent mark. The expansion of the reset impinged on the modernization phase.

The United States went into OIF/OEF during the post Operation Desert Storm fall of the Soviet Union phase, where the United States possessed significant military advantages across the board. The 15 years of focus on OIF/OEF gave other competitors time to build capability. Coming out of OIF/OEF, the United States saw significant erosion of advantages as well as asymmetric advances that offset some of advantages. The Services all developed ambitious modernization plans to maintain areas of advantage, prevent further erosion of some areas, and

[6] Aaron Mehta, "Mattis Orders Fighter Jet Readiness to Jump to 80 Percent—In One Year," Defense News, 9 October 2018.

Figure 22. *Force Design 2030* cycle



Source: courtesy of author, adapted by MCUP.

close gaps where advantage was lost (figure 22). Now, the nation is faced with how it can "steal a march" on the competition.[7]

Faced with this cycle, the idea is that this will eventually return to the ideal state. The ideal state takes into account that the force never arrives. Completing the force in 2030 and taking a break is not based on reality. There will be ongoing efforts to close gaps, maintain, and extend advantages where possible and affordable. The ready force is the active deterrence throughout the globe in close cooperation with allies and partners.

Given the general framework, the specific application is to then unroll it by force element or community (e.g., infantry units or fighter squadrons) and lay it out flat as a schedule. Within each community, it is then applied to each unit. Next it is applied to the calendar and

[7] "Army of 2030," U.S. Army, 5 October 2022; and "Reoptimizing for Great Power Competition," U.S. Air Force, 1 March 2024, in addition to the previously mentioned Marine Corps *Force Design 2030*. The Navy issues an annual update to their 30-year shipbuilding plan that encapsulates their modernization plans that include new classes: the *Columbia*-class ballistic missile submarine and the *Constellation*-class frigate.

Figure 23. Unit schedule

Year 1												
Unit	J	F	M	A	M	J	J	A	S	O	N	D
1st BN	Ready						Reset					
2d BN	Build						Ready					
3d BN	Modernize						Build					
4th BN	Reset						Modernize					
Year 2												
Unit	J	F	M	A	M	J	J	A	S	O	N	D
1st BN	Modernize						Build					
2d BN	Reset						Modernize					
3d BN	Ready						Reset					
4th BN	Build						Ready					

Source: courtesy of author, adapted by MCUP.

forms that ideal schedule for each unit (figure 23). The units are offset so that it looks like a Gantt chart —often called a "patch chart"—that forms the basis of what the Service can realistically provide for ready capacity over time.

The schedule above is then synchronized with real requirements and resources. In the conceptual framework, the unit illustrates a concept summarized as "four to make one." In the real schedule, there may be cycles where modernization is not slated for that particular community in that period, so more time is spent on the build phase and the ready phase can be extended. The figure also illustrates a concept known as deploy to dwell (D2D) expressed as a ratio of months or days at home station versus months or days deployed.[8] Each of the four battalions has a D2D ratio of 1:3. D2D ratios were established to provide decision points to prevent burnout. It can be tricky as there is the backward-looking D2D as of the last deployment and the forward-looking planned D2D at the next scheduled deployment. D2D ultimately fails in many cases to measure burnout as the personnel within the unit can be rotated to prevent burnout or vice versa. The new unit could be rounded out by personnel who just deployed. A different metric at the individual level is known as personnel tempo (PERSTEMPO), which counts the days deployed during a rolling two-year period and is a more accurate measure of personnel burnout.[9] The more critical element of D2D is that the decision points need to support the time needed to properly train the unit to perform its designated and assigned mission. These high-end capabilities require detailed and rigorous training, and there is an irreducible minimum amount of time to train and hone those skills. That time is not the same for all unit types. Some take longer than others due to their inherent complexity. The real trade-off is unready units or cross leveling of personnel and equipment between units to ensure the deploying unit is ready. This will eventually compound and drive burnout of personnel and overuse of equipment.

Actual Force Generation Models

The conceptual force generation framework has variation in actual implementation. The U.S. Navy and Marine Corps have long-running versions.[10] The current iteration of the Navy's cycle is called the Optimized Fleet Response Plan (OFRP) that was rolled out in 2014. It is a three-phase cycle that starts with maintenance, then training, followed by the sustainment period. The sustainment period is when the ship is available for a deployment window and surge capacity around

[8] *Directive-type Memorandum (DTM) 21-005, Deployment-to-Dwell, Mobilization-to-Dwell Policy Revision* (Washington, DC: Department of Defense, 13 October 2022).
[9] *Department of Defense Instruction 1336.07, Management of Personnel Tempo* (Washington, DC: Department of Defense, 28 December 2020), 6.
[10] *Marine Corps Order 3502.6A, Marine Corps Force Generation Process* (Washington, DC: Headquarters Marine Corps, 7 June 2013).

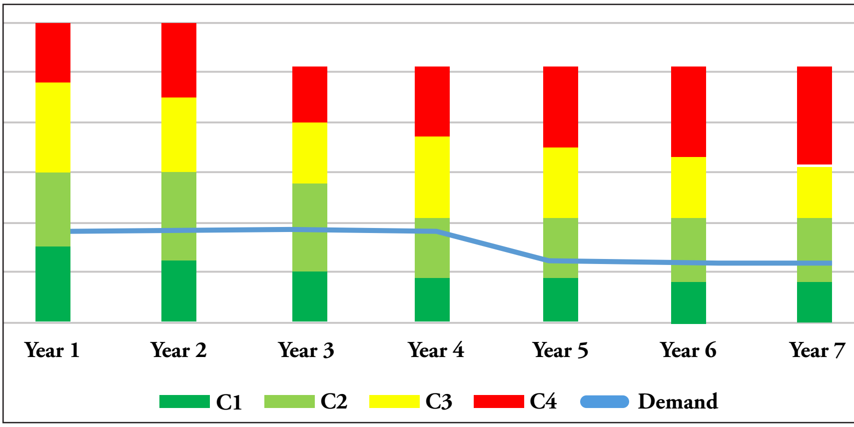
it. OFRP has received significant criticism lately because the cycle as planned is not reliable. It is not the fault of the plan, but overuse of vessels in the sustainment phase that requires a longer than planned maintenance phase.[11] The U.S. Army went through a couple of force generation approaches. During OIF/OEF, they adopted Army Force Generation (ARFORGEN), then went to the Sustainable Readiness Model after OIF/OEF. The Army has since updated their model in 2021. The Regionally Aligned Readiness and Modernization Model (ReARMM) will provide Army units with a construct that will align units regionally to meet current Joint Force demand while preparing the force for the future. It aligns units across the total Army in a predictable and sustainable life cycle through training, modernization, and mission windows.[12] The U.S. Air Force has adopted the AFFORGEN model during the last two years that is a 4 phase, 24-month cycle, much like the balanced conceptual framework.[13] All these actual implementations are designed to build sustainable force generation models to ensure truly ready forces are generated for employment, a predictable plan for resource management, personnel stability, and reasonable quality of life expectations.

The Supply of Readiness Forces Over Time—The Forecast

Trend analysis has shown that the production of ready units is predictable. This supports the supposition that readiness is not an accident: units are organized, staffed, equipped, and trained to be ready to perform their designed mission for a scheduled period, which is often called deployed, but can include an alert status or employ in place activities. Each Service has a force generation model similar to what is described in the previous section. This is synchronized with the Global Force Man-

[11] Megan Eckstein, "Navy Issues Revision to OFRP Deployment Scheme," *USNI News*, 28 October 2020.
[12] "Regionally Aligned Readiness and Modernization Model," U.S. Army, 16 October 2020.
[13] "Airmen to See Changes in Deployment Cycles with AFFORGEN," Air Force, 27 June 2023.

Figure 24. Ready supply versus demand



Source: author's notional supply and demand chart to illustrate the narrative, adapted by MCUP.

agement (GFM) process and modernization plans. There is a predictable distribution of readiness levels within each phase. This provides the basis for a forecast of the ready capacity of each force element over time. The systematic inefficiency is baked in by use of the historical distribution to prevent the forecast from being an optimistic view of the planned schedule of activities. This forecast is then collected so a look at the Joint Force over time is possible.[14] Between the current readiness system and this forecast, there is a now and future few of the supply of ready forces. This can then be used to support a longer-term view of war planning, budgeting, GFM offerings, and a baseline to evaluate potential impacts of change. Change can be external such as congressional actions or internal decisions driven by a host of factors including the forecast. Once the supply of ready forces is presented, it can immediately be compared to demands to determine force sufficiency (figure 24).

In figure 24, a notional unit type is forecast across a seven-year period and demand is overlaid. In year three, there is a reduction in the supply, indicating there is less total inventory, and one of the units in the community will be deactivated. However, the demand is not

[14] Deputy Secretary of Defense, "Implementing a Strategic Readiness Approach," memorandum, 13 May 2022. The details of guidance and practice for compliance are not documented in a publicly releasable form.

reduced until year five. From year four through year seven, the ready supply is stable, though the supply of C3 capacity is slowly shrinking. This indicates the community is pulling capacity from modernization and build phases forward into the ready phase to maintain the ready capacity. This is exactly the slow burn down of the community that this view will help leadership to visualize the long-term impact or the impacts of a near-term decision.

The figure depicts a single force element; imagine when a Joint capability portfolio is depicted. There is significant overlap in capabilities across the Services and a Joint capability area view of the supply of ready forces can help synchronize force posture and modernization plans so that there is sufficient capacity in each area. As indicated in part 1, identifying the capability can present an interesting challenge. The existing taxonomies for Joint capabilities diverge into a flat structure, versus an easier to digest portfolio. Any general capability as defined in part 1 starts with leaving the one-to-one relationship as many of our force elements are multifunctional. The easiest construct to manage is the operational domain, warfighting function, and destination or target domain. The domains and functions are well understood and provide an easy to maintain and flexible way to group force elements across the Joint Force. Table 36 provides an example of a variety of multifunctional and single function force elements.

This construct is very helpful at grouping capabilities at a high level. It is not meant to be detailed as each specific force element has its own strengths and weaknesses. There are too many details for determining a broad shortfall in a particular domain and function. It also allows for a short list of special interest capabilities that is much easier to manage. Special interest can include things below the level of function, like antisubmarine warfare or medical services due to their inherent costs or complexity. The special interest list can be adjusted easily based on senior leadership guidance if the list is kept to no more than a dozen items.

In addition to grouping force elements by capability, there must also be linkage to coherent intermediate formations. Operational read-

Table 36. Joint capability by domain and function

Force element	Capability	Operational domain	Warfighting function	Target domain
Destroyer	Attack ships	Maritime	Fires	Maritime
	Antiair	Maritime	Fires	Air
	Attack land targets	Maritime	Fires	Land
Aerial refueler	Aerial refueling	Air	Sustainment	Air
Aviation maintenance	Maintain aircraft	Land	Sustainment	Air
Air defense	Antiair	Land	Fires	Air
Armored brigade combat team (ABCT)	Ground close combat	Land	Maneuver	Land
Airborne warning and control system (AWACS)	Airborne control	Air	Command & Control	Air
	Airborne early warning	Air	Intelligence	Air
Medium vertical lift	Assault support	Air	Maneuver	Land
	Aerial resupply	Air	Sustainment	Land

Source: author's depiction of a Joint capability matrix of force elements, domains, and war fighting function, adapted by MCUP.

iness is at higher echelons than battalions, squadrons, and individual ships. Wars are fought with divisions, corps, wings, and fleets. As with capabilities, the one-to-one relationship is obsolete. There are many force elements to still resolve to a single type of intermediate formation, but there is also a proliferation of units that are building blocks to several different kinds of larger formations. Once the linkage is established, the basic question of the health of the building blocks of those types of formations can be answered. The ultimate goal is that there are specific machine learning algorithms that can rapidly evaluate how many of each type can be constituted in time and space, at what levels of readiness, and can provide multiple options to leadership rapidly.

Excursions to the Forecast as Decision Support

Once the forecast is put together, it can be broadly useful. It does not take long before the question is asked about what the impact is of changing one of the underlying assumptions. What happens if a deployment is extended, a unit is deactivated as the platform is obsolete, and a new deployment is needed to react to world events? These questions are part of the daily business of the Department of Defense, the Joint Chiefs of Staff, and the Services. These types of questions did not appear with the forecast—they were always being asked. The forecast now shows long term impacts of the decisions made as it was developed. New decisions can be compared to the forecast baseline. Decision support is not using data to tell leaders what to decide. The human factors of making decisions are incredibly important. Senior leaders have a lifetime of experience, and the authority vested in them to make these decisions. Data is intended to inform the decision, providing insight into when, how big, and how long an impact a decision will have. Data can also inform leadership on mitigation options to address the impact of a decision. Data informed decisions do not provide certainty. The decisions involving readiness over time have incredibly complex underlying interactions and potential adversaries have their choices. There is risk in all these decisions and forecasted outcomes are probabilities, not certainties.

Impacts of a decision are not always negative. They can be positive, neutral, or negative. There tends to be a focus on negative impacts for obvious reasons. However, understanding decisions that create positive impacts are important to determine how to mitigate negative impacts of a different decision. Extending a deployment is a decision that creates a negative impact on future force readiness. Understanding positive impacts of adjusting other schedules that generally improve future force readiness can provide options to mitigate the negative impact of the extension. The value of the forecast is knowing when and how much to pull the lever.

The building of an excursion to the forecast baseline starts with a question: What happens if a leader does *x*? The question comes to the staff analyst to evaluate. The question is turned into a new set of inputs to the forecast model to determine the impact. This is presented to the leader as a set of options. The leadership may change the question if they do not like the results. The leader can accept the risk associated with the impact. The leader can pose the question on how to mitigate the impact, creating a new decision tree. The mitigation could be based on model output or could be more involved, such as convening an integrated or operational planning team to study options and provide potential courses of action.

Strategic Readiness

Much of this work so far is focused on operational and tactical levels or readiness. These are the components of readiness that come to mind for the general audience. Looking at this alone can create a false sense of security if the readiness looks good against the established norms. When current readiness reporting systems were fielded, they measured what was feasible to measure and there was a general assumption that if these were produced there would be sufficient infrastructure to build from for a larger conflict. It is one of the main points of Betts's work: military readiness (as measured in operational-tactical metrics) buys time for mobilization. Current and historical examples show that this is not a safe assumption. For many U.S. conflicts—from Korea to Afghanistan—there was sufficient capacity to meet the requirements of that conflict and provide a credible deterrent in other theaters without having to worry about strategic depth. This lulled the country into a false sense of security. The nuclear enterprise was the backstop. However, it is clear that this could inadvertently move the nuclear threshold up when a conventional response is more palatable. Part of a modernized view of readiness is to open the definition to cover all three levels of war, so strategic readiness becomes a routine part of readiness assessments and decision calculus. A prolonged conflict as seen in Ukraine is a wake-up call to many that there is still the possibility of major wars that last years. Just like using logical pillars of unit readiness, the pillars of national strategic readiness must also be defined. In defense circles, they often refer to the elements of national power as diplomatic, information, military, and economic power (DIME). This construct, while generally useful, is too broad for an assessment that can illustrate trade

Table 37. Notional pillars of national strategic readiness

Force readiness and posture	The operational and tactical readiness of existing forces and their locations and deployment. Readiness of the combat support agencies
Intelligence community	Health, capacity, effectiveness of national ability to collect and process intelligence. Key is the ability to provide early warning and build resilient intelligence gathering networks to understand competitor or adversary intentions. Provide and coordinate counterintelligence across multiple agencies
Mobilization	Active, National Guard, and Reserve components, Individual Ready Reserve, Selective Service and supporting infrastructure
Munitions	The amount, location, production capacity, and surge capacity of munitions
Industrial base	Depth and breadth of industrial capacity to surge, convert, etc. Includes current defense industrial base and all other industrial capacity capable of being converted in an emergency
Fuel-energy	The totality of fuel and electricity production, storage, and distribution
Communications	Both domestic and military commercial communications networks, including wireless, internet, and satellite. Includes cyberspace defensive and offensive capabilities
Transportation	Both domestic and partner nation transportation capacity for shipping, rail, trucking, aviation and ports, railroads, highways, and airport infrastructure. Moving forces and sustaining them globally
Facilities	Bases, port, and installation capacity for the support of mobilization, training, sustainment, and reconstitution of forces
Bureaucratic agility	The depth and capability of the Department of Defense move faster than an adversary to support the enterprise in all supporting functions
Partners and allies	The depth and breadth of partner and allied contributions across all pillars
Space	The commercial and military space-based capabilities and all associated functions
Artificial intelligence	The compute power, the talent management, and the infrastructure to compete and gain superiority in this growing general-purpose technology

Source: courtesy of the author, adapted by MCUP.

space between its elements. Once defined, then we figure out how to measure them. Table 37 looks at a notional set of national strategic readiness components.

It is worth noting that not all of these fall within the purview of the Department of Defense and require liaison with other cabinet level departments of the federal government. These are the basic pillars of a potential national security strategy from which the Department of Defense and military strategies are nested beneath.[15] These liaisons should be standing relationships with regular exchange of personnel and information to provide an assessment of the readiness of these pillars. Organizing a framework of strategic readiness pillars helps with packaging a vast amount of data into an assessment that can be absorbed and understood quickly. Even with a good framework, there is significant information to cover. Given its expansive nature, an annual assessment is likely the most frequent one could expect. An annual assessment can provide a baseline that supports rapid decision making by scoping the strategic readiness portion to those parts of the decision that have connection to the pillars of strategic readiness and the relative impacts. Subsequent strategic readiness reviews would be adjustments from the previous baseline. A standardized way of including strategic readiness as a routine aspect of significant decisions, such as budgets, employment plans, and major changes in posture due to crisis response better informs leadership with a more comprehensive look at the impacts of a given decision and tees up mitigations.

The Shift to Strategic Readiness within the Department of Defense

With the end of the major forces committed to Operations Iraqi Freedom and Enduring Freedom, there was a period of refocusing the Department of Defense on resetting the force. It did not take long

[15] Goldwater–Nichols Department of Defense Reorganization Act, Pub. L. No. 99-433 (1986) establishes the legal basis for the *National Security Strategy* (NSS).

for many leaders to realize that operational readiness only answers the question of immediate readiness to fight, but it does not answer the broader questions. This “fight tonight” perspective, while important, is not only myopic but could lead to overinvesting in current readiness at the expense of the future. Many aspects of the bigger picture were considered in other parts of the Department of Defense but not consolidated into a single assessment. The shift from near-term operational readiness to strategic readiness moved through the halls of the Pentagon across changes in administrations and leadership. In line with guidance from the 2022 *National Defense Strategy*, the Department of Defense is establishing a strategic readiness framework that expands the view of how it thinks about readiness and leverages existing tools and assessments to inform a broader understanding of the cumulative and cascading impacts of decisions on readiness.[16] A working group from across the Department of Defense considered a definition of strategic readiness and established a working set of dimensions. These are to be codified in policy in a new DOD instruction, *Department of Defense Instruction 3000.18, Strategic Readiness*. It defines strategic readiness as the ability to build, maintain, and balance warfighting capabilities and competitive advantages that ensure the Department of Defense can achieve strategic objectives across threats and time horizons.[17]

The DOD instruction also set roles and responsibilities to produce an integrated strategic readiness assessment (SRA) across 10 dimensions of strategic readiness.[18] This exercise proved challenging as there are all sorts of interaction and overlap between parts of each pillar, but the pillars also had to align to the organization of the DOD so that offices of primary responsibility could be designated that have the authority to obtain and contribute data. The definitions listed represent the author’s summary of the instruction document (table 38).

[16] *2022 National Defense Strategy of the United States of America* (Washington, DC: Department of Defense, 2022), 19–23. Unclassified for public release version.
[17] *Department of Defense Instruction 3000.18, Strategic Readiness* (Washington, DC: Department of Defense, 30 November 2023), 17.
[18] *Department of Defense Instruction 3000.18, Strategic Readiness*, 13–15.

Table 38. Department of Defense dimensions of strategic readiness

Dimension	Description
Operational readiness	Traditional readiness metrics of operational forces
Sustainment	All factors impacting the production and maintenance of the materiel, supply capacity, logistics flow, and global lines of communication necessary for the Joint Force
Mobilization	Subdivided into the components of personnel, industry, and materiel and equipment
Modernization	Focus on technology fielding and integrating into the appropriate force design, this is focused on obtaining or maintaining technological advantage
Global defense posture	All forces forward stationed or rotated, the supporting installations, and the host nation agreements
Force structure	The overall view of the designed force, including the size, authorized strength, authorized equipment, number and mix of forces if staffed, equipped, and trained produce combat capable and credible forces
Resilience	The ability of the various functions to adjust, recover, and reconstitute from adversary action or natural disaster
Human capital	Attracting and retaining the needed skilled military and civilian workforce. Development of and investment in the existing workforce
Allies and partners	The contribution of allied and partner nations to bases, installations, force contributions to coalitions, sharing intelligence, access, overflight, etc.
Business systems and organizational effectiveness	This dimension has two aspects. The first is the effectiveness of the business systems, that is information technology systems, not including morale, welfare, and recreation systems. Second is the ability of the organization to pursue strategic objectives

Source: courtesy of author, adapted by MCUP.

The instruction provides more in-depth details on the particulars of each with each having an office of primary responsibility.

It is worth considering the concept of strategy as a whole in national security and how the DOD strategy fits. The United States produces a set of nested strategy documents roughly every four years (corresponding to executive branch administrations). For the executive branch, it starts with a *National Security Strategy* (NSS) that looks at the whole government.[19] Nested within it is the *National Defense Strategy* (NDS) produced by the DOD that provides the departmental strategy to achieve the goals set out in the NSS.[20] Next is the *National Military Strategy* (NMS) produced by the Joint Chiefs of Staff, and as the name implies looks at the specific military contribution to the NDS.[21] Within these strategy documents are the annual processes of the military enterprise, which are budgeting and force management. The budgeting process for DOD is called planning, programming, budgeting, and execution (PPBE). In 1961, then-Secretary of Defense Robert S. McNamara introduced the planning, programming, and budgeting system as a framework to link budgets to strategic objectives. The concept was borrowed from industry and adapted to statutory budgeting requirements laid out in the Constitution. In 2003, it was renamed PPBE to add emphasis to effective execution of the budget.[22] Efforts are underway to reform this process again; some want to add an assessment to make it PPBEA to provide a feedback loop on the effectiveness of the process.[23] This type of assessment could be a key input to the SRA dimension of business systems and organizational effectiveness within the PPBE process or a crosscutting input to multiple dimensions on the funding levels. Force management can be interpreted broadly, but in the case of the annual processes within DOD is called GFM. It is

[19] Annual National Security Strategy Report, 50 U.S.C., § 3043.
[20] Materiel Readiness Metrics and Objectives for Major Weapon Systems, 10 U.S.C., § 118.
[21] Chairman: Functions, 10 U.S.C., § 153.
[22] Brendan W. McGarry, *Defense Primer: Planning, Programming, Budgeting, and Execution (PPBE) Process* (Washington, DC: Congressional Research Service, 2024).
[23] Senate Commission on Planning, Programming, Budgeting, and Execution (PPBE) Reform, Section 1057 of the National Defense Authorization Act for Fiscal Year 2023. The Commission has concluded operations as of August 28 2024.

about the posturing of the forces that are available to meet current day-to-day demands and have sufficient forces to support an array of plans. These two requirements are mutually supporting as all that posture and activity must be paid for. The traditional definition of the strategic level of war was covered in chapter 2 in the deterrence and fighting of wars.

Strategic readiness is more focused on the contributions and ability to implement the stated strategy in the appropriate source document. This introduces a significant challenge. Strategy can change but strategic readiness does not. The effectiveness of a strategic readiness approach is highly dependent on a coherent strategy document. During the author's career, there have been several strategies that have come and gone. They are not all equally coherent. In the author's opinion, the last two *National Defense Strategy* documents (2018, 2022) were especially good and helped lay the foundation for the shift to strategic readiness. The key is that the strategy as articulated should be sufficiently detailed for the downstream documents to be meaningful and actionable. Imagine a strategic goal of improving national security. That sounds like a reasonable goal, but without associated aspects of improving national security by something, it is only a platitude. Development of overarching strategies are a key component of civilian oversight and control over the military. It can also be impacted by political considerations. Party politics are part of the process, however, in many cases neither party wants to own lack of readiness. The military and veterans can be a powerful voice in the political arena. The *National Security Strategy* is inherently a civilian and political undertaking. It is part of each party's platform. All citizens have their input through the political process. There exists the potential for highly politicized strategies that could force the DOD to change how it supports the strategy, but the pillars and concepts of strategic readiness remain.

Not all pillars are equal, and to support decisions the investment in each needs to be determined as well as its sensitivity to change in those investment levels. Next, the fungibility of these investments needs to be determined. For example, when assessing a pillar of strategic read-

Table 39. Operations and maintenance investment

Pillar	Score	Cost per FY	Base fixed cost	Variable cost	Variable cost score correlation
Pillar 1	75	$100B	$60B	$40B	+1/$5B/10 -1/$3B/6
Pillar 2	55	$50B	$40B	$10B	+1/$0.6/5 -1/$0.25/10
Pillar 3	60	$120B	$80B	$40B	+1/$10/3 -1/$2B/8
Pillar 4	80	$200B	$120B	$80B	+1/$15B/5 -1/$10/3
Pillar 5	90	$75B	$50B	$15B	+1/$0.4/3 -1/$1B/5
Total			$350B	$185B	

Source: author's illustration of the narrative, adapted by MCUP.

iness using notional data to illustrate the concept, a general overall readiness level should be determined. For example, the annual investment in that pillar is $100 million and it is allocated human capital of 10,000 people and the assessment gives it a score of 90 out of 100. It is determined that of the investments in that pillar, the financial component is 1 point lost per $5 million reduction up to $15 million, so a reduction in investment here of $15 million would take it to 87 of 100. Another pillar is at 65 of 100 and could increase 2 points per $3 million of investment. The shift of the $15 million from pillar one to pillar two would move the pillar to 75 or 100.

This is the point of the process. It does no good to perform an assessment and admire the problems it shows. The analysis needs to determine the ability to rebalance investments and provide senior leaders the trade space so they can make meaningful institutional decisions. These calculations can be complex nonlinear relationships. Some pillars may be less sensitive to reduction to a low level but can become much more sensitive after a certain threshold. The sensitivity to increases may be different. Money is more fungible than people but there are fixed, variable, and capacity costs. A balanced scorecard conceptually may look like table 39 on operations and maintenance investment. Score correlation gives an increase per point at the cost after the slash followed by the upper limit. Next is the decrease per point cost and the lower limit. The limits imply much larger costs with changes beyond the limits calculated.

This approach can be broken down into major component areas, so any redistribution of resources can be targeted at specific aspects that are determined to be more important than others. In the table, no change in variable cost could make more than a 10-point difference in the overall score, and each has a unique sensitivity to their variable costs. Here, one could decrement pillar four by $20 billion, reducing its score to 78, and raise pillar three by 2 points or a one for one, or it could raise pillar two the full 5 points that it could possibly improve for $3 billion and pillar three 1.7 points.

Ultimately, the DOD SRA should be nested in a national SRA. These provide key inputs to the next iterations of strategy documents and inform the key process within DOD. They provide senior leadership with a better (not perfect) view of the strengths, weaknesses, capabilities, and gaps. Armed with that insight, this can drive resource allocation decisions to address weaknesses or gaps and to analyze the expense of strengths and capabilities. Understanding the long-term trade-offs can help shape crisis response to provide a balance between the tyranny of urgency and the future.

Past, Present, and Future—Together

To recap what readiness should look like: the readiness data should be considered in the three views of past, present, and future. Traditionally, readiness data is focused on the present, and that is insufficient. The past gives context to the present and informs what is likely in the future. Present data is meaningless without the past. The past shows what is most likely and helps us understand the sensitivity of the complex force generation process to changes. A readiness brief routinely delivered by the readiness branch started with present readiness as a "you are here" point in time. Then comes the forecast based on historical trend analysis and known employment and modernization inputs, followed by the historical trends focusing on institutional readiness. It is very different from a readiness report at the battalion, squadron, or brigade level. However, these lower echelons can benefit from a version of the data that provides the commanders with a similar view. It sets realistic expectations for how much readiness the unit can produce. When discussing readiness with many commanders over the years, the author often encountered frustration with commanders who could not be ready with the resources they had. The response was always, “of course not, no one expects you to be ready until you have sufficient resources. Your role is to take what you have been given and ensure that they are made as ready as possible so they can form the nucleus of a fully resourced unit when the time comes or provide ready elements to another unit.” At the institutional level, readiness should span the strategic and operational levels, with less detail on the tactical level, but it is available if needed. It is a framework of how to view the data, not just what the data elements could or should be.

CHAPTER 9

WHAT WE DO NOT MEASURE

There are other important factors that are essential to a comprehensive understanding of readiness that are not measured in the readiness system of record. Some of these factors are not measured anywhere and some are measured in other areas and are ripe to be included as technology is opening the door to pull in many other data sources. Some of these are factors that can be measured but may not change the overall readiness assessments, yet there may be useful correlations between unit readiness and these other issues. These are often called readiness adjacent metrics.

Deter, Fight, Win, and the Theory of Victory

The definition of military readiness for this work is established, but it has some key components that impact assessments. The active section is to deter, fight, and win. So much of readiness assessment methodology is focused on readiness to fight. It is assumed that sufficient readiness to fight is deterrence and that readiness to fight is the best start toward winning. This idea introduces some dangerous fallacies.

There is a significant body of literature on modern deterrence and deterrence theory.[1] These approaches are an integral part of designing a national/strategic level plan. Detailing the relative merits of the theories is beyond the scope of this work. The author presumes subject matter experts have designed the strategy with this body of knowledge in mind. Any national strategy includes all levers of national power, not just the military. Here in the military readiness arena, we are seeking to gauge the day-to-day contributions of building and demonstrating military readiness toward the national strategy. We know rotational deployments, crisis response, major multinational exercises, and various activities are designed to contribute to this strategy. The effectiveness of the specific implementation of deterrence in a given strategy can be challenging to assess in real time. Are all these activities or plans in the near term advancing the deterrence portion of the chosen strategy? Is the nation overinvesting in current readiness for deterrence at the expense of future readiness and a future deterrence strategy?

Given the challenge of building and maintaining current readiness versus future readiness, knowing if these actions contribute, hinder, or are neutral is helpful. If we can identify areas where specific actions hinder or are neutral, those resources could be allocated elsewhere. For example, if there are six deployments to a particular area to provide ongoing presence, the plan is that these contribute to the deterrence plan or strategy. If the force is stressed by supporting the six deployments, without some measure of effectiveness it is difficult for leadership to decide if four or five would still provide the desired effect while reducing stress on the force. The effectiveness of deterrence can be assessed during a period to see if the desired outcome was achieved. The best example of this is to look from the Cold War era to determine if a third world war or a nuclear war of any size was deterred, and that is true. The cost of that deterrence includes the high cost of the size and capa-

[1] Frank C. Zagare, "Modern Deterrence Theory: Research Trends, Policy Debates, and Methodological Controversies," in *Oxford Handbook of Topics in Political Science*, ed. Desmond King (New York: Oxford University Press, 2016). This resource provides an overview of the main schools of thought and some of the key points of ongoing debate.

bilities of the military enterprise; it also includes many conflicts within the lower end of the range of military operations. What can be inferred from the last 75 years is that the cost of avoiding another "big one" is many "small ones." Even that approach is flawed as the nation does not know if what it invested in was too much or just enough. Fundamentally, to understand deterrence is a move from a correlation of forces—from a mathematical approach—to the realm of human behavior.

To measure the effectiveness of deterrence of unit activity, we need to see what adversary behaviors were changed in an action-reaction cycle. To understand changed behaviors, there needs to be an established baseline. This requires recording competitor behaviors and recording them as data. It is better to describe adversary behaviors as actions taken and patterns of life. In industry, part of the marketing department where the author worked would buy stock in competitors and record their financial performance, and they would monitor news releases, investment reports, and reports from the sales force on where they saw them doing business and in what volumes. This compiled data helped gauge their patterns of life. In a military context, this is part of military intelligence—to monitor the adversary order of battle, patterns of employment of training, and deployments. These are standard practices and are performed for the primary purpose of providing indications and warnings of an attack, or capabilities that need to be incorporated in training. The point here is that the data is being captured in many ways but comparing it to friendly actions to gauge changes is a different use of the data. As an example, a potential adversary has an air defense formation in a given region. Its presence is confirmed and observed. Friendly forces have typical training patrols that the adversary tracks. Friendly forces are strengthened to deter aggression in the region. If the adversary makes no observable change, then it is clear the attempt may not have been successful despite the cost of the additional forces. If the adversary reacts by positioning more air defense formations or repositioning their formation to a more defensible location, that is harder to sustain. This would be indicative of a successful deterrence operation as the adversary perceived the change and reacted in a way that cost them additional resources. We cannot see inside their minds, but we can see actions they take as expressions of that thought process.

A tactical example has been provided; these types of detailed observations are possible if a larger deterrence strategy was decomposed to observable behaviors. If the strategy is to deter aggression by x in a given region, this broad statement must be broken down into what is meant by aggression and analyzing what the aggressive behaviors are specifically. In Iraq during Operation Iraqi Freedom, the improvised explosive device (IED) became the signature enemy method of attacking Coalition forces. It was an asymmetrical response to tactical overmatch. To deter this activity, it required tracking each incident as to when, where, and details of the incident. This data was used to find patterns to identify and attack networks that made and emplaced IEDs. In a larger deterrence approach, we could count the frequency and regions to determine the overall effectiveness of the campaign.

To pull this thread, once the aggressive behaviors have been quantified, we can then assess our effectiveness at stopping them. This can be the first measure of effectiveness. The second measure is the cost to make that change. Is the observed change cost effective, and what is its sensitivity to changes in resources? This second approach then feeds the ability to measure the balance of required readiness now against future readiness. We established a trade space that lies between minimum required readiness and maximum force generation capacity. Starting at the minimum required to an underdetermined point is the deterrence portion of readiness capacity. Understanding this cost benefit is important as the force mix may not be the same as the force mix needed to achieve favorable results in combat. It may also require posture that does not support planned employment of the forces in a potential conflict well. A deterrence force may be intelligence, surveillance, and reconnaissance heavy. Large formations may be less important, or elements of those larger formations may need to be placed in host nations or areas that may make forming up much more difficult should hostilities start. These are readiness investments that compete against building and positioning an optimal force to fight and win a major conflict.

Understanding that deterrence is a competing investment is crucial in undertaking it in a deliberate manner and major commands wanting to undertake a deterrence campaign need to do the work to map out the types of details discussed. Next, the actions can be assessed for effectiveness, so precious resources are not expended on deterrence that has no observable impact on the intended audience. Keep in mind that a competitor may change behaviors in other ways. They could double down, thus causing escalation instead of deterrence. Gauging how far and how hard to push is part military strategy and part national policy. Doubling down can be desirable if it forces them to overplay their hand and isolate themselves politically or economically. So much of a deterrence strategy is about having the adversary burn their readiness trade space prematurely. The Cold War deterrence strategy was a form of economic and information warfare to generate a favorable result without starting World War III.

Military conversations about readiness for combat often begin with the preface "when deterrence fails . . . " Combat and deterrence are not truly exclusive. The many small wars during the Cold War had to be integrated with the larger deterrence strategy. Sometimes a nation must be willing to engage in combat operations for larger deterrence outcomes. A larger deterrence strategy, including nuclear posture, can prevent a small war from escalating into a larger conflict and may involve self-imposed restrictions to operations. During the Korean and Vietnam Wars, the United States and its allies restricted bombing campaigns and ground maneuver despite these restrictions being exploited by adversaries. It could also be argued that these self-imposed restrictions were desired outcomes of Soviet and Chinese deterrence strategies.

Until combat operations begin, the primary consumer of readiness is the deterrence strategy. Forward postured units, deployments, major exercises, maritime and air patrols, and alert forces are all aspects of a deterrence campaign—the operational inputs to a deterrence strategy.

Having established that deterrence is not just a part of building readiness to fight, the second part of the triad, to fight, is the focus of traditional readiness. The concern for twenty-first century readiness is a period of rapid changes during the last 30 years that cumulatively change how wars are fought. Many of these are mentioned in the first part and include reliance on space for communications, navigation, intelligence; proliferation of drones of numerous types and capabilities; and long-range precision strike capabilities. The world has seen precursors of what a major conflict may look like in Ukraine, but that is merely a hint as the air and maritime domains are barely included. The maritime domain has experienced fundamental changes in technology and capability that has never been truly used in generations. Sneak peeks came in the Falklands in 1982 with the 1970s technology Exocet, in a nonstate launch of a land based antiship missiles at a U.S. destroyer in October 2016, and the closest the United States has come is the complex use of ballistic and cruise missiles with drones in the Red Sea.[2] There have been no fleet actions between major powers since World War II. Airpower is also changing rapidly. U.S. airpower seemed overwhelming, however, adversaries made adaptations, dispersed, and decentralized. Russian airpower has been underwhelming in Ukraine to date, despite the significant investment in aircraft. In a military sense, America is much like the great powers prior to both World Wars when changes in technology, doctrines, and training changed how the wars would be fought. Military professionals had some sense of the challenges of fast-firing artillery, machine guns, and entrenchments but struggled for years in the face of horrendous losses to figure out how to solve the tactical problem.[3] This is a case where tactical problems changed the strategic direction. It took the careful application of combined arms warfare to finally break the Germans in the west in 1918. This lesson was better developed by the Germans in the beginning of the Second World War. The French made major investments in read-

[2] Jon Gambrell, "Yemen's Houthis Launch Their Largest Red Sea Drone and Missile Attack, though No Damage Is Reported," Associated Press, 10 January 2024; and Jake Epstein, "U.S. Navy Warships Fought Off a 'Complex' Missile and Drone Attack in the Red Sea," *Business Insider*, 27 September 2024.
[3] Gordon Corrigan, *Mud, Blood, and Poppycock: Britain and the First World War* (London: Cassell Military, 2003), 203–6.

iness, yet they were totally outmaneuvered in May 1940. What the Germans failed to do in 1914 to 1918, they accomplished in weeks. Their political desires outstripped their military capability, despite delivering very favorable conditions. By 1944, their adherence to certain tactics became their greatest failing. Their reflexive commitment to counterattacks despite the United States and Great Britain having overwhelming firepower superiority ground them down.[4] Being ready to fight means having a mindset and adaptability. The mindset is hard to measure. All forces experience some shock in the face of combat. Aggressive professionalism can be trained and historically is effective at preparing soldiers for combat. Teaching adaptability and integrating it to training in schools and major exercises is absolutely critical. Instead of drilling doctrine, drilling tactical problem solving is essential. These are not items that make it explicitly into a readiness report but are no less important. They should be woven into the organizational culture and part of everyday business in training exercises.

The third part of the triad is to win. Fundamentally, all military organizations want to be able to win and defeat their adversary. How is the ability to win measured? A military can be highly successful at a given level of readiness but still lose. Can every battle be won and still lose the war? The current view has been skewed by World War II and the unconditional surrender that ended the war. Across the long, bloody history of war, such a definitive outcome is uncommon. In the larger struggle of nations and groups, armed conflict exists on a spectrum of competition. For the military enterprise, it is inefficient to consider the unconditional surrender of an adversary as the primary objective. That may not be the stated goal of the nation, so it would be unwise to consider it the norm. The goal should be to provide favorable outcomes to political leadership to give them the ability to achieve their national policy objectives. It is important not to conflate tactical victory or more theoretical concepts like "imposing your will on the enemy" or "breaking their will to fight" with providing a

[4] James Holland, *Normandy '44: D-Day and the Battle for France* (New York: Grove Press, 2019), 645–48.

meaningful contribution to the set of favorable outcomes needed to support national policy objectives. There is a psychological aspect to defeat and victory but will and morale are difficult to measure and can shift rapidly. The author witnessed an Iraqi Army lose its will to fight, and the U.S. military impose its will, that is to maneuver where it wanted, when it wanted. However, this was neither universal nor permanent, and they retained plenty of capability to brutally defeat the Shi'ite uprising following Operation Desert Storm.[5] Morale changes with the weather, a hot meal, good news, and rest. It is very ephemeral and measuring it could be achieved, but by the time it was collected for analysis it will have changed.

A theory of victory approach provides a working framework that can be compartmentalized into specific military tasks that can then be trained and assessed. A theory of victory framework includes a set of conditions and objectives that would provide national leadership with the perceived leverage to end the conflict with a desirable outcome. This may be territorial, or adversary force based, or a combination. For example, if country X invades its neighbor and occupies a region, a territorial objective may include the recapture of the region, or a force may include the destruction of military capability to do it again at a later date. These frameworks can inform the formulation of standing war plans that can be compartmentalized into general tasks that military forces organize, equip, and train to accomplish. This approach is more definitive than generic military training and also informs the force design. If the force is designed around the wrong lines or in a disjointed, uncoordinated manner it may not be able to produce favorable results. The rest of the problem is that since there are various adversaries in different parts of the world and their capabilities change over time, each has its distinct theory of victory framework that must be reviewed and revised over time. The force designers must look across the sets of objectives to determine the needed force mix that is feasible.

[5] Rick Atkinson, *Crusade: The Untold Story of the Persian Gulf War* (Boston, MA: Houghton Mifflin, 1993), 491, 497.

This all works for the conflicts a nation plans to fight, but the very planning to fight them is part of the deterrence that may prevent them from happening. Competition does not dissipate. If pressure is applied to a balloon, it will bulge elsewhere. Conflict deterred is not competition denied, and an unanticipated conflict may arise where we did not anticipate. It is not accidental; competitors will seek out vulnerabilities and draw us into conflict not under circumstances of our choosing. The military enterprise must be aware of this and either shift planning dynamically as a part of continuous, evolving deterrence or hedge in types of force design that have general applicability.

Joint Force Design

Force design, also known as capability development, is an area of the military enterprise often shrouded in mystery. These professionals take a large series of inputs from various sources to then analyze the data to design what force structure is needed and then balance that with affordability. They produce the authorized strength and composition of forces.[6] This forms the denominator in readiness calculus. Essentially, readiness metrics measure the success or failure of the institution to produce the designed forces. Traditionally, this work is the purview of the military Services. There is solid logic behind this, as the Navy designs what the future Navy should look like and so forth with the other Services. This traditional approach starts with reconciling the designs against what the nation can afford. Currently, this potentially contentious issue is preadjudicated with planning guidance that allocates to each Service their share of the anticipated budget, so each force design team operates within that sandbox. Of the total budget allocation, the Services have a large percentage of must-pay bills such as military and civilian payroll and the operations and maintenance of the existing force.

The remaining amount is what can fund changes in the designed force. Many changes are not just equipment acquisition based; a redesigned mission that requires fewer personnel may reduce the must-pay

[6] *Manual for the Operation of the Joint Capabilities Integration and Development System (JCIDS)* (Fort Belvoir, VA: Defense Acquisition University, 2021), A-1.

payroll over time. This approach was used in some Services' modernization efforts called "divest to invest." This strategy can be controversial as to how much is being divested and how it is synchronized to minimize the reduced capability during the investment phase. It is always easier to divest, cut, or reduce than it is to build new force structure. This can be especially difficult if the new concepts are substantially different. The most often cited case of this is the divestment of tanks from the U.S. Marine Corps. In the Marine Corps' *Force Design 2030*, there were many changes, but the one that caught the attention of most commentators was the total divestment of the two active component and one reserve component tank battalions.[7] Marine tank battalions fought during World War II, Korea, Vietnam, Operation Desert Storm, Iraq, and Afghanistan. However, several factors were behind this decision. The tanks in question were M1 Abrams tanks that are very heavy (about 67 tons) and use lots of fuel, which stresses the Marines' expeditionary logistics capability in a highly contested environment. The Army has the robust logistics to support M1 tanks in sufficient quantity to be decisive (i.e., hundreds of tanks), so the Marine Corps' decision did not say that such tanks were obsolete. Given the smaller numbers that could be reasonably put into action by the Marines coupled with the proliferation of advanced precision antitank weapons (loitering drones, antitank guided missiles, etc.) their survivability becomes low. The counterargument beyond the emotional portion centers around the need for Marines to augment Army capabilities in some circumstances, which then gets into a Joint Force design argument. Is the Marine Corps given specific top-down guidance on force structure as part of a coherent single force structure? The answer is no—the guidance is broad and general enough to allow the Services to use their expertise to provide the best and most affordable solution.

[7] Matt Gonzalez, "Force Design 2030: Divesting to Meet the Future Threat," Marine Corps Systems Command, 1 December 2021.

Included in the guidance are congressionally mandated portions of force structure.[8] This practice of writing into law certain aspects of force structure is a tactic that can circumvent the often contentious balancing of resources. It can end debate on an issue, but during long periods of time can force a potentially outdated structure on the Services. Congressional mandates are revisited annually via the National Defense Authorization Act (NDAA) process that should prevent this problem. Major structure provisions are difficult to address after they are enacted.[9] After many years, these provisions become dogma and to question them is a form of heresy. The most visible example is in the numbers of certain types of ships. The law states the Navy must maintain at least 11 aircraft carriers. What if a future force design determines that eight is more appropriate or even more radical if that class of ship is rendered obsolete and the Navy should invest in a more survivable and sustainable platform? Similarly, a law was recently passed mandating 31 amphibious ships. The current 30-year shipbuilding plan did not get the Navy to 31 ships, and the testimony was contentious. The Navy's response was that given all the mandated requirements, the budget allocation was not sufficient. The Marine Corps has sufficient force structure to keep 31 amphibious ships busy. By all accounts, the inherent flexibility of Marines on Navy amphibious shipping provides the geographic combatant commands significant capabilities of security cooperation with allies and partners, crisis response, and deterrence. In defense of the Navy, they are recapitalizing the ballistic missile submarines, fielding a new class of aircraft carrier, and a new frigate class, all of which are also sorely needed. Should these mandates drive changes to the budget allocation, what would the Army and Air Force lose to pay for more ships?

[8] United States Navy: Composition; Functions,10 U.S.C, § 8062 (b) (2025). "The naval combat forces of the Navy shall include not less than 11 operational aircraft carriers and not less than 31 operational amphibious warfare ships, of which not less than 10 shall be amphibious assault ships." § 8063 (a) :"The Marine Corps, within the Department of the Navy, shall be so organized as to include not less than three combat divisions and three air wings, and such other land combat, aviation, and other services as may be organic therein." The provisions for the Army and Air Force, while detailed, are not as prescriptive in force structure.
[9] Valerie Heitshusen and Brendan W. McGarry, *Defense Prim er: The NDAA Process* (Washington, DC: Congressional Research Service, 2025), 1–2.

The United States does not have a general staff system. It has a Joint Staff that provides input into the Services' organize, train, and equip authorities and a civilian led Department of Defense that provides oversight, policy, and guidance. The Joint Staff does not formulate a comprehensive, prescriptive force design.[10] They do not mandate exactly how many ships, aircraft, and battalions each Service must have. A general staff system has more centralized authorities, but in reality, around the world they cannot escape service parochialism. The true power of a potential Joint Force design is the budgetary authority to act on the design as well as an impartial process to reconcile the Service equities. In theory, the civilian control of the military is intended to provide that impartial view. That view must be informed by the Joint Staff and Services, so they are accurately represented. There is value in a more detailed top-down design to eliminate ambiguity and focus on the true overlap between the Services. Aviation is one truly Joint area of forces. The Services have spent decades working and training on a Joint air doctrine and practice. Air Force, Army, Navy, and Marine Corps aircraft routinely work together in complex air planning and conduct of air missions. In a limited sense, they can support each other, though each has a different primary focus. A perfect example would be a maritime strike, which is attacking adversary ships. All three Services have valid missions that need this and can work together in performing them. There is common ordnance (missiles and bombs) that are interchangeable. A Joint Force design can allocate the number of aircraft needed for each to retain a balance of this capability with the other needed missions. A Joint Force design could also help synchronize modernization across the Services to ensure sufficient capacity is available over time. The Joint Force design can also codify force generation cycles. It could look like the Army should have x heavy divisions in structure with y brigades ready, and a time phased readiness of the other parts. Much of this type of information exists but is generated from the Services, not from the department.

[10] Joint Chiefs of Staff, 10 U.S.C., chap. 5, § 151 and 153 establish the composition and responsibilities.

If asked what the current Joint Force design is, it is an aggregation of the Services' force structure. The readiness of the Joint Force is then an aggregation of each. The readiness of the Joint Force can be assessed against various plans or demand signals, but there is no single design to measure against. A Joint Force design is most likely a set of reference architectures with broad capability objectives, strict data and interoperability standards, and synchronization of Service efforts. These areas are then enforced by budget restrictions to push the Service efforts in the same general direction.

Unit Cohesion, Morale, and Resilience

Any student of military history knows the importance of unit cohesion, morale, and resilience. In chapter 5, the author briefly discussed cohesion as part of the personnel dimension of unit readiness. There are ways to measure the conditions that generally produce cohesion, and the intent is to capture those in some methods. Even if a group had the ideal tenure of a team working together that the personnel system can produce, it is no guarantee that the unit is highly cohesive. Can other ways be used to gain more insight? The most promising approach is by having external, trained, and qualified evaluators observe a major challenging exercise and provide a specific assessment of the cohesiveness of the unit and its command staff. Cohesion is only exemplified under pressure, like the quality of steel in a forge. Exercises that are externally evaluated can provide that crucible that can reveal the cohesion of a unit. With any adjustment, the means and opportunity may present the biggest challenge. How are the evaluators trained and by whom, and who pays for it? The exercises exist but are not necessarily synchronized with the force generation cycle that can set up a unit to be evaluated too early in the cycle, which is premature. The argument here is that morale is not necessarily worth measuring as it is highly conditional and can change rapidly. Training in the rain lowers morale; the sun comes out and morale improves. Canceling liberty due to poor performance may lower morale, while earning an unexpected pass for superior performance increases morale. We intuitively know there is a "pool" of morale that goes up and down, but there is a breaking point at which the morale state falls below the cohesion line and the unit begins to disintegrate. This is a unit level version of boot camp where an individual is "broken down" and "built back" with a deeper realization of their limitations. During the broken down pressurization phase, morale can be very low, but the process is like strength training—it resets the limits. For a unit, it is similar but is really related to cohesion as this applies to collective morale. A unit can be tested and gain a new level of cohesion that is a function of those personnel present during the process. As personnel rotate in and out, the impact wanes and the process is repeated. The point is that training proficiency is assessed to perform a task to standard, but the more important aspect of the training is the building of the underlying cohesion while getting to the achievement. Much of this aspect of the training is implied, but the frequency of the activity that builds cohesion can be measured to spot anomalies and gauge the resources necessary to build cohesive units reliably and consistently.

Resilience is a factor that has received increasing interest in light of the war in Ukraine. The high tempo, heavy conventional warfare that reproduces heavy casualties during an extended period provides a clear and present example of the challenge of resilience. A nation may build a highly trained force and assess it as ready with the current methodology, but how well can it take a hit and continue operating? The current readiness methodology would show the degradation of losses to a unit and was originally designed with that in mind. It becomes a resource management tool at that point. It does not indicate the breaking point. In modern warfare, the term *elite units* is used, but what made a unit elite? They may be better at the employment of their weapons, but is it better to have a few elite units and a mass of mediocre units or have a medium-size force of good units? The most common characteristic of elite units is their ability to continue to operate after sustaining more casualties than other units. How does this actually work behind the raw numbers of casualties? Given the lethality of modern weaponry, better trained troops can only reduce their vulnerability so much; they must train on how to sustain heavy casualties. This comes from rigorous, realistic training that includes the imposition of heavy casualties that forces the unit to fill gaps in roles and responsibilities rapidly. Like cohesion, an external evaluation may be the best opportunity as the casualties can be assessed randomly or inconveniently. Casualty assessments in exercises should be linked to poor fieldcraft to incentivize proper technics, tactics, and procedures to reduce vulnerability, but also with random aspects as enemy activity is not 100 percent predictable. Casualty play includes the imposition, treatment, and evacuation of casualties and then sustaining operations while processing casualties and after evacuation to force the unit to adapt to the missing personnel. The more difficult aspect of resilience is training on the rapid inclusion of replacements in an operational environment. Historically, there are examples of units receiving replacements while in contact and struggling to integrate them without them immediately becoming casualties. To train for that capability and measure it may present a creative challenge, but this is where leadership would like to know if their units can fight and win in a protracted fight.

Resilience of units in a protracted campaign will also come with a degradation of capability found in a professional volunteer force. There are some interesting precedents of how this may work. Contrasting Imperial Japanese and U.S. naval aviation during World War II in the training pipeline shows two forces that originally relied on long and detailed entry-level training that produced highly skilled aviators. The Japanese likely had an edge at the beginning of the war. The Japanese kept their best pilots forward and the attrition and battle fatigue essentially expended them. The long lead time training was increasingly curtailed to meet the demand and produced fewer skilled aircrew. The United States in contrast rotated the pilots back more often to train, yet kept the training rigorous, and it produced more aircrew at significantly higher skill levels.[11] U.S. ground units in the Pacific campaigns fought shorter intense campaigns where the unit was aggregated and

[11] Ian W. Toll, *The Conquering Tide: The War in the Pacific Islands 1942–1944*, vol. 2 of the Pacific War Trilogy (New York: W. W. Norton, 2016), 136–37, 238, 430–31.

trained over time and undertook the operation. For example, the 1st and 2d Marine Divisions trained for shorter intense campaigns such as New Britain-Cape Gloucester, Saipan, Peleliu, and Okinawa. In the European theater, the divisions remained in the line for months and had to integrate replacements as they went. The capabilities were difficult to sustain at the original level as the turnover in the combat rifle companies was very high. The professional British Army of 1914–15 was worn down and "Kitchener's" army of 1916 did not have the same capabilities, nor did the conscript army of 1917–18.[12] Each change necessitated a change in tactics to accommodate the limitations of the new units. The recommendation is that the institution should select its preferred resilience strategy and train it. Unit rotation is likely the best way to preserve as much capability of the professional force as possible. If war plans call for a high percentage of units to be committed, then unit rotation may not be practical. A system of individual rotation like the World War II European theater or Vietnam may be the practical solution. Such a resilience strategy should address not just the reconstitution of existing units but incorporate how to make new units with cadres from existing units. It is far better to think it through and train for it than worry about when the time comes.

Leadership

The value of leadership has been well established from antiquity to now. Institutions invest countless hours and mountains of money in developing leaders from noncommissioned officers (NCOs) to officers through generals. There are rigorous selection criterion, schedules of professional military education that span a career, annual appraisals, promotion boards, and command selection boards. In addition to the major milestones, Services have numerous schools for specific skill sets that become required qualifications for certain roles in the organization. For example, in the Marine Corps, of which the author is famil-

[12] *Kitchener's army* refers to what was initially intended as an all-volunteer section of the British Army based on the recommendation of then secretary of war Herbert Kitchener. Corrigan, *Mud, Blood and Poppycock*, 333–57.

Table 40. Professional military education

School	Level	Duration	Rank
Officer Candidates School (OCS)	Qualification and basic training	10 weeks	Officer candidate
Basic Officer Course (The Basic School, TBS)	Entry-level training	6 months	2d lieutenant (O1)
Infantry Officer Course (IOC)	Military skill	3 months	2d lieutenant (O1)
Expeditionary Warfare School (EWS)	Career-level course	12 months	Captain (O3)
Command and Staff College (CSC)	Intermediate-level school	12 months	Major (O4)
Marine Corps Tactical Operation Group (MCTOG)	Operations officer certification course	6 weeks	Major (O4)
Cornerstone Course	Commanding officer qualification course	2 weeks plus additional week tactical focus for combat unit commanders	Lieutenant colonels and colonels (O5–O6). Command-slated officers will go twice if commanding at the O5 and O6 levels
Marine Corps War College (MCWAR)	Top-level school	12 months	Lieutenant colonels and colonels (O5–O6)

Source: author's representative professional military educational career path.

iar, a career path for an infantry officer may follow this typical progression (table 40).

In the example career path above of more than 20–25 years, the minimum professional military education requirement totals roughly 4 years in school. Many other Service schools are common, such as the Army's parachute qualification and Ranger schools. Officers who go through aviation, nuclear propulsion, reconnaissance, or special operations will have additional lengthy schools. In all those schools, a significant portion is dedicated to leadership development. News reporting shows the Services are not shy about relieving a commander for cause in many cases. Having schools and annual reviews is nothing new. Military organizations have professionalized their training and education during the last several hundred years, including by developing the Service academies and standing war colleges and universities, such as the Marine Corps University, National Defense University, or Naval Postgraduate School. These institutions can confer advanced degrees in various areas of study. This professional military education accomplishes several things besides leadership development. It builds social networks within the student groups that can provide mutual support for years afterward. It imparts institutional knowledge that is necessary for the students to be functional in the military bureaucracy beyond command positions. These are broad, indirect investments in the general readiness of the student population. In the author's experience, there were some disconnects between the curriculum and its applicability to the next assignment, but he must not have been the only one, as changes were made over the years to address these issues for the better. The school attendance is tracked and could be pulled into a readiness assessment to establish if the leadership of a unit has completed the required education goals. The burning question is if all this produces better leaders. Intuitively, it should, but it is difficult to measure. There are many anecdotal accounts of wide ranges of leadership. During the author's own career, he served under many commanders, and they had a wide spread of leadership skills from his point of view. Some were very effective and inspired great confidence and loyalty, some were indifferent managers, and some were toxic. Having served under such a wide range, it helped shape and inform his own leadership style that evolved as he went through a version of the path in table 40. Leadership is a messy human interaction problem. It is not a one-size-fits-all problem; it involves tailoring the style to the situation and personnel. During his career, the author led teams of Marines, truck drivers, and software developers. Each represents a very different leadership challenge. The United States also uses an up-or-out system, so leaders must progress or leave the Service. Some may argue this institutionalizes the Peter principle. Laurence J. Peter's 1968 book *The Peter Principle* observed that people within a hierarchy tend to rise to "a level of respective incompetence."[13] The military is most definitely a hierarchy. Officers are promoted based on their success in previous jobs until they reach a level at which they are no longer competent, as skills at one level, such as company command, do not necessarily translate to another. How can not just effective leadership but propensity to lead be measured? Readiness reporting is less concerned with leadership development, but effectiveness of the leaders that are in place. It is worth exploring as there is compelling evidence that despite the efforts in leadership development, we cannot assume the leaders are good to go, the Peter principle is real, and a unit that is properly resourced could be poorly led and fail in combat.

To assess the effectiveness of a leader, it can be boiled down to key indicators. Effective leaders should inspire the retention of officers and NCOs. Retention statistics are tracked and can be pulled. Tactical leadership outside active combat service is difficult. Externally observed exercise is the best opportunity available. A portion of these exercises should be designed to test the key attributes of leadership. Tactical leadership is different than the application of general leadership traits. For example, doctrine defines the role of the leader in ground combat and a leader has three ways to influence the outcome of an engagement: personnel presence, the prioritization and allocation of fires, and when and where to commit the reserve. Of these, personnel presence is the least effective, as it tends to only impact the physical area that the presence is seen or heard yet is still important in building confidence in shared risk. The prioritization and allocation of supporting fire is complex and receives much practice in exercises due to its inherent complexity and danger. The most important of all but hardest to assess

[13] Peter J. Peter and Raymond Hull, *The Peter Principle: Why Things Always Go Wrong* (London: Profile Books, 2020), 13–15.

is the commitment of the reserve. Committing the reserve involves understanding the time-space problem of the battlefield so the reserve is positioned so it can move in time to have the desired effect. Where it is committed is the critical moment of an engagement, and avoiding the most common errors can be hard. The two biggest problems are committing too early and reinforcing failure. They are common errors across militaries throughout history. Exercises must be constructed so that it builds to the critical moment, and the external evaluation should specifically address how, when, and where the reserve was committed. It should be a test of the military judgment of the commander. It is that military judgment that is what needs to be understood for the potential effectiveness of combat units.

In addition to military judgment, a command's conduct of day-to-day operations in the field are a direct reflection of the leadership. External evaluations should also go through the fieldcraft and tactical dispositions of the subordinate units. Sloppy fieldcraft, cutting corners, disposition based on convenience versus survivability, security, and defensibility are all indicators of poor leadership. When the author was a captain, he had a general officer, the division commander, come to inspect their positions during an extended "free play" exercise. He had the distinction of being awarded the Medal of Honor in the Vietnam War when he was a company commander.[14] He walked our lines and got into a machine gun position where he checked the lay of the gun and range card. Fortunately, serious care was taken about such things, and the company commander should lay the guns, and they were properly done. It is likely that poorly led units could go through the motions and place a machine gun along the line, but it is an exercise with blanks, and it is easy to cut corners. There is an old adage that you fight like you train. Evaluations should inspect and evaluate these issues and provide detailed feedback for remediation. Externally, evaluated exercises need to be carefully synchronized with the force

[14] The Medal of Honor was awarded to MajGen James E. Livingston (Ret) for his actions commanding Company E, 2d Battalion, 4th Marines, at the 2 May 1968 Battle of Dai Do in Vietnam. He assumed command of the 4th Marine Division on 8 July 1991.

generation process so it provides the commander with sufficient time to be prepared—and time for remediation is needed.

Ultimately, evaluations of leadership can be performed regularly, but commanders must be held accountable for their leadership. If a leader has a personal problem and is relieved, that should happen, but the Services should not shy away from relieving a commander that does not exhibit effective military judgment and unit discipline. An external evaluation should be able to be assessed as ineffective or not mission capable with remediation requirements. If those are not met or the failure of the evaluation was egregious, the commander should be relieved of command. The flip side to accountability is this sort of evaluation becoming a rote exercise reinforcing slavish adherence to doctrinal specifications in an objective checklist. If holding leaders accountable crosses this line, then it is counterproductive. The Services have fought many opponents that followed their doctrine religiously and they were able to exploit it. During the military renaissance of the 1980s, the Marine Corps published *Warfighting*, Fleet Marine Force Manual 1, embracing the maneuver warfare principles.[15] It was followed by *War fighting*, Marine Corps Doctrinal Publication 1, in 1997, solidifying its principles.[16] Part of this ethos is the eschewing of the "checklist mentality." Checklists can be very handy; ask any pilot. Checklists are invaluable tools for sequential procedures. There are layers of procedures in the military enterprise. These have checklists. Looking at maneuver warfare, the intent is the mentality, not the checklist itself. Warfighting is not all procedural.

Warfighting doctrine like maneuver warfare is a set of principles that can be evaluated. Exercises can be constructed to put leaders into a position of using or not using the principles outlined in doctrine. Let us call this principle-based training. In an exercise, as in combat, many layers of an organization are working concurrently toward a common goal.

[15] *Warfighting*, Fleet Marine Force Manual 1 (Washington, DC: Headquarters Marine Corps, 1989), 58–61.
[16] *Warfighting*, Marine Corps Doctrinal Publication 1 (Washington, DC: Headquarters Marine Corps, 1997).

Many of these activities are procedural; others involve critical thinking. Leaders can be evaluated for their use of the principles, much like the previous discussion of when and where to commit the reserve. Even something as common as an operations order has a procedural aspect. The order has specific paragraphs and formatting. The standardization of the format allows for clear communication. Contained within the order is the application of the doctrinal principles.

Ground maneuver has many types of operations, each with some procedural aspects, and having a checklist to ensure coverage in training should not be discouraged. How does the higher headquarters know if the depth and breadth of the training is comprehensive? In the experience of the author, there was a faddishness about certain types of operations. During the late 1980s, it was the nonilluminated night attack. It became part of everyone's training plan and took a disproportionate amount of time to perfect at the expense of other types of operations. The British had used it to good effect in the Falklands in 1982 and it became the capstone training event for many units.[17] The prevailing thought was that due to its inherent difficulty, the event would reinforce a broad range of skills. It was not really comprehensive, though. There were difficult and dangerous operations requiring training that received less attention like passage of lines and relief in place. The author subsequently had to do these operations in combat with inadequate training, and it was very dangerous. The irony was that in combat they did not do a nonilluminated night attack because it made the use of supporting fires and close air support very difficult, both of which were decisive capabilities in our offensive operations in Operations Desert Storm and Iraqi Freedom. These had also been cornerstones of U.S. offensive doctrine for decades. There should be an expectation that a trained unit has some training across the enumerated types of operations, and the leadership should document the when, where, and conditions of this training in the training management system of record.

[17] Joe Shute, "The 72-Hour Battle that Won the Falklands War," *Telegraph,* 12 June 2022.

Quality of Life and Retention

One of the primary factors behind the growth of military capability and the tactical overmatch mentioned already is the all-volunteer force. Having a professional, volunteer force makes quality of life, recruiting, and retention metrics critical components of building and sustaining readiness. These metrics exist and are used in many forums across the DOD, but there is a subtle internal seam that exists between the personnel and the readiness communities. Readiness measures the size and depth of the hole. Personnel represents a never-ending cycle of recruiting, training, and attempting to fill the hole in unit staffing. The readiness community and many unit commanders do not have visibility on the health of the pipeline. This problem has become vastly more complex during the last 50 years as the variety of skills has exploded. Even units that would seem to be less complex, like an infantry battalion, has dozens of skill designators besides riflemen. A key metric that needs development and inclusion is retention. This does speak to many of the hard to measure human factors. People can vote with their feet. They may leave at the end of their obligated service of their own volition, and it can be difficult to measure accurately why. Retention is complicated as the structure is hierarchical, so no Service needs to retain all the first-term enlistees. They need to target the quality people and measure their ability to retain them at each decision point. For enlisted members, the key decision points are reenlistments. The evaluation system is the logical start point that tasks leaders performing the evaluations to rate not only current effectiveness, but propensity to be successful at the next level. These types of evaluations need to flag that member for potential retention. The larger institution then looks at the staffing numbers and sets the global retention goal. Ideally, the number of personnel flagged for retention is greater than the goal. If the flagged personnel are below the goal, then there is a fundamental problem. Leadership must be tasked to look at members not flagged for retention and open the aperture. Ultimately, there is a need to measure the effectiveness at retaining the ones flagged for retention as well as those retained that were not originally flagged.

With members flagged for retention that did not remain, it is absolutely critical to find out why. Is it plain market competition, is it toxic leadership, is it poor quality of life factors like family housing, healthcare, or education? In the late 1980s, it was announced that the number of dependents of Marines outnumbered the number of Marines.[18] That was the "no going back" moment when issues of housing, healthcare, job opportunities for spouses, and on-base education went from shoe-string budgets and nice-to-have to absolutely essential. U.S. military readiness depends on retention of skilled and experienced servicemembers. The Services must measure the relationships between the health of these services and the required retention. Knowing the correlation of these factors can help justify and optimize budgets to produce the required retention and make the required number of ready units.

For the servicemembers, the metric for personnel tempo (PERSTEMPO) measures the number of days spent away from home in a rolling two-year window. There are specific rules for creditable days versus noncreditable days. There are challenges in data collection such as training exercises that are often not captured in the PERSTEMPO systems. It is a formal requirement, and all the Services are required to calculate it to the best of their ability, so some data exists.[19] It is then possible with reliable individual to billet mapping to understand the collective PERSTEMPO across a unit. Linking PERSTEMPO to retention will indicate whether it is a significant factor in personnel leaving. In the author's transportation industry experience, there was an assumption that time away from home was a significant factor in truck driver retention. The company studied the problem and discovered from the data that there was not a direct correlation between time-at-home as measured in days per month and driver retention. After further study, the biggest factor was economic competition. In areas

[18] *2022 Demographics Profile of the Military Community* (Washington, DC: Department of Defense, 2023), 116. As of 2022, the number of Marine dependents is below the number of active duty Marines; however, for the all the armed Services, there are 1,304,720 active servicemembers and 1,507,987 family members for a ratio of 1:1.2.

[19] *Department of Defense Instruction 1336.07, Management of Personnel Tempo* (Washington, DC: Department of Defense, 28 December 2022).

where there were many options besides over-the-road trucking, drivers were more likely to pursue other work even though they enjoyed the most time at home. In the author's military experience, PERSTEMPO impacts different segments of the population differently. Young, single servicemembers often joined to be active and "see the world." Extended times at home station often drive down morale in that population. They did not leave family and friends and go through boot camp to stand watch every third day at Camp Swampy. In the NCO and officer ranks, where they are often married with families, the opposite is true. They seek stability.

Contractors

The use of contracted labor for a wide variety of tasks across the DOD and the Services allows for the ability to bring in specialized workers that would be difficult or impossible to hire or recruit and develop the necessary experience when needed. It can also free uniform members for more combat related tasks. The financial benefit is that the capacity can surge as needed without the long term commitment with uniform servicemembers and civil servants. The DOD obligated more than $360 billion (in 2020 dollars) in fiscal year 2018, more than all other federal agencies combined.[20] Congress requires DOD's Inventory of Contracts for Services (ICS) (10 U.S.C. § 2330a[c]), an annual report that provides information on certain categories of contractor hiring by individual DOD components (e.g., the military departments and defense agencies). In fiscal year 2017, the ICS report showed 464,500 full time equivalents.[21] This overall report cannot easily be traced to unit-level capabilities. There are challenges when determining dependencies for contracted labor to be able to calculate discrete readiness. If contract labor is considered no differently than military or civil servants, then considering it as part of the personnel dimension of readiness makes perfect sense. When determining personnel readiness, the actual person-

[20] Heidi M. Peters, *Defense Primer: Department of Defense of Contractors* (Washington, DC: Congressional Research Service, 2020).
[21] Peters, *Defense Primer*, 2.

nel are compared against a wartime requirement. This basic rule, which also applies to equipment and training, would create a requirement for a contracted position. The Antideficiency Act (31 U.S.C. § 1341) prevents the DOD from creating a requirement for a contract that is not funded.[22] Unless the law is changed for this case, it is not currently allowed. There are some viable options that have been used that do not violate the current law. The ability to access contracting capability and capacity to provide contract labor when needed can be assessed as a mission essential task. The need for specialty contract labor can also be captured as a resource standard for a mission essential task. Allowing contract labor to fill authorized positions for military or civilians where possible can show the dependency where appropriate. Both policy and statute would require adjustments to consider contract labor as part of the personnel dimension where it should logically reside.

Munitions and Consumables

It has already been said that there is the ability to calculate an ordnance level in special cases. This is used for units that are deployed with specific types of ordnance that cannot be easily changed. There is a detailed munitions planning process that is not normally part of traditional readiness reporting that looks at war plans and is appropriately constrained by storage limits and affordability. No one has unlimited space to safely store munitions and buy mountains of ammo that have a shelf life limitation. The general understanding is how much do the Services need (consumption) compared to what they can store and move around (distribution) and compare that to the ability of industry to make more (production). There are plenty of historical examples of problems with each of those three legs. The World War I examples cut across all the combatants on consumption, distribution, and production. The problems get worse the longer combat continues. There are fundamental concerns on consumption, as historically there is a ten-

[22] "Involving the government in any obligation to pay money before funds have been appropriated for that purpose, unless otherwise allowed by law." Limitations on Expending and Obligating Amounts, 31 U.S.C. § 1341(a)(1)(B).

dency to underestimate consumption. This can be the result of letting affordability drive the analysis. The consumption estimate should produce two numbers: the full estimate and what is affordable. Underestimates also come from an unrealistic or sanitary view of combat where a set of known targets are serviced by a known number of assets that need to shoot x number of rounds to have the desired effect. In reality, units engage the targets they can detect as the desired targets move or hide. Units will also engage a target with what they have versus the most suitable munition. The Services saw this in Afghanistan where the United States expended large numbers of Javelin and TOW antitank missiles against long-range infantry targets.[23] The most difficult part of estimating consumption is with new capabilities. If the new version of x is better, are fewer needed? Users like to think that getting a better munition includes the need to buy less as a selling point, especially since the unit cost is invariably higher than what it is replacing. With some new capabilities that are truly new, there is no basis for comparison, so consumption would only be constrained by availability.

The distribution pillar can be incredibly complex as there are so many facilities around the world. The United States can safely store munitions in many locations across the country and in facilities abroad. The allocation of the fixed space is an initial layer of complexity. This is data informed as the size and packaging of munitions and the floor space available are known. As opposed to warehousing dry goods, there are many more restrictions to safely store and move munitions. Where they are stored impacts how fast they can be moved to the point of need. The requisition and distribution by specific munition time is not practical in many cases. During World War II, a "unit of fire" was used as a prepackaged set of munitions that a unit would need given the standing daily consumption of all the types of munitions in that unit type. So, an infantry battalion's unit of fire includes bullets, grenades,

[23] Liz McCarthy, "TOW System Upgrade Goes to Troops in Afghanistan," U.S. Army, 11 September 2009; "Javelin Weapon System," Raytheon, accessed 22 May 2024; and "AAR Analysis of Javelin Use in OEF" (Raytheon presentation, NDIA Joint Armaments Conference, Seattle, WA, 15 March 2012).

and mortar shells that they were estimated to consume per day. The size this would take up by loading it together made the distribution much more efficient.[24]

Production is an interesting problem as ideally the storage and distribution should be sufficient to fulfill the consumption until the production supplies it. There is a dizzying array of munitions and many manufacturers. There are government-owned, contractor operated facilities and there are contractor-owned and operated facilities. Each has unique considerations of steady-state capacity versus surge capacity, actual production, resources needed to move actual production to surge or maximum capacity, supply chain, subcontractors, and subcomponent manufacturers. A sophisticated missile may have a prime contractor and assembly facility but may need dozens of subcontractors and components manufactured in many facilities all over the place.[25]

Munitions are measured in great detail, but it is not normally included in the readiness sphere. There is a need for common metrics to be captured across the munitions enterprise to understand the ability to fight and to estimate how long it is sustainable. A unit may be fully ready in their readiness reports but have no idea that there could be insufficient munitions for the unit to sustain combat operations.

In addition to the more detailed aspects of munitions, the idea of the ability to access the necessary consumables for units to operate is not considered in current readiness policies. In this case, consumables are the classes of supply needed to sustain the unit (e.g., food, water, fuel, ammunition). Units at home station draw on central supply sources for training, so it is logical not to consider them at the unit level when at home. The installation or organization providing the cen-

[24] *Ammunition Supply*, Army Field Manual 9-6 (Washington, DC: War Department, 1944), 4. *Unit of fire* refers to: "A unit of measure for ammunition supply within a theater from a tactical point of view, based upon experience in the theater. It represents a specified number of rounds per weapon, which varies with the types and calibers of the weapons. The unit of fire is not synonymous with the term 'day of supply'. . . . In general, it represents a balanced expenditure by the various weapons under conditions of normal action. The unit of fire prescribed by the War Department may be modified by theater commanders as necessary for each individual theater."
[25] Luke A. Nicastro et al., *Defense Production for Ukraine: Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2024), 7–11.

tralized source of supply should be reporting on the sufficiency of its stocks to support all the units' training needs. Units that are underway, like ships, or units on operational missions that have on hand supplies drawn should provide an assessment of current capacity. To understand the ability of the unit to operate, this type of data is not necessary to be finely detailed and could be as simple as days of supply that is often measured in operational planning.

Allies and Partners

The United States has fought all its major conflicts during the last 100 years as part of or leading a coalition. Some of these are allies, those with which the nation has formal treaties, such as the North Atlantic Treaty Organization (NATO), or others considered partners. A key pillar of strategic readiness is allies and partners.[26] Some of the most effective deterrence to aggression is ongoing cooperation with the United States and/or allies and partners as demonstrated in major exercises. These build rapport, train interoperability, and demonstrate resolve to work together. Despite its critical importance, the government does not measure the readiness of allied and partner forces integrated with U.S. forces in its systems that would allow the detailed capability assessments performed on U.S. forces.[27] There are some basic barriers to including them in readiness assessment systems. Most of these barriers come from misunderstanding and straw man arguments.

The barrier is the classification of readiness systems. The initial argument is that the government cannot allow or manage the broad range of foreign personnel access to the system. The author's response is that there is no plan to allow allies and partners to enter their data directly into this system. That is what U.S. liaison officers are for. The government has direct liaisons with many allies, military attachés, foreign area officers, and regional area officers that can be tasked with

[26] *Department of Defense Instruction 3000.18, Strategic Readiness* (Washington, DC: Department of Defense, 30 November 2023), 11.
[27] *DODI 7730.66, Readiness Reporting Guidance for the Defense Readiness Reporting System* (Washington, DC: Department of Defense, 10 December), 27. The policy now exists to close this gap, and this issue will be corrected in a phased implementation during the next few years.

entering readiness assessments of allies and partners. It will never be as detailed as the U.S. interconnected data systems, but it starts with an order of battle and characterization of their forces. For American forces, this is called unit registration, where units and their hierarchy of command are captured in a database. Many columns then describe attributes of a given unit.[28] Having a reliable and managed allied and partner order of battle in a compatible format would be a massive improvement over what in place.

Another argument is that U.S. allies and partners are not necessarily forthcoming on the details of their readiness. They have a variety of reasons why that is the case. As the Services train with, have exercises, or interact through liaisons, the liaisons are tasked with providing the basic readiness assessments of the allied and partner forces. This is a normal function during wartime coalitions; it just needs to be an ongoing requirement. Information on coalition partners' readiness is part of a commander's critical information requirements that include friendly force information requirements.[29] These are part of the intelligence field, and some get squeamish about "collecting" intelligence on allies and partners, but the United States cannot be effective as a coalition if it does not have timely, accurate, reliable information about allied and partner forces for equitable comparison to facilitate appropriate tasking of forces to missions. The argument here is that it is better to collect this information through liaisons as they will look at readiness in the same way the United States looks at its forces. Having a foreign officer provide data directly may be counterproductive as they may have a different approach to readiness assessment that is not compatible with U.S. data. With that being said, it would be a bit arrogant to presume a monopoly on good ideas in this process. The United States should be open to best practices and good ideas from allies and partners that could improve how it assesses readiness.

[28] *DODI 7730.66, Readiness Reporting Guidance for the Defense Readiness Reporting System*, 17.
[29] *Joint Intelligence*, Joint Publication 2-0 (Washington, DC: Joint Chiefs of Staff, 2013), I-6–I-8.

The readiness assessment data systems are not currently configured to allow the registration of foreign units. This would need to be programmed in the databases and user interfaces. It should function very similarly to U.S. forces, as much as possible, but allow for lack of automated data feeds that run much of the current readiness data collection. The provenance of the data is important: who entered it, when, collection methods (observation of training, open-source reporting, foreign military reporting, etc.) would all need to be captured since the data is not automated. The provenance must be tracked so the assessment can be caveated if the data is incomplete or stale.

The way ahead is to establish the requirement and start somewhere. The easiest is to start with NATO and begin with the registration of the full order of battle (the full force structure of our NATO allies). As these are entered and their command hierarchy is captured, liaisons can be trained and held responsible for providing assessments in the same format. This can work out the kinks and be expanded to other areas in a measured rollout. It is a reasonable estimate that there could be decent working orders of battle for allies and partners within two years, and decent readiness assessments for a measurable percentage within two years after that. Recommended goals should be to have 100 percent unit registration coverage for allies, 80 percent for partners, followed by readiness assessments quarterly for 80 percent of allied units and 60 percent of partner units during a two to four year period. This can facilitate capability-based assessment of combined/coalition forces. To not pursue this or a similar approach is an inexcusable lapse of due diligence in building and understanding a broad strategic readiness framework.

Safety

Military training and operations are inherently dangerous even without enemy action. The United States routinely operate year-round in a variety of climates and conditions and to do that safely takes lots of practice. Leadership must constantly balance building proficiency with safety. The Services take safety very seriously and have extensive programs and guidelines to assist commanders and reduce the incidence of a mishap. The title of a safety incident or mishap sounds fairly mild but is classified into several categories with a class A being serious injury, fatality, or significant damage to military equipment. A mishap is not necessarily an accident. It includes everything from mechanical failure to human error. It is an unintended event resulting in damage, injury, or death. Mishaps are tracked and investigated to determine root causes, and the results of these investigations are regularly incorporated into training and standard procedures. When asked if mishaps have an impact on readiness level, when data is reviewed throughout the years, mishaps are very rarely large enough to impact the readiness assessment levels of a given unit. A major aircraft or ship incident may have a definite impact such as a collision or fire on a ship causing it to be lost or in unscheduled repairs for months. The reverse of the question is where can interesting data be found? Does degraded readiness increase mishap rates and severity? Is there vulnerability when a slow reduction in readiness to perform complex tasks makes it more dangerous than it was in previous years? These types of correlations between degraded materiel readiness or training proficiency to mishap are worth pulling into the readiness calculus. Some of this is done for aviation as there are measured relationships between flight hours and mishap rates. If flight hours are reduced due to lower aircraft availability rates, does the mishap rate rise? There is some of this data by specific aircraft types, there are correlations, but that does not equal causation. It is still probabilistic, that is the chances increase of a mishap, but the type, location, etc., has many more local details as part of the comprehensive safety program and conditions to be able to predict where, when, and how. Even so, it is an indicator of aircrew proficiency well understood in the aviation community. Flight hour rates should be included in aviation readiness reporting to provide ongoing support for this type of analysis. Similar data for ground units is not nearly as clean or does not exist and represents a significant data gap.

Similar to mishaps, injury rates are worth exploring. Readiness reporting does cover personnel who are not medically deployable. Beneath that metric then includes a variety of medical conditions from cancer to pregnancy, but the most common is sports injuries, including muscle tears, broken bones, stress fractures, ruptured discs, sprains, shin splints, and torn ligaments experienced during training such as rigorous physical training or tactical training involving lifting and moving with heavy weights. A great deal of effort is expended on training for injury prevention and providing trained medical support and physical therapy to return as many as possible to full duty. Since this is measured, the question asked is do injury rates impact readiness levels? Fortunately, the answer is that very rarely if ever are there enough injuries to lower a unit's personnel level. Like mishaps, the real question is if degraded readiness impacts injury rates. Some preliminary data indicates that compressed training schedules do impact injury rates. Understanding the relationship better can show impacts of changes to the planned force generation to potential injury rates. These injuries may not change a unit readiness level but do cost billions of dollars in treatment and disability as well as the moral obligation to try and prevent injury to servicemembers. Including readiness impacts to mishap and injury rates can expand the understanding of the broader effects of decisions over purely unit readiness indices.

PART 3

CHALLENGES

> *There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.*
>
> *~ Niccolò Machiavelli*[1]

Having established the need for readiness assessments to support decision making and the exponential increases in data as a distinctive aspect of the modern age, the enterprise must confront certain challenges early and often. The reality is that the data informed/driven world is run by a large number of people with diverse backgrounds and agendas, and obtaining true unity of purpose in readiness assessments can be very difficult. A frank discussion of the various challenges and pitfalls will better prepare those working in this area. Many of these challenges were learned the hard way over the years, and it is the author's sincere hope that some may benefit with a few caution signs on the readiness road. No matter how much automation put into the objective data, the nation is dependent on frontline users around the world to input data and make subjective assessments. The readiness professionals

[1] Niccolò Machiavelli, *The Prince* (Mineola, NY: Dover Publications, 2016), chap. 6.

must realize that these users may have an incomplete understanding of the nuances of readiness metrics, will input data periodically, and have competing priorities.

These challenges exist in various forms and are part of the landscape of change. The categorization and descriptions are tailored to the readiness subject. The following human, technology, and political factors will inevitably appear in some shape or form in any discussion of readiness. These are not really problems to be solved, but the terrain on which readiness policy changes must maneuver. In fact, many of these issues are an outgrowth of the military mindset that, in a broader sense, is its key strength. The military mindset is a type of groupthink born from a shared purpose. Each Service has its own variation on the theme. In it is a strange, ironic dichotomy. On the one hand, the military can be very innovative, pushing the bounds of technology and human performance. On the other hand, in processes and procedures, it can be profoundly conservative and parochial.

CHAPTER 10

HUMAN FACTORS

State of Play

The author has always told his teams in uniform, in industry, and in the Pentagon, "No matter what it says on the door, we are in the people business." Human factors in readiness assessments and effecting change are inevitable. This part points out the potholes, but they cannot be fixed. Personalities, agendas, and organizational culture all contribute to the factors enumerated below. The beauty of statistics is that they can account for these variables in some cases. Policy and oversight adjustments can minimize the deleterious impact of some of them. Whichever approach, they cannot be ignored.

Normalization of Deviance

Sociologist Diane Vaughan is credited with coining the term *normalization of deviance*.[1] It captures an aspect of group behavior, sometimes referred to as *misconduct* within an organization, which many may have observed in their daily lives. A simple example from the daily commute is the speed limit on the freeway. The sign reads 55 miles per hour, but it is common knowledge that it is not enforced unless someone exceeds

[1] Diane Vaughan, *The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA* (Chicago: University of Chicago Press, 2016), 62.

at least 10 miles per hour higher than the limit. The new practical limit is now 65. Should someone get ticketed for going 60, they would feel wronged. The military can work this concept well. In concept, a military organization is the very definition of a bureaucracy. There are formal orders covering all aspects of the institution. There are Department of Defense directives or instructions, Chairman of the Joint Chiefs of Staff instructions, Army regulations, Air Force instructions, Navy instructions, and Marine Corps orders that all spell out policy and procedures in varying degrees of detail. The challenge comes from the sheer volume. There are hundreds of policies published that can be interrelated, but not well synchronized due to the amount of staff work and coordination required to update a policy directive. Over time, the directives pile up like unread magazines in a hoarder's house. Eventually the pile grows too large and falls over. The most conscientious soldier or civilian can find themselves out of compliance inadvertently and often there is no one watching. The military enterprise also has its own sociology; it is not a random sample from a given society. It is a particular set of personalities that takes the general tendency to a new level. The military enterprise seeks to have a bias for action, determination, and creative problem solving. The military ethos celebrates those that cut through the Gordian knot of red tape to get the job done. In the defense of the busy junior officers and noncommissioned officers (NCOs), the plethora of regulations make it seem impossible to follow all of them to the letter, because they can be obscure or contradictory. This is often cited as the beginning of the normalization of deviance. Deviance can manifest in readiness data in two distinctive ways.

Lack of Enforcement of Standards

The first type of deviance is the overt lack of enforcing of standards, which erodes standards in a conscious way. This is the more obvious of the two manifestations. A common version is the publication of a directive policy with no enforcement mechanism. It is much easier to publish a directive than enforce it, which is the incentive to do so. An organization can spit out policies in the greatest detail, but without some sort of audit or enforcement provision there is no way to know if they are being performed. In organizations with longevity in various roles, the power of a personality can carry a directive forward, but in military organizations the turnover is too frequent to rely on the force of a given personality. If enforcement of policy is a function of personality, then it is not sustainable as there is no guarantee that the next personality in the role will want to do it the same way. An example experienced was a particular training event to be conducted by units every two years. The senior leadership was concerned that this was not being done. The staff engaged the responsible organization, and they put up a set of charts on how many of these events were done. They pointed out that one part of the organization did twice as many as another. Nowhere on the charts was there an indication of how many events each organization was required to do. The organization doing twice as many was still at only 50 percent compliance. There was no enforcement mechanism to notify units when it was due, facilitate accomplishment, and properly record the achievement. The organization establishing the requirement has the ultimate responsibility of facilitating its accomplishment. Units did not comply with the policy as they had competing priorities and determined it did not add value to them. They were not acting maliciously, but it was not sold to them in such a way as they saw its value. Once the value proposition is established and accomplishment of the task is facilitated to where units have a fair chance to comply with the policy directive, using the performance data to shame units into compliance is not the most constructive approach. Leveraging the naturally competitive nature of military leadership to drive compliance, or more importantly achieving the actual goal and intent of the policy versus checking the compliance box, can improve achievement.

Erosion of Standards

The second type of deviance is more subtle and as such can be very dangerous. If resources or training are slowly eroded by external constraints, then poor quality training becomes the norm. The system adapts to the resources it has. New generations of soldiers may not realize the extent to which the current standard is substandard. This an example of the pernicious impact of risk management across the enterprise that may have "dumbed down" training as part of occupational risk management practices and that is now the norm. It is also a natural process of time, essentially the entropy of a training event. As an example, a Service built a live-fire and maneuver range. It involved complex maneuvers, coordination of supporting arms, and use of terrain. The range and training events it achieved become capstone training events for ground combat units. While a large and complex range, the safety constraints from using live ammunition for supporting arms are reasonable so the firing locations and routes of maneuver are known ahead of time. For several years, the event fulfills its role testing a generation of soldiers, officers, and NCOs to their limits. However, over time, the event is performed by multiple generations of soldiers. Officers and NCOs have experienced it multiple times across their careers at various levels. Through heavy use the firing positions and maneuver routes are worn into the terrain. What was once a challenge is now a rote, scripted exercise. While not useless—the skills used are important—many of the qualitative factors that made it a capstone event have faded over time. The tactical problem resolves into a schoolbook answer that does not require or reward critical thinking. Senior leaders who may look back on the capstone event with a touch of nostalgia can easily be deceived that it was as good of a test of readiness now as it was 20 years before.

Report Card Mentality and Gaming the System

There is an old adage that says, "Be careful what you measure, because that is what you are going to get." This is a variation of Donald T. Campbell's law: "The more any quantitative social indicator is used for social decision-making, the more subject it will be to corruption pressures."[2] This came to life for the author when working in industry with design of performance metrics linked to pay bonus structures. Once metrics are linked to continued employment, promotion, and compensation,

[2] Donald T. Campbell, "Assessing the Impact of Planned Social Change," *Evaluation and Program Planning* 2, no. 1 (1979): 67–90, https://doi.org/10.1016/0149-7189(79)90048-X.

human nature will intervene. Other works have covered this tendency in great detail, such as Jerry Z. Muller's *The Tyranny of Metrics*.[3] Interestingly enough, pay or promotions are not linked to readiness outcomes. Quite the opposite—the classes taught to readiness officers and commanders explain that readiness reports are not scorecards for a unit or its commander. In reality, there is a perceived scorecard mentality, coupled with the personality types that are military unit commanders. They are intensively competitive, performance goal oriented, and they have an intense desire to be ready and successful in the ultimate crucible of combat. Any system of measuring performance can be gamed to skew to positive performance. For example, after an exercise where several items of equipment broke down, the unit could delay the induction into the maintenance system until the next morning to balance against items coming out of maintenance. There is local discretion in many areas that are fairly minor in readiness metrics, but commanders will make readiness informed decisions to maintain their resources at the threshold between two levels. Carefully managing these resources can maintain a unit just above the threshold. At what point does managing resources carefully to maintain readiness become gaming the system, which can be difficult to gauge? As objective, data collection has improved during the past decade, we see within the authoritative data sources what amount of skewing a commander could do. A straw-man argument is to throw out the whole enterprise due to this measurement bias. The good news is that while a commander's discretion can game the system, the positive bias is low. Another important offset to positive bias is a measurable group of commanders with a negative bias. These commanders belong to a school of thought that a unit is not ready until it reaches the pinnacle of readiness. This binary view of readiness is a type of negative bias that places the bar at a very high level, such as a major training event. While healthy skepticism is not inherently bad, a realistic view of training is important to gauge progress. Fortunately, military culture strongly encourages personal ethics and discourages

[3] Jerry Z. Muller, *The Tyranny of Metrics* (Princeton, NJ: Princeton University Press, 2018), 169–73.

falsifying records, so the incidence of actual fraud appears to be low. The positive bias gamers are nearly canceled out by the negative bias skeptics and appear in a balanced bell curve distribution.

Ever Increasing High Standards

Not long ago, the author sat in a meeting discussing readiness in the training of fighter aircraft. One participant passionately asserted that if a squadron had not gone through the equivalent of the Air Force's Red Flag exercise it was not ready. This exercise had instrumented ranges, dedicated adversary aircraft, and realistic threat emitters.[4] The author was blunt in his opposition to that assertion. While such training experience is valuable, there is a broad range of readiness leading up to such an exercise. The size and complexity of such a training exercise is so great that there is not enough capacity to put all fighter squadrons (Air Force, Navy, and Marine Corps) through the training regularly, so it is therefore an unobtainable standard. There is a massive investment in training fighter pilots that takes years, and the pilots gain proficiency leading up to participating in such an exercise. The capacity is so limited that they normally send handpicked pilots to go through this high-end training, and these become the certified weapons and tactics instructions back at their home squadrons. This gentleman's view of readiness was so myopic that the not ready category would be so large as to mask the true range of capabilities available in the fighter squadrons. A squadron may be ready to perform a wide variety of tasks in many conditions but could still benefit from a high-end exercise.

There are similar capstone training events across the Services, whether it is the Army's National Training Center (NTC), the Marine Corps' Integrated Training Exercise (ITX), and the Air Force's Exercise Red Flag, all provide advanced skill building in challenging environments.[5] There is not enough capacity for all units to cycle through as a

[4] Walter J. Boyne, "Red Flag," *Air & Space Forces Magazine*, 1 November 2000.
[5] "Tactical Training and Exercise Control Group," Marines.mil, accessed 23 May 2025; and Matthew Cox, "Headed to the Army's National Training Center?: Here's What You Need to Know," Military.com, 19 May 2019.

basic readiness requirement. It is challenging to synchronize the training with the force generation cycle, so the training complements the predeployment training. In many respects, these training events build institutional readiness across the force. These exercises should be distinguished from a certification exercise. Some forces must go through a tough, evaluated exercise to certify that the unit is ready to deploy. Given time, space, and resource constraints it would not be practical to leverage these high-end training opportunities to certify every deployment. This does not mean the certification exercises are not as rigorous as an NTC or ITX rotation, but the location and timing is more specifically tailored to the deployment.

Bravado or Ever-Ready Mindset

The opposite to the never-ready mindset is the ever ready. At a basic level, the military recruits, trains, and retains driven personality types that want to succeed. In extreme circumstances, units that are not ready by the standard measurements will be committed, and they can do well. Having confidence in yourself and your command is a good thing but should not be confused with the purpose of readiness measurements. The larger institution needs to measure how effectively it has distributed its resources. The ever-ready approach manifests in two ways. It is either forward looking or overvalues intangible factors. The forward-looking aspect reports that the command is ready "if." The if can be anything from more personnel or equipment to training completion. It can be tempting to mark a unit ready if the personnel and equipment are known quantities that are potentially available or en route to the unit. For example, "I have 50 new privates en route from school next week so with them onboard I am ready." Until those are joined to the unit, there is no true guarantee that they will arrive. In an emergency, they could easily be rerouted to a different unit. It can also look like this: "The prepositioned equipment at location x makes me ready to perform my mission." Like the inbound personnel in an emergency, the ability of the unit to get to the prepositioned equipment could be interdicted by enemy action, or the prepositioned stock could be hit in a preemptive strike.

Intangible factors are real. Military professionals have studied these factors for hundreds of years.[6] Command climate, unit cohesion, and morale are known factors but are difficult to measure. A commander's narrative can certainly address them, but they should not pretend they do not exist. Morale can change rapidly with weather and tactical conditions. Command climate and cohesion are built and can be carefully cultivated, however, sometimes commanders can be deluded by their own impressions. These toxic command climates happen, and the commander that is toxic is not likely to realize it. In the author's experience, they are more likely to be in the ever-ready camp. Fortunately, the author has worked with many fine leaders over the years who built positive climates and highly cohesive units. Part of their value was a more realistic appraisal, which made it more likely that their readiness assessment was more fact based. The ever-ready assessment usually contains this argument: "Despite the numbers, our unit is highly motivated and is ready for any challenge." While there is no doubt that a highly motivated unit is in a sense ready for any challenge, without the appropriate resources it cannot physically produce the output standards of the unit's mission. A unit could have the best pilots and ground crew, but if the mission requires a sustain sortie rate of x and the unit only has 50 percent of its aircraft mission capable, it cannot generate the needed sorties to be ready. Once a unit has sufficient mission-capable aircraft, submit a new report with the correct readiness level.

Ever ready is a version of a resting-on-your-laurels mentality. It would be a huge mistake to think that U.S. adversaries are not working as hard or harder. There are too many examples to count of highly confident forces losing to better prepared adversaries. Finding the balance between never- and ever-ready mindsets goes back to chapter 1, where true readiness exists on a continuum between the two poles. Politically speaking, the United States came out of Operation Desert Storm and

[6] Carl von Clausewitz, *On War*, ed. and trans, Micheal Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 156–69, 184–93.

the dissolution of the Soviet Union pushing the ever-ready end. The protracted wars in Afghanistan and Iraq and their anticlimactic conclusions have reset many to the never-ready end.

Straw Man Attacks on Readiness

In readiness data, there is a common line of attack that uses the classic straw man tactic of setting up an unrealistic standard to knock it down. For readiness, its very complexity can lend itself to this attack. All aspects of readiness cannot be quantified, so some will say if they cannot measure x, the entire system of assessment is invalid. It is important to push back on this approach with an accounting of what is measured, that readiness does not confer certainty of outcome, and the numerous other variables represent a massive investment of money, personnel, and time. If someone can measure 19 of 20 variables but the last one eludes us, is it really logical to flush the entire process? Is certainty of outcome even possible given a thinking, dynamic adversary?

Where this approach is observed, it comes from an analysis that the leader does not agree with the conclusions. It is not uncommon to have seen leadership disagreement with the data on both sides of the spectrum with the analysis containing either positive or negative results. Another manifestation is the hot topic of the day. Some new concept to perform readiness assessment has gained traction or visibility with leadership. Then comes a demand that it be included in readiness reporting. This creates an ever-increasing reporting creep over time. Additional data requirements added into a readiness assessment will persist for decades and can undermine the quality of the data provided. The hot topic may have passed into obscurity years ago but once added into the system the frontline users are asked to provide the data and the connection with the why behind is broken. This then makes the assessment included ask odd or irrelevant questions that merely create confusion and frustration. If the users providing the data do not understand the question or why it is there, one cannot expect a useful answer.

The hot topic problem is unavoidable. If Congress and other senior leadership wants to know, organizations have an obligation to provide the best answer possible. Building temporary data collection capability into readiness assessments is the best way to accommodate the hot topic. Temporary data collection can be removed when the topic loses its relevance or becomes institutionalized in other routine processes. The hot topic does not necessarily mean forces are any more or less ready than when it became a topic of interest.

The other common straw man attack is that readiness is just a snapshot and is out of date by the time a senior leader sees it and therefore is of limited utility. It can also be called backward looking. There is some truth to this as readiness reporting by statute has an expectation of currency. The law demands near real-time readiness. The current assessment methodology has a situational report aspect to it. Most think of it as a monthly report, and it is common practice to take monthly data and present it in the next month, so there is some truth to the lack of currency. However, there is data to counter the argument. First, units have all the reports, not just the latest, so the analysis sections look at reports over time. Units also have the data used to calculate the report, so even more data stands behind the reported data. With this, units aggregate readiness data across unit types and communities and show them as trend lines. This data clearly shows that readiness values are not particularly dynamic. An analysis of *why* goes back to one of the central tenets that readiness is not an accident. Units are organized, staffed, equipped, and trained to do missions. The institution is tuned to make ready forces to meet the demand. Once leaders understand that it is a self-fulfilling prophecy, it helps that day-to-day readiness is anomaly detection or impacts of changes to the plan. Like any engine, the force generation process could experience a problem internally that then is detected in readiness levels. This is a basic function of readiness sections at all levels of the military enterprise: to catch issues at the lowest level and resolve them or escalate to higher headquarters for help.

The key to addressing the snapshot concern is including trends in virtually all types of reporting. If one report shows a readiness level, it has a basic meaning of whether this unit is ready or not ready. It does not indicate if the unit is supposed to be ready now or not without reading the free text remarks. How ready was it planned to be, and is this consistent with the last 3, 6, or 24 months? Even a unit that is ready too early could be a negative if another unit of the same type is not ready when it is supposed to be. This could indicate an error in the distribution of resources. Building and including these trends and plans is not horribly complex; it is well within current technological capabilities. Providing this contextual data is helpful to commanders and senior leadership.

Ride to the Sound of the Guns

There is a tendency among military members to heed Marshal Joachim Murat's admonition to "ride to the sound of the guns!"[7] The aggressive bias for action mindset is a highly desirable trait in battle. The negative aspect of this can be a hyper focus on one thing. During the Cold War, this worked well, as the United States had a singular threat, but this left the nation vulnerable to asymmetric attack. One of the major points of this work is to emphasize that military readiness must include the full range of military operations, and the military should be flexible enough to look at both potential and current adversaries. If everyone shifts focus to the main effort, then there is not enough in the supporting or reserve efforts. This hyper focus can produce the deficiencies in readiness called the "one trick pony" effect, where the force is optimized to one adversary and is woefully unprepared to act elsewhere. The military can adapt, but often that adaptation is costly in lives and resources. The professional military enterprise is big enough to be able to address multiple threats. The allocation of resources must be made across the range of operations and potential adversaries. It is not possible to train everyone to do everything. Leadership must clearly assign resources so that there are some forces that are organized, trained, and

[7] Likely apocryphal quote attributed to Marchal Joachim Murat at Waterloo, but also to the Duke of Wellington as "march to the sound of the guns!" and to Gebhard Leberecht Blücher also at Waterloo. Murat was known as an aggressive cavalry commander, so the quote is consistent with his character. In an age of difficult communications, it may have been a common dictum. It was widely attributed as a common saying in the American Civil War, but the usage and provenance is unclear.

equipped for many threats. These other resources may not be large enough in themselves but can provide the healthy cadre to build the necessary forces when needed. The allocation and distribution of these focused force elements should be integrated with the appropriate geographic or functional commands to ensure feedback loops keep pace with potential adversary changes.

The Tapioca Effect

The tapioca effect concept comes from a talk given by Admiral John M. Richardson when he was the Chief of Naval Operations and is worth including here. He indicated that when he had a question or issue, it would be worked by an action officer and subject matter experts. They would develop a hard-hitting brief that pulled no punches. Then this brief would go through several layers of prebriefs that would increasingly soften the language and conclusions until it became tapioca when it came to him. The danger is that senior leadership may not get the true nature of the problem. Historically, the fear of pushing bad news up the chain always ends badly for a military. The admiral was genuinely concerned and tried to change the way he was briefed. Staff officers and civilians applauded as the experience was not uncommon.

Part of this challenge starts with the basic problem that a senior leader cannot know everything. Much must be delegated. The staff, when asked, is challenged with not telling the boss everything they know but only telling the boss what they need to know. Having an action officer-level briefing go straight up the chain without going through the chain is problematic. The chain of command needs to know what is going on and may be in a position to provide additional input or a different perspective. It is common for action officer briefs along with subject matter experts to be emotionally charged or passionate about their subject. In the author's experience, staff did not want to water it down, but they must back up their statements with facts. The longer the staff works with a particular leader, the greater their understanding of what they need to know. For the staff, it must be an honest broker, a conduit of information regardless of whether it is good or bad. This must come from the leader first in the setting of expectations with their staff. The best way for a senior leader to prevent this is to push back and take a deep dive unexpectedly. Ensure that action officers and subject matter experts are in the room. It is a leadership principle of "inspect what you expect." Inspection cannot be performed on every brief, but as long as it happens enough that people take it seriously, it can help. A professional officer culture that rewards honest reporting is crucial. It can be problematic to use words like courage and cowardice in the profession of arms outside the battlefield. It is not courageous to tell the truth in an honest, impartial method. It is a basic job requirement. If staff officers are afraid to tell the truth, they are in the wrong profession. The truth, even when bad news, is not an excuse to be unprofessional either. Staff officers and civilians provide information to senior leaders so they can make the decision. That may include assuming risk. It may not be the recommended course of action. Another leadership principle of loyalty is to then implement the decision as if it were your own.

Perception versus Reality

A common saying is that perception is reality. The gist of it is that perception is as important as reality or often overshadows reality. However, the saying is fundamentally untrue. Perception is not reality; only reality is reality. The two are very different in many cases. How they are addressed are very different. In data-informed or data-driven decisions, the distinction of these ideas is very important. Data is reality. However, data is always some part of reality—a subset of reality. What people think about the data is perception. Dealing with perceptions is an exercise in communication. Can the data team communicate what the data means or indicates, or does the audience draw its own conclusions? In most forums, more time is spent on validating the data than what the data indicates. Perceptions are different from reality, but it is more likely that decisions are based on perception more than reality. That is why it is so important to carefully communicate the data and what the data is saying dispassionately. The whole point of data-informed and data-driven decisions is to use reality as the basis of decisions versus perceptions.

Managing to the Threshold

Setting and managing thresholds of readiness is a general utility to help manage the complexity and volatility of the many different aspects of readiness.[8] After years of looking at readiness data added to various examples encountered during readiness reviews and inspections, it is clear that since the thresholds for readiness measurements are well known, it is common throughout the enterprise that component systems like personnel, supply, maintenance, and training each manage their work to these thresholds as they do not want to be seen as the weak link. In practice, this is easily observable as details behind the 1–4 index are within 2 to 3 percentage points above or below each threshold. Over decades, this becomes ingrained into the acquisition and reliability of equipment. Equipment should be reliable within the given thresholds. This is not inherently bad and is much like the education complaint of "teaching to the test" presumes that the test does not adequately demonstrate the needed skills. If the thresholds adequately measure the general health of that pillar, then it is not bad. Having a detailed understanding will better inform the relative brittleness or resilience of units. The level 1 units generally have a 90 percent or more threshold. In practice, they ride at 90–93 percent and level 2 (80–89 percent) ride in the 87 percent range. The real challenge is that in most cases the level 4 units ride just below the 50 percent range, the width of the level 4 is much greater than levels 1 to 3. That is why we often see units make rapid jumps from 4 to 1 or 2 as they are managing just below the level 4 threshold and one event can jump them rapidly up the scale.

[8] Laura J. Junor, "Managing Military Readiness," *INSS Strategic Perspectives* no. 20 (2017): 9–10.

CHAPTER 11

TECHNOLOGY FACTORS

Even with the enormous amount of data that is collected, people are just scratching the surface of the ability to leverage all the disparate data sources into a coherent pool that supports analysis, decision making, etc. The fundamental difficulty in making readiness data useful is that it is more than just the readiness reporting system of record. Readiness is a layer of new data generated based on lots of underlying data that is summarized, scored, and commented on. The underlying data can be from a range of systems and a range of technology stacks; it is not common across the Department of Defense. Some data sources can be 30 or more years old, some much newer. Each was built to perform their core function such as payroll, equipment maintenance, and deployment planning, and leveraging the data beyond that core purpose can be very difficult.

Obtaining and Maintaining Unity of Effort

The latest technology has opened the door to bringing together all these different data sources. The author spent many years within a single Service getting a handful of data sources integrated into the readiness reporting software. What was learned is that even when you get the data feed integrated, it is not a once and done effort. Both the source and target systems are evolving and that forces the allocation of resources to maintain the data exchange. The Department of Defense is energized to leverage the technology that can bring the data together, but it must persist beyond a single set of leadership.[1] How can the department gain and maintain unity of effort? There is resistance to change in a generic sense that makes changing how things are done difficult. The most common form of resistance is that the group being tasked is not resourced to do anything else. On its face, this is true, but only because a staff will always do work up to its capacity. That is its function, to do work, so it will make work. Like nature abhors a vacuum, a staff abhors downtime. This is not to say that the staff work is worthless. Much of it is coordination processing and formal requirements that make getting concurrence on a noncontentious memorandum a major undertaking. A senior-level meeting involves prebriefing the chain of command across the participants. For example, a meeting of the senior civilian and military leadership with the secretary of defense and the Chairman of the Joint Chiefs of Staff involves including several under secretaries, Service chiefs, and combatant commanders. This meeting would have about 20 senior leaders, each requiring a prebrief and their chain of command for the action office pushes through three layers so two other sets of one-star, then two/three-star levels must be briefed. There are about 60 prebriefs of the read-ahead materials, including any data analytics to be shown. In addition to regular quarterly meetings on readiness, readiness sections throughout the Department of Defense compile monthly reports, two sets of semiannual reports (thus they alternate each quarter).

Keep in mind that there are several parallel tracks ongoing besides readiness that have the same staff processes. The office of primary responsibility (OPR) or action office that has civil servants, military personnel, and contractors perform the analysis, build the briefs, write the papers, and perform the staff functions. To do anything different, there are two basic options: add more people or replace an old process with

[1] Deputy Secretary of Defense, "Creating Data Advantage," memorandum, 5 May 2021.

a new process. The easiest answer is to add more people, and that is the reason staffs grow over time. Adding people takes money and space. The fastest way is to use contractors, which is also quite a common approach that does work. In the long term, though, using contractors is easy to add and easier to cut in the future. Much of what is proposed here is not additive but is meant to replace old processes with better processes. This approach is hard. Primarily, there is a transition period where the old process is slowly replaced, which causes an overlap of effort. Here is where contracted labor can help bridge the overlap period. To make a transition happen, senior leadership must specify what is to be replaced. To do so, senior leadership must be made aware of all that is being done and provide guidance on priorities. What seems important to the staff may not be important to senior leadership. Guidance should be codified in policy, or it changes with regular turnover in leadership, which can exacerbate the staff churn. Regular senior leadership turnover is the single biggest factor that ensures institutional inertia. Terms are so short that a senior leader can typically only achieve a single objective while managing the ongoing requirements of the job.

This work is not meant to deal with organizational dynamics. It is worth noting that to make the changes recommended here and make them a part of the normal processes for a useful period, a brief discussion of what these dynamics are and how to navigate them is necessary. The current processes are inadequate, as has been established. There is a demand signal for change, both from senior military leaders and from Congress as signaled in various provisions of the National Defense Authorization Acts during the last several years.[2] The basic argument is that the current processes have been made obsolete and need to be updated for the realities of the twenty-first century. The concepts require broad acceptance, so someone cannot simply get the key players in a room and make a sales pitch. The recommendations must be socialized and incorporate feedback across a broad community of

[2] John S. McCain National Defense Authorization Act for Fiscal Year 2019, S. 358, H.R. 5155, 115th Cong. (2018); and National Defense Authorization Act for Fiscal Year 2020, S. 365, Pub L. No. 116–92 (2019).

stakeholders. This takes a long-term commitment. In the author's case, it has taken commitment across different roles over several years to get this far. Gaining senior leader understanding and buy-in has occurred as the author's changing roles opened more doors. Their input was not a singular font of wisdom but for reading the room on change and dissatisfaction with current processes. Some changes are subtle, like the slow choking off of resources to obsolete processes. Old processes are rarely explicitly killed outright. They die a slow death of growing irrelevance. Writing a change into policy is a two-year undertaking. Some may wonder why; those that have experience will understand. Policy changes require drafting and review across many departments and all input must be adjudicated. A change can be solidified during formal policy development, but it needs to have sufficient sponsorship and momentum to get it rolling.

Defining a Single Source of Truth

The technology is there to consolidate vast amounts of data into a single, cloud-enabled platform. This platform can host a variety of tools and tools yet to come that need access to data. Progress has been made in the U.S. Department of Defense. The creation of the Chief Digital and Artificial Intelligence Office in 2022 combined the Chief Data Office, the Joint Artificial Intelligence Center (JAIC), and the Defense Digital Services (DDS) with the advanced analytics (Advana) platform, which has set the stage for building momentum on creating and extending a data advantage over competitors.[3] The authorities that come from the organization have pulled more than 400 data sources into the platform. This alone was an astounding accomplishment. It took years to get six data sources integrated with a single service. Advana has integrated hundreds in just two years. Getting the data is not a single solution, but it is a vital step. It provides tools for interacting with the data lake at several levels from nontechnical users to data scientists. Providing a sufficiently detailed data dictionary of the data and its associated business

[3] Jaspreet Gill, "Say Goodbye to JAIC and DDS, as Offices Cease to Exist as Independent Bodies June 1," BreakingDefense.com, 24 May 2022.

rules is ongoing. Within the data, the ability to link data sets together with common data elements will remain a challenge. The Global Force Management Data Initiative (GFM DI) provides a set of data standards to facilitate this linkage and has proven to be very helpful.

While GFM DI has been around for years, it is just beginning to come to fruition.[4] The former deputy secretary of defense, Dr. Kathleen H. Hicks, signed a memorandum in 2021 on creating a data advantage.[5] In that memorandum, she designated Advana as the single source of truth for executive analytics. The challenge leading up to the memorandum was a proliferation of analytics across the enterprise. In executive forums, the different analyses often did not agree as they were built from different sources at different times. Precious time was lost and the use of data to support decision making was undermined. It is perfectly valid for leadership to debate decisions and consequence mitigation; the data should be consistent and validated. There is a level of paranoia that is common across the enterprise that the data should be closely guarded and curated before passing it up the chain of command. This leads to the "my data shows this, and your data shows the opposite" situation. The picture should be the same and debate should be able to arrive at a decision about it. Even with the progress and strong sponsorship, there still exists those wanting to do something different. Some of these people harbor doubts on a consolidated data lake, and others are vendors seeking to grow their business. The current approach provides some important aspects to the government. The Advana platform is not a single vendor. It is a collection of commercial technologies that are integrated by the government. Many different vendors support infrastructure, data streams, and applications. It is open ended for new technologies and vendors to compete and add value to the government. The government oversees it and owns the data rights to the data, algorithms, and application source code. The depart-

[4] *Department of Defense Instruction 8260.03, The Global Force Management Data Initiative (GFM DI)* (Washington, DC: Department of Defense, 19 March 2018). Originally published in 2014, which canceled the original published in 2006.
[5] "Creating Data Advantage."

ment should continue to discourage and avoid proprietary solutions. The government should never be coerced into a single source contract.

Confidence in the Data

A data scientist and staff can produce the most in-depth, comprehensive analysis but that is no guarantee that it will be believed. It can be frustrating, but there are those that see data analytics, projections, and forecasts as a form of smoke and mirrors. It is not expected that leaders make recommended decisions based on the data alone or out of any analyst's vanity. There are many more factors beyond military readiness data that senior leadership must take into account, and they may have very different tolerance levels for risk. Nearly every military decision will have some impact on readiness. People tend to use the word impact as if all impacts are negative but impacts really are changes to the current or forecasted readiness levels. These changes can also be positive or neutral as well as negative. The challenge is a lack of confidence in the data. If a single source of truth is built, there is a basic expectation of it being believable. The author has observed three ways this has manifested. The details are not important for this discussion—it was how the lack of confidence in the data is manifested.

The first manifestation is called the "back of the napkin math" approach. A detailed analysis was performed and presented to a senior leader who proceeded to perform their own analysis in the meeting on a scratch pad, saying their math showed a different result, and the decision was made using the scratch pad math as justification. To the defense of senior leaders, they are often well educated and quick on their feet, so data should withstand scrutiny. The analysis presented was somewhat more involved, but the inherent complexity was dismissed summarily and replaced with simple calculation that did not show the long-term problems. A variation on this theme was another forum when an analysis was presented, the leader dismissed the conclusions and went into the data and reinterpreted it. While someone does not have to agree with the implications or conclusions on their face, the team of analysts and data scientists that built the report interpreted it a certain way for a reason. It was convenient to dismiss the conclusion instead of addressing the implications, especially if it is contrary to preconceived notions. One can certainly understand that many analyses can highlight worst-case scenarios and should not necessarily incite panic. In this case, the report correlated with another issue, which is why it was presented at the forum.

The third manifestation involved a presentation of readiness data. It was a trend analysis, which is not particularly complex or difficult. A senior leader asked incredulously where the readiness shop had obtained this data. The answer was tactfully from his units' reports each month. They are saved and analysts can look at the trends and union it with employment data. In this case, the data showed the force generation cycle of each unit, month by month for the last five years. The data did not agree with what the leader was expecting to see so it was dismissed. In some decision-making forums, there can be an aspect of theater, and there are debate techniques. The data available is getting better daily, and the analysis is not intended to tell leadership what to do; it is to show the potential impacts of various decisions. Many like to say, "garbage in, garbage out," but looking at human behavior and trend analysis, one man's garbage is another man's treasure. How someone throws out the garbage is significant. Their habits become part of the data. Confidence in the data is about destroying the canard, "there are lies, damn lies, and statistics." To build confidence in the data is being the honest broker. The single source of truth approach is part of starting with a common data source, using industry standard tools, and best practices. Openly dealing with the data quality is helpful. Many senior leader mindsets are shaped earlier in their career and can carry forward impressions on data from those experiences. The author has worked with several who worked with earlier versions of readiness data and systems that have evolved a great deal during the last 20 years but are not perfect. People can also misunderstand how much data is available. During a meeting with a senior leader who noted that the overall readiness index does not tell the whole story and if he had another piece of data he could do more, it was awkwardly pointed out that the staff already has the other data and uses it routinely. The readiness shop could easily include it in additional reporting for him. It was a quick win. The senior leader was used to seeing the topline summary and had not realized he had all the data behind the summary. It is just too much to show leaders all the time. Managing the centralized data and the chain of command for data analytics can bolster the honest broker of data component of confidence. The hardworking people in readiness would prefer not to be accused of being liars.

CHAPTER 12

POLITICAL FACTORS

Like it or not, military readiness is a political football. There are valid reasons that military readiness should have political ramifications. It represents a massive investment on the part of taxpayers. There are plenty of historical precedents on the consequences of unreadiness. It is also easy to argue about since there is no simple answer. No political party wants to own another Pearl Harbor, 9/11, or Task Force Smith. Inevitably, there are deep ties between the resources needed to build military readiness and the districts and constituencies that provide them.

The classic example of the difficulty dealing with military realities is the Base Realignment and Closure (BRAC) commission. The Department of Defense toward the end of the twentieth century had an extensive network of facilities that grew from the rapid expansion of the military during World War II. The installations needed to support a military of 12 million were no longer necessary for a smaller standing military. Though capacity was needed to support levels of mobilization, the cost of maintaining the aging infrastructure was growing too fast for budgets to keep up. It was a clear financial reality that the infrastructure was not sustainable. No congressional delegations wanted to vote to close a base in their district. The brilliant resolution was to establish a bipartisan commission to draft a comprehensive plan, so the votes were for the overall plan, not station by station.[1] Another political fight over readiness is the insertion of "marks" into the budget forcing the Air Force to buy more aircraft than it needs, or to retain aircraft that are not needed in their force design.[2]

Political oversight is the reality that virtually all military establishments face. It should have oversight. The point here is that strategic readiness is a national political issue to be considered and debated. If the assessment of readiness is being done properly, senior leadership has the data to inform the debate. Readiness professionals within the defense enterprise should provide a better understanding of the trade space of ready capacity, sufficiency, modernization, and force rotation.

Where the trouble lies is not that readiness has a political aspect; it is when readiness data is manipulated or skewed to influence the outcome of the political process. This may sound obvious, but in practice it can be very subtle. Readiness data is used to influence the political process, as that is explicitly why organizations collect the data in part. The author established earlier that the data, while extensive, is not comprehensive. Analysis is necessary to select what data and how to present it and generate the narrative. Each Service and military department also has its view of the world. Some of the controls are in place to help address the inevitable skewing of data to support high-level arguments. The first control is to have a common set of readiness measurements, which are available. Continuously reviewing them and improving the timeliness and fidelity comes with it as well as standing under audit by an impartial third party. These controls function as checks and balances across the enterprise. There can be an adversarial aspect as Service positions can be strongly held. Service parochialism is very real. These factors cannot be wished away; they are inevitable group dynamics. Mature leadership

[1] Christopher T. Mann, *Base Closure and Realignment (BRAC): Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2019), 1–2.
[2] Jeremiah Gertler, *Air Force C-17 Aircraft Procurement: Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2010), 1–4; and Kyle Mizokami, "The Air Force Really Wants to Kill the A-10 Warthog but Congress Keeps Saying No," *Popular Mechanics*, 4 December 2020.

requires understanding these dynamics and getting past them. The United States does need a Navy, an Army, an Air Force, a Marine Corps, a Space Force, and a Coast Guard to provide for the overarching national defense, because it is a core function of government.

Part of the political process is determining how much of each Service is needed, and then how each of those Services is organized, trained, and equipped. The political leadership must get a sense of what they received for the investment and what needs to be changed to make it better, stay relevant, be affordable, etc. This is made even more difficult by the military details under civilian oversight. It is incumbent on the military professionals to articulate the complex in an understandable way for civilian leadership. That can be part of how the narrative can be skewed to support a particular agenda, regardless of the objective data. The various narratives will eventually come into conflict. What the military professionals want to avoid is Congress "coming over the top," or not through the secretary of defense or the Service secretaries, with directed force structures and changes that are not integrated or make matters worse. It is the prerogative of Congress to do what they will, but both parties do want a better, more effective military enterprise. It is therefore necessary for the military enterprise to communicate clearly and often with Congress to ensure mutual trust and understanding. Even with the best communications and controls in place, skewing of readiness data can manifest in several subtle ways.

Never Ready

This approach shows degraded readiness with an intent to influence additional resourcing. It is easy to hide as there are always real readiness challenges, so many units are not ready at any given time. This is intentionally weighing down readiness versus the day-to-day struggles of force generation. There is a proclivity to be wary of showing a unit as too ready as ready units can still fail in action. This fear of overestimating readiness can be the philosophical judgment behind a never-ready approach. In some cases, it is purely crass grubbing for more money.

There are many ways to do this in practice. Setting performance standards too high, rounding fractions down, providing command guidance, and setting a tone at regular readiness forums that span from overt systematic skewing to subtle command influence. In some respects, this approach is the easiest to get away with as it can be seen as an under promising and over delivery approach. During Operation Desert Storm, the narrative was it could be a tough fight. Were they really ready to fight the battle-tested fourth largest army in the world? The U.S. military clearly over delivered with an epic, lopsided victory.[3] To truly find this skew, analysts must examine ready capacity over time compared to required ready capacity. If ready capacity remains low despite changes in resources of all types, then there may be an issue. A downward skew will typically manifest in the area of risk mitigation, that is the ready capacity above the minimum requirement, which is the contingency buffer. Services are loath to not meet the minimum requirements. They do not want to be seen as failing to perform their mission. Hovering near the threshold is intended to encourage additional resources. In other words, this approach is to always show dire need. The eventual problem is when everything is an emergency, then nothing is. If the numbers are skewed downward, but there is really readiness available, then the assessment process is undermined in its fidelity.

Counternarratives can be used to address or defuse a downward skew. If forces are consistently degraded, the question should be, is there a realistic understanding of the mission? If forces are rarely ready to perform their mission, is the mission aspirational? If resources have changed and readiness has not, what is the alternative or what is not being measured? It is important to not confuse a potential downward skew with a truly overutilized unit type. There are certain unit types that are few in number either due to age or expense of the platform, or difficulty in training highly specialized skills that have overwhelming demand during day-to-day operations; these are legitimate instances of sustained (being year after year) lack of readiness.

[3] Rick Atkinson, *Crusade*: *The Untold Story of the Persian Gulf War* (Boston, MA: Houghton Mifflin, 1993), 424.

Aspirational capability is a variation of this theme. When a unit is designed, then organized and equipped, it is given a mission that it is designed to accomplish, and training standards are developed. In these times when technology is moving rapidly and new capabilities are being fielded faster than the traditional processes can support, there are instances when units are organized and activated, but the mission and equipment are aspirational goals that may take three to five years to become realistic. To some, this approach can signal the additional resourcing needed to obtain the future capability. It does not show the current force ready capacity, even if there is true ready capability hidden behind the future capability. For a hypothetical example, a new type of missile battery is being fielded, and the vision is to identify and strike moving targets at 500 miles. The initial fielding has a capability of identifying and striking stationary targets at 100 miles. After two to three years of development and testing, an intermediate capability will add moving targets and extend the range to 200 miles. The full capability would theoretically follow in two to three years after the intermediate step, and a technological limitation left the unit with a 400 mile range. This new capability was intended to replace a legacy system that can only hit static targets at 75 miles. The first increment is still more useful than the legacy. The legacy system has a high readiness as it is mature. The new system is already more capable than the legacy at initial fielding, but as a new system it will face problems and will have to work hard to build readiness. Against the envisioned system capability, it is still unready even if it reaches the full readiness of the initial system. The intermediate capability will suffer the same fate, as it is still less than the envisioned capability, despite the fact that it is better than the initial increment and the legacy system.

Fielding and training the new system and its intermediate capability represent significant investment in resources and effort from the servicemembers doing the training and maintenance. At unit level, there is a basic desire to accomplish the task with the resources provided. It is highly detrimental to the morale of the unit that can never achieve readiness. The result is that it undermines the value of measuring readiness. The "fight tonight" question is still foundational. The unit in question may be ready with more capability than the legacy platform, yet by gaming the system with an aspirational, unachievable standard to somehow signal the need for additional resourcing, the Joint Force only sees an unready unit. A counterargument could be that the intermediate readiness could be confused for the future capability, but if the mission is properly built, the Joint Force should receive a clear understanding of the current capabilities of the ready unit. Given the power of the data systems, the readiness of the current capability and a comparison to its envisioned capability can be engineered without additional workload on the reporting unit.

Cutting the Best First

To quote the pop song, "the first cut is the deepest" is a common approach when programs are asked to economize.[4] As a budgeting tactic, it is simplistic and can work when there is minimal scrutiny. All resources are fundamentally limited, even the largest military program has a fiscal and staffing limit. Part of balancing resources across many programs or portfolios comes with exercises in cutting the requested level. Most resource areas involve layers of fixed, variable, and capacity costs. Intuitively, there is an understanding that any given program could likely absorb a cut of a few percentage points under the 10 percent threshold through internal cost controls. It is also understood that this cannot be asked year over year as the collective impact grows beyond the normal flexibility.

The defensive strategy to prevent a year after year death of a thousand small cuts is to associate key capabilities that are "must pay" or defining characteristics with any reduction. For example, an information technology system must have cybersecurity as well as basic utilities. These costs likely comprise the first 40–50 percent of the total cost per

[4] Cat Stevens, 1967, as popularized again by Sheryl Crow. "The First Cut Is the Deepest," track four on Sheryl Crow, *The Very Best of Sheryl Crow*, A&M Records, 2003. Though the album was a compilation of previous tracks, it included this Cat Stevens song as a new track. The song earned her two American Music Awards in 2004.

year. The remaining costs are change management and development. In reality, a cut would hit the latter area first, not cybersecurity or utilities. The strategy often works as there are legitimately programs that have already cut the variable cost out and a small cut could hit their fixed costs. Cuts in forces or force structure are more complicated as it takes a mix of unit types in the proper proportion to make a coherent intermediate/operational capability. Thus, the Services must invest in the enabling units that are often harder to make than their defining capability to make a number. One could give the appearance of capability by having the same number of "flags," also known as intermediate units, such as regiments or brigades, but inside it is reduced in the number of subordinate elements. This is precisely what the Russian Army did during the 2000s with the battalion tactical group concept, which was to retain brigades and regiments, but each would only field two battalions instead of the traditional four while retaining all the equipment.[5] This is similar to the Soviet practice during World War II of retaining many divisions with a full complement of equipment, but only staffed at 25–30 percent strength.[6] In the Soviet approach, the equipment becomes the fixed cost and the personnel the variable cost. The equipment generates the combat power of a division, and the minimum number of personnel needed to service the weaponry is likely the 25–30 percent. The unit has little depth or resiliency and can be very brittle. In action, they feed these understrength divisions into action and rotate the remnants out of the line rapidly to be either broken up or reconstituted.

If it is well established that budget requests are typically supported at a given percentage, then over time the budget submission will be gamed to where the true requirement falls at the lesser level by asking for more than is really needed. For example, a unit that is typically staffed at 80 percent of an ostensible requirement of 50. Over time, the

[5] Mason Clark and Karolina Hird, *Russian Regular Ground Forces Order of Battle* (Washington, DC: Institute for the Study of War, 2023), 14.
[6] David M. Glantz and Jonathan M. House, *When Titans Clashed: How the Red Army Stopped Hitler* (Lawrence: University Press of Kansas, 2015), 40–41, 177, 200, 235, 349, 351.

requirement would grow to 60–65 so that it gets staffed at 48–50 percent. This is an example of requirements creep. If there was a change in organization that suddenly staffed to the requirement in the example, they would likely neither have the space to accommodate the additional 10 to 15 people, nor sufficient work to keep them gainfully employed. Revalidation of a zero-based requirement periodically is needed to curtail the impact of requirements creep.

Resources to Readiness

This is the burning question that is often repeated. It often starts with, if I had a dollar to invest in readiness, where do I invest it? That is a readiness optimization question. Can readiness be optimized based on fiscal investment? That can be a very dangerous premise, as optimization must be based on something measurable. Unit readiness is typically discussed in this context. Investing additional resources into unit readiness is only one pillar of the broader strategic readiness. Do not become overly focused on unit readiness—the other aspects require investment to be truly ready too.

The first question is how to allocate a budget to each of the pillars of strategic readiness. Capability and capacity from shipyards, the industrial base, munitions stocks, and installations must be appropriately funded so there is a firm foundation to build any unit readiness. Those who ask the original question will quickly concede that the question implies that the allocation is set and given the portion for unit readiness—How is that best spent? Assuming the investments in the other aspects are appropriate, the investment in unit readiness can also be very misleading if one is not careful. If a Service wants to improve overall readiness, the least expensive units to make ready is the easiest answer, but that may not be the correct force mix or balance of forces. If all a Service wants to do is improve the percentage of all existing units based on readiness indices, then go after the largest population of units. Ground combat units are the easiest to make ready. To the defense of ground combat professionals (of which the author was one), this is not an easy task. Relative to other highly technical or platform based units, such as aviation and ships, which have external limitations to how fast that can be made ready, it is demonstrably easier. This approach would work out in math, but that is the intent of the investment. It could be argued that additional investment should go to units that are the hardest to make ready, though will not make much impact to the aggregated readiness output. A more promising approach is to group units by capabilities and look across the Joint Force capabilities and determine which is the lowest and invest there. The author is putting into place the ability to present the readiness data in such a way as to enable that view.

How resources are allocated is a major factor in determining where to invest. In the United States, Congress appropriates funds. These appropriations are very specific on how they can be used. Moving money between appropriations is a process and may require congressional approval.[7] The appropriations come in some basic types that determine how long the funding is available for execution, including military personnel, operations and maintenance, procurement, research and development, military construction, and shipbuilding. The discussion of unit readiness primarily falls into operations and maintenance appropriation type, which is the largest category at more than one-third of the budget. This type of funding is good for one fiscal year and is allocated to specific accounts such as equipment maintenance, flight hours, and unit training. Military pay and benefits is the second largest chunk of dollars at about one-quarter of the total.[8] The all-volunteer force drives this requirement's relative size compared to conscripted manpower. To attract and retain the talent necessary, the pay and benefits must be competitive with the economy at large. In many fiscal years, the ability to recruit and retain the needed numbers is the determining factor, and there has not been downward external (congressional) pressure to reduce manpower costs. In fact, the opposite is true. Investing in military

[7] James V. Saturno and Megan S. Lynch, *The Appropriations Process: A Brief Overview* (Washington, DC: Congressional Research Service, 2023), 1.
[8] Pat Towell, *The Department of Defense (DOD) Budget: An Orientation* (Washington, DC: Congressional Research Service, 2021), 1–6.

pay and benefits is hard to move the needle and is limited by Congress. The original question then becomes more specific as: If Congress asks where to invest additional operations and maintenance appropriations dollars to improve readiness, where would they invest it?

Having narrowed the areas of potential investment to operations and maintenance appropriations, consider the areas where that money goes and gain an understanding of the sensitivity of those areas to investment (table 41). This can provide the quick win answer to the question.

Readiness analysts tracked investments in these areas and can model the sensitivity of readiness outcomes to the level of investment in many cases. The details of these analyses are classified, but the general unclassified conclusions are worth sharing. The first lesson is that money is not necessarily helpful. If there are not enough mission capable aircraft, then flight hours cannot be executed regardless of how much is funded. It is also important to know that, in general, a unit can generate enough flight hours from roughly one-half the aircraft in a unit, so a flying unit can make progress on its training even if the mission capable rate is relatively low. Higher mission-capable rates are needed for a fully combat capable unit to generate enough sorties. In practice, the flight hours can be moved between units easily so there is local control to maximize the flight hours that can be produced by the available aircraft. The ability to move units to training opportunities can be helpful, but the shelf life of the improvement is fairly short. Investments in maintenance at both field and depot levels can yield longer lasting returns but often take one to two years between investment and measurable return. Field-level maintenance pays for parts and these parts take time, from funding, bidding, manufacture, and distribution. The other part of field maintenance that can yield rapid results is the secondary reparable shops. These take major subcomponents of items like engines, transmissions, weapons systems. Then create an intermediate shop that has a maintenance float, such as extra items, so units turn in the subcomponent and get a fully functional replacement while the shop then does the time-consuming repair. Awaiting repair on complex

Table 41. Readiness investment areas

Readiness metric	Investment type	Impact
Training level	Transportation of personnel and things	Moves units to training areas and events that provide needed space and capability to perform complex high-end training
	Flight hours program	Funds flight hours and incremental associated maintenance for aviation training
	Training consumables	Targets, fuel (for ground vehicles), field rations, batteries, and satellite bandwidth used to conduct training events
Equipment condition	Field maintenance	Funds spare parts and secondary repairable items for unit-level and intermediate-level maintenance
	Depot maintenance	Maintains the long-term health of the total asset inventory

Source: author's representative professional military educational career path.

subsystems is a common driver of low equipment condition rates, and the secondary repairable shop addresses that. Ensuring these are fully funded can be the easiest way to improve and sustain high materiel readiness levels at the unit level. As with any area, it has a certain capacity, so its benefits, once realized, can only go that far.

The resource-to-readiness question is often asked rhetorically as if there is no answer. There certainly is a set of answers. The answer can be complex, such as what the optimal balance of investments is across the pillars of strategic readiness, capabilities across the Joint Force, or finding the quick win. The strategic balance is beyond the scope of this work; it is a question for senior political and military leadership. The text has advanced this area by defining the pillars of strategic readiness in policy to ensure the deliberations are appropriately comprehensive. At the Joint Force capability level, enormous progress has been made with building the forecasted supply of readiness forces across the future years' defense plans for all the Services. This allows for the follow-on analysis grouping of the forecasted elements into the various capabilities and looks at the balance of the portfolios. Technology has enabled the continuous combination of financial and readiness data so the sensitivity to changes in funding and execution levels to the various readiness indices can be mapped. Some of this already exists and is in use to help guide investment decisions, but there is much left to discover.

Ignoring Political Factors

There are purists within the military enterprise who do not wish to sully their hands with political factors. It is more common to find this deeper inside the military departments. There is certainly a temptation to look at purely military aspects of any given situation without the messy aspects of politics. While there is a separation of powers in the laws and the United States clearly has civilian leadership of the military built in, a significant percentage of the civilian leadership in the Department of Defense are military veterans or retired career servicemembers.[9] This certainly helps as they have a deep understanding as the Department of Defense is a vast and complex bureaucracy. It has its own language and culture. It is a two-edged sword though. It can become very insular. If military leadership does not encourage an open dialogue with Congress, it invites Congress to get involved. It is certainly within the prerogative of Congress to provide oversight and guidance to the military enterprise, but without open communication it could be counterproductive. There are a variety of pathways to provide Congress with insights and understanding of what the department is working on. The political realities cannot be ignored. They can be seen as impediments, or they can be embraced, understood, and incorporated into the decision process.

Tyranny of Urgency

> *It takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!*
>
> ~ *The Red Queen*[10]

One of the most difficult challenges of strategy is having the ability to

[9] *DOD Civilian Workforce: Actions Needed to Analyze and Eliminate Barriers to Diversity* (Washington, DC: Government Accountability Office, 2023), 153. Across the total DOD civilian workforce, the percentage of veterans has increased to 38.91 percent in FY21 from 36.6 percent in FY12.

[10] Lewis Carroll, *The Adventures of Alice in Wonderland; And, Through the Looking-Glass* (London: Heirloom Library, 1949).

not be drawn into the "tyranny of urgency." A crisis to crisis approach to political leadership is common for some inescapable reasons. The United States has global interests so there is a high probability that there will be something impacting the national interest somewhere at any given time, often multiple situations in multiple areas. The modern world is no longer subdivided easily into regions as the internet and proliferation of media means events in one region can impact all the others in various ways. A classic symptom of this is the 24-hour news cycle. Political leadership on both sides of the aisle has a tendency to elevate important issues into crisis mode to energize interest and voter turnout. That is how politics work. There used to be a saying that all politics is local. While not completely dead, the power of modern media has "nationalized" many elections focusing on national issues versus the local specifics. This is not intended as a criticism for how political leadership works. It is intended as a statement of the changing conditions under which the balancing of current and future readiness falls. The hyper focus of the media, rapid news cycles, and the globalization of media all work to create a perverse incentive to focus on the quick fixes. There has always been a near-term incentive that makes balancing a challenge. Leadership is not typically in place for extended periods, so their success or failure is often judged at the end of a two to four year tenure. Military leadership typically falls in on the plan laid down by their predecessor, executes that plan for the first year as they build the needed situational awareness to formulate their strategy, then rotates leaving that strategy for the next leader. In the Department of Defense, it is very difficult to formulate and execute a strategy and see it through to its fruition. Here is the challenge for which there is no easy solution—strategic thinking is not ignoring the near-term issues—it is balancing the near- and long-term issues. Using reliable data analytics, rapidly generated, helps leadership see the balance in digestible graphics. The allocation of time, effort, and ready forces to near-term issues are decisions that must be made in time and space. The effort here is aimed at ensuring those decisions can be made rapidly and effectively. Even if readiness is consumed greater than planned for near-term issues, the data helps inform the way ahead to mitigate the long-term impacts. One can read about great leaders of the past and the various work habits to help them find balance. There is not a single prescription other than that it is a deliberate activity—a mental discipline. George Catlett Marshall Jr. rode his horse daily, Raymond A. Spruance faithfully walked briskly for exercise.[11] What it is varies, but it is a key leadership trait worth identifying and encouraging as leaders are developed.

[11] "George Marshall, Equestrian," Marshall Foundation, 15 July 2024; and Ian W. Toll, *The Conquering Tide: War in the Pacific Islands, 1942–1944* (New York: W. W. Norton, 2015), 316, 336–37.

CHAPTER 13

INSTITUTIONAL CHANGE

Assume that it is possible to navigate the challenges of human, technological, and political factors and overcome the massive institutional inertia to make a change. How do we make the change last? The bitter reality is that everything has a shelf life. An agent of change is often marked for advancement if successful or pushed aside into irrelevance if unsuccessful. Uniform servicemembers rotate every two to three years, and civilians and contractors often pursue better opportunities every few years. A change in how people look at military readiness is not just a set of ideas—good, bad, or indifferent from them or their colleagues. This effort would follow a similar path for other initiatives in an institution as large and diverse as the U.S. Department of Defense (DOD). A senior executive leader at DOD once told the author that institutional change is all about incentives. In this case for change, that statement made the author think about what the incentives are. It can sound mercenary when change boils down to a what's-in-it-for-me mindset. Incentives are not bribes. Knowing that change is difficult, people must realistically show the benefits to the institution. Finding the right incentives is crucial. It is not a one-size-fits-all proposition. Some people are ambitious for advancement and are looking for a promising project to help propel them to the next level. Ambition is not inherently bad and can be useful. Some have a genuine passion for readiness. That can be a very powerful tool. A powerful incentive in public service is showing or feeling the positive impact of service rendered. This comes from recognition of that service and observed improvements. Proponents of change must identify the appropriate incentives for those that are needed to accomplish the change.

Building the Coalition of the Willing

Changing how the Department of Defense looked at military readiness started as a hundred separate conversations, sidebars at meetings, working groups, and slide decks passed around. There is a readiness community of interest thrown together by job descriptions. Some are just passing through, and some are in it for a career. Readiness branches across the military Services review the metrics on a monthly and quarterly basis. It is a basic military function. It can easily ossify into a "reading the news" or "making the donuts" exercise as it has often referred to by readiness analysts during the last decade. It can get lost in the noise until something upends the day-to-day activity and it is thrust into the limelight. The readiness community of interest across the Services, the Joint Staff, and the Office of the Secretary of Defense began to realize that as the understanding improved, they needed to evolve their understanding to keep pace with the demand for better information. They need to do more than just identify and work on current readiness degradation issues. Out of this community came those with the personality, commitment, and stubbornness to undertake this multiyear campaign.

Evangelism

Carrying the torch as the ideas and concepts coalesce into real changes is a delicate balance. People must carefully read the room and take opportunities to socialize potential changes. The evangelist must strike a balance. If they push the message too hard and too often, the evangelist can be relegated by the target audience to the organizational oblivion of being labeled and ignored. The ideas and concepts relayed also need to support, not undermine, the value of the data available. Wanting something better does not mean that the data in hand is useless. What people have is how they are going to get to something better. Ultimately, it is sales. In a previous career, the author spent several years as a salesman. In formal sales training, he managed the inventory of potential sales, and where each customer was on the sales cycle. A prospect is developed, a proposal delivered, and a sale is closed. As an evangelist for readiness reporting, reform works in the various meeting rooms and offices where prospects are developed. Some prospects are long-term investments —like senior leadership— when ideas are planted that can bear fruit down the road as they rise to higher roles. Some prospects are newcomers to the readiness community that can become fellow evangelists for change to help spread the ideas. It can sound deliberate in writing, and it can be very informal at an individual level. This stage of institutionalizing is decentralized. A key milestone in this process is when it begins to mature to the level where senior leadership sponsors it. No change can really last without senior leadership support. A senior leader who catches the vision and actively joins the evangelism process is priceless. Once a senior leader is on board, the evangelism shifts into formal strategic communications. The case to push or direct change must be clearly and consistently articulated at every opportunity. Senior leadership builds a team with subject matter expertise supported with strategic communications and project management to ensure plans, schedules, and engagements are developed and executed. When pitching change, it is important not to be bogged down with overly detailed explanations with senior leadership. There is a story arc that needs to be told. The story arc has three components:

- How did we get here?
- Where are we going?
- What is needed to get there?

Telling this story can be a 10-minute or a 30-minute journey. It can be supported with a small set of PowerPoint slides. It must relate to the audience, so build a flexible story for customization. The third point is the "ask." What is it that is being asked for a senior leader to do?

Sign a memorandum, endorse a course of action, provide personnel or funding? Strong communications across multiple venues lays the groundwork for the next phase, which is formalizing change through policy and budget.

Policy and Budget

No one likes the process of writing, staffing, adjudicating comments, and obtaining the required signatures associated with making policy. The military enterprise is a bureaucracy. It is built on statute and policy. While making policy is painful, once it is signed, it is the key to making things work. The process can be energized, but it cannot be rushed. Major policy directives and instructions are meant to be in place for many years, and each revision or new policy can take more than a year from start to signature. A policy will need to be passed around to dozens of offices and be reviewed by hundreds of people. Each has their equities. The policy owner then has the unenviable task of reconciling all the feedback in a coherent policy. Some policies are 8–10 pages—others can run more than 100. Very rarely do you develop policy from scratch. The DOD issuance style guide and templates help with construction.[1] There are teams within the department whose sole function is management of policies and directives. For the readiness professional, the policy and directives issuance process can be arcane. Most may only do it every few years. Let the issuance process teams support the effort.

Concurrently and no less important is formalizing change in the budget. In the U.S. Department of Defense, the budget cycle is two years out.[2] To add a new initiative will take two years to obtain a budget line. Not all changes discussed here involve new budget lines; they can be rolled into an existing budget. To make a change in the core readiness reporting information systems, people cannot just divert the current sustainment funding into a future version.

[1] *DOD Issuance Style Guide: The Official Guide to Writing and Publishing DOD Issuances* (Washington, DC: Department of Defense, 2025).
[2] Brendan W. McGarry, *Defense Primer: Planning, Programming, Budgeting, and Execution (PPBE) Process* (Washington, DC: Congressional Research Service, 2024).

Because much depends on the readiness reporting system, it must be sustained while changes are made. Then a deliberate cutover from old to new is performed in a phased approach to reduce technical risk. Turning off an old system and turning on a new system is very risky. While it takes longer, the phase cutover is a proven method. Thus, even changes to an existing budget are still trapped by the two-year cycle to lobby for the additional funding needed to modernize. Interim funding can be secured through several means. New requirements, once validated by senior leadership, can seek funding through an unfunded requirement (UFR) request. Some agencies may call them current year deficiencies. UFRs are collected within agencies and then prioritized. If appropriate funding becomes available, it can be funded. It is always a gamble. For funding to become available, some other program underexecuted their budget. At the deputy secretary and secretary of defense level, there is some authority to redirect funding between programs.[3] If funding is identified, it is easiest to use existing contract vehicles to hire contractors. Civilian billets are a long-term commitment and are harder to secure. Besides UFRs, embedding some new work within the scope of existing sustainment can accomplish some parts, albeit slowly. Staying afloat for the two years needed to have a budget line can be stressful, but it is worth it in the end. A budget line requires program and financial management to build and maintain the budget request and manage what is allocated—often not the full funding requirement. Spend plans, phasing plans, continuing resolutions impacts, and contracting all require time and energy for a program manager to plan for the execution of the budget. Without a dedicated budget, readiness reporting, forecasting, and modeling are not sustainable endeavors.

Structure

Adding permanent structure to the organization is key to locking in policies and budget. This is a multistep process once funding is secured. There is a change to the unit structure request to add the new billets to the database. It has a separate approval process. Then a position must

[3] *DOD 7000.14-R, Department of Defense Financial Management Regulation* (Washington, DC: Department of Defense, 28 February 2025).

have a position description (PD) written. The PD is the job description and has a particular format. It goes through an approval process then is passed on to be classified. In this case, classification has nothing to do with classified materials or data. It sets the job skill code and pay scale.[4] All this then goes out for a job posting and hiring process. This process can take many months, rarely less than six months in the author's experience. This lengthy process makes it difficult to hire outside of the government. Most hires are current government employees, veterans, or military spouses. Major efforts are underway within the Department of Defense to make the hiring process faster. The fundamental flaw is the disconnect from the organization and the human resources offices. The office that is seeking to add a billet and hire against it must apply to a bureaucracy whose offices have no personal or emotional investment in the success or failure of the process.

Conceptually, a neutral third party could accomplish these tasks dispassionately. It is their very detachment that breeds the problem. Classifiers often have little understanding of what the job entails even on a new PD based directly on one approved within the last six months. Making the timelines tighter may speed up the process by forcing it, but until the human resources activity is aligned with what is going on in the agency and invested in getting the right people in the right jobs it will not improve the process. Without understanding what the organization is about and what is being accomplished with a compressed schedule, it will only add friction and create an adversarial relationship. Pushing three simultaneous rocks (policy, budget, and structure) uphill for years can be a daunting prospect. Here is where the moral courage to earnestly seek change for the better is needed. There are many frustrations as a comments resolution matrix comes in with a hundred comments to adjudicate, a budget request is cut by another x percent, and a PD is kicked back for a third time for a minor change.

[4] "Hiring," Office of Personnel Management, accessed 29 May 2025.

Practice

Once change is codified in policy, budgeted, and structure added, you get to do it and see if it works as well as you hoped. Based on experience, the changes often work out in unexpected ways. Do not be discouraged. The policy changes likely involved compromises. The budget is limited. Developing and fielding software takes time to do properly. Users will invent ways to work around things that were not considered. Many did not know the art of possible until changes were made and then it changed people's perceptions. Once a change is made, it often takes several months of data collection to get a statistically significant sample. Changes must be monitored. If it works, then success has been achieved. If it fails, the action was still successful because knowledge was gained. Accept that some ideas that sounded good did not pan out in practice. Adopt a sustainable change management regimen. Too much activity will burn out the community. Keeping them informed can support quarterly system updates. Ensure a significant portion of the change management budget is allocated to user experience improvements. The Services ask a lot from the unit readiness personnel to input useful data. Given what this book has covered, there is a significant amount of data. Let them know that their time and productivity is respected, and they will provide better data. Update the strategic communications strategy from selling to sustaining the transformation.

CHAPTER 14

ARE WE BETTER OFF NOW?

This book spent some time over the last few chapters discussing and defining what military readiness is, how it is currently assessed, and how it could be done better. But the question remains: Did this make the Service better? Will it give the Service better outcomes? These are good questions, but a better question is based on a comparison. Is this thing better than this other thing? In the military realm, it is a maxim that success is about being better than the adversary. The actual answer at any given time is classified and is closely studied by all nations that invest in a military capability. People could argue that U.S. forces are better than the same types of units were during the last 30 years. The Services still use a relative scale, so a ready unit today receives a similar assessment to a ready unit 20 years ago. That does not answer the question of whether there are enough ready units or not and whether they are the correct mix of types and capabilities for deterrence and armed conflict. Are the U.S. Services at parity, losing, or gaining ground with competitors and potential adversaries? Conflict lies within the realm of uncertainty. Everything is built on layers of study and analysis to pursue what is likely to produce the best outcome. Therein lies the paradox.

Better understanding of the realities of readiness at multiple levels does not ensure success; it can only reduce the probability of failure. We generally accept that more readiness (military capability and capacity) reduces risk, but the investment is very expensive, so how do we manage it at an acceptable level? It is also not a clean academic exercise. There are many influences on force structure, capabilities, and capacity beyond the readiness calculus such as Service parochialism, traditional structures, and political lobbying. Determining the acceptable level comes with challenges.

In specific applications, we can look at readiness in a mission assurance construct. A good example was from Dwight D. Eisenhower's force strength versus likelihood of success matrix used in the decision of when to launch the D-Day landings during World War II. There is a classic "S" curve in the numbers.[1] His analysts had determined that if they could land a theoretical high of 56,250 men, they would approach 100 percent success, with a target strength of 45,000 for an 85 percent probability of success. He made the call knowing other factors were in play and the probability was not 100 percent success but was very high. This analysis does not consider the forces needed in five years. It is a complex calculation for a specific time and place. What we are looking to manage are the forces needed for now and in the foreseeable future. His analysts had the advantage of fighting the Germans for a couple of years to help inform their analysis. Could the Germans have pulled something that they did not count on? How does one assign the probability of an unknown? There are ways to do that but all fall in the realm of chance. It may be apocryphal; it was said that Admiral Isoroku Yamamoto, when asked about the odds of the Pearl Harbor attack winning a war with the United States, claimed the odds were 50-50. Those are not good odds to risk the future of your nation. Mission assurance looks a lot like risk management and that can be ripe with danger.[2] One could easily say that Vladimir Putin seriously miscalculated the resolve

[1] Sam L. Savage, *Chancification: How to Fix the Flaw of Averages* (n.p.: Savage, 2022), 97–100.
[2] Douglas W. Hubbard, *The Failure of Risk Management: Why It's Broken and How to Fix It* (Newark, NJ: John Wiley and Sons, 2020), 14–17, https://doi.org/10.1002/9781119521914.

of the Ukrainians in February 2022. Once the coup de main failed, it also was clear his military was not ready by anyone's measurement. That is the risk inherent in war. We can hope it is a cautionary tale to others who may have forgotten the costs and how plans can go awry and spiral out of control. In June and July 1950, we had no idea how this conflict would play out. It is sure that in early 1965 no one foresaw the events of 1968–69.

If there was a set of metrics and assessments that shows we have achieved the right balance of investment for current readiness and future readiness, it will be short lived as competitors and potential adversaries will adjust. It is a dynamic feedback loop that requires constant refinement. We can use data, advanced machine learning algorithms, and AI to improve the fidelity of our forecasting, but it is still in the realm of probabilities.

The nature of the readiness paradox is that you do not know for sure until you use it. Is it circular reasoning? Not really—we calculate the odds, and when it plays in our favor we can validate some of our assessments. Good analysis does not end there. Both successes and failures must be rigorously studied to make better models. Operation Desert Storm (1990), Operation Enduring Freedom (2001), and Operation Iraqi Freedom (2003) demonstrated a high state of readiness for forces to get there and produce decisive results quickly.[3] Then as time went on in Afghanistan and Iraq, the readiness to fight a counterinsurgency campaign was low and required a painful learning curve. Readiness to build Afghan and Iraqi self-defense capability was demonstrably poor in light of the rapidity of the growth and expansion of ISIS in Iraq in 2014 and the precipitous collapse of the Afghan National Army in 2021.[4] Given the hard fighting the Army of the Republic of Vietnam put in from 1972 to 1975, we could reasonably infer the capability to

[3] Richard W. Stewart, ed., *American Military History*, vol. 2, *The United States Army in a Global Era, 1917–2008* (Washington, DC: U.S. Army Center of Military History, 2010), 416–26, 468–73, 480–89.

[4] "Factors Behind the Precipitate Collapse of Iraq's Army," BBC, 13 June 2014; and Max Boot, "How the Afghan Army Collapsed Under the Taliban's Pressure," Council on Foreign Relations, 16 August 2021.

build foreign self-defense has atrophied.[5] This shows we can be very ready in some areas and not as ready in other areas.

We want to improve in some areas and maintain in others. We cannot know for sure unless we improve how we measure it. Measuring something does not make it better or worse. We do not want a false positive creating a vulnerability, nor do we want a false negative and overinvest in the wrong things. The reality is that we will get some of each as we have such a broad set to look across. Ultimately, metrics and assessments do not make the force *better*; they are decision support tools for leadership to make the difficult decisions. It is those decisions that make the force better or worse. Leadership has told the analytical community that they desire better information, so much of this book looks at how we are or can continue to improve this information.

The work contained here cannot offer the optimal strategic, operational, or tactical strategy to pursue. It can provide some tools and thoughts on refining these strategies. There are fair questions like the balance between capability and capacity. Do the increasingly expensive platforms come at the expense of quantity? We know empirically, yes, but it takes careful analysis to determine that balance. Any realistic assessment on this count is highly classified. It is a legitimate concern that a small, high-tech military will not be able to prevail in a protracted conflict against a more numerous, increasingly technologically advanced adversary. One should be more concerned in a protracted conflict about the other dimensions of strategic readiness than just capability and the capacity of units problem.

The practical reality is that we will continue attempting to measure readiness to improve the odds of success. The alternative to not adapt, change, or rethink how we do things is not a viable option. We have invested too much and have too much at stake not to do whatever we possibly can to improve the probability of success in our favor, knowing that it will never reach 100 percent. If all we want to do is drive down risk now, one can guarantee we will over allocate resources and

[5] Stanley Karnow, *Vietnam: A History* (New York: Viking Press, 1983), 640–63.

not have the readiness we need in the future. Our potential adversaries are doing similar things and if we can keep the probabilities low enough on their "S" curve, we can successfully deter a conflict or limit its scope if it does happen.

CONCLUSION

This book covers lots of ground and is intended primarily for civilians and military members working with military readiness at some point in their careers. With that goal in mind, a brief summary for easy reference is provided.

The definition of military readiness is the military capability and capacity to deter, fight, and win across the full range of armed conflict with the appropriate personnel, equipment, and training to produce the desired results from now through the foreseeable future.

Readiness reporting is a basic and necessary military activity. Its modern incarnation dates from the founding of nation-state standing armies in the early 1600s. The basic function is establishing the inventory of units by type and status of their personnel, equipment, and training.

Readiness exists at the three levels of war: strategic, operational, and tactical. Simply put, strategy is fighting wars, operational is fighting campaigns, and tactical is fighting battles.

Most discussions of readiness are focused on the tactical and operational end of the spectrum; however, a broader understanding is necessary to understand a national, alliance, or coalition perspective.

There is a fundamental difference between the administration of armed forces and the mode of employment dating from the formation of standing militaries. This has gotten worse over time as the more complex capabilities and improved communications allows for extensive task organization of forces.

For the U.S. Department of Defense, the readiness reporting requirement is codified in Title 10 of the U.S.Code, section 117.[1] Readiness reporting is a statutory requirement that is then implemented through Department of Defense directive and instruction, a Joint Staff instruction, and Service-level orders and regulations. The requirements are extensive, detailed, and prescriptive.

The modern U.S. computer-based readiness reporting dates from 1980 with the Global Status of Resources and Training System (GSORTS). It was preceded by a system of forms and various methods to capture the data based on an Army system in 1963 that then-Secretary of Defense Robert S. McNamara implemented across all the Services.[2] In the early 2000s, the Defense Readiness Reporting System (DRRS) was rolled out that originally intended to replace GSORTS with a capability-based assessment.[3] Many found the capability assessment difficult to use to support resource management decisions, so it was determined that the GSORTS and DRRS would be used concurrently. They were later consolidated for efficiency. While operating as a single system, it still is functionally two different types of reporting (resources and capability) running in one system.

The GSORTS report produces readiness levels on a scale of one to four, with one being most ready and four being least ready. GSORTS has four resource areas: personnel (P-level), equipment on hand (S-level), equipment condition (R-level), and training (T-level). There are detailed business rules on how to calculate the four resource levels. The overall readiness is called the C-level and defaults to the lowest of the

[1] 10 U.S.C. § 117.
[2] William M. Donnelly, *Army Readiness Reporting Systems, 1945–2003* (Washington, DC: U.S. Army Center of Military History, 2018), 42.
[3] Laura J. Junor, "The Defense Readiness Reporting System: A New Tool for Force Management," *Joint Force Quarterly* 39 (2005).

four resource levels. This system is based on a German system in use during the World Wars. In addition to the calculated scale of one to four, the Service can designate units to have a C-5 to exclude it from consideration as it is undergoing a significant change (activation, deactivation, major reorganization, relocation, or dry dock for ships) or set resource areas to report a six if that resource is not measured.[4]

The capability assessment is also known as the mission assessment. All unit types have a core mission, that is the mission the unit is designed by the Service to perform. The mission is a collection of mission essential tasks (METs) that form a mission essential task list (METL). Each MET is a collection of performance standards that must be achieved to have the full capability. These performance standards include personnel and equipment necessary for this task, training events, subordinate unit tasks, certifications, and measurable outputs. This construct is very flexible so it can apply to any type of unit, but the downside is that the data structures are complex.

The mission and METs are assessed as yes (Y), qualified yes (Q), or no (N) and are often referred to as YQN. The performance standards are either achieved or not achieved. Achieved was chosen to avoid confusion with the word "met" and the acronym MET.

For each assessment, there is a reason code and remarks. Overall remarks are always required; reasons and remarks are required for resources if they are not a one. All assessments, reason codes, and associated remarks are classified.

Generating readiness is a process with many well defined metrics along the steps, which lends itself to statistical analysis. It supports well-established trend and forecast methodologies as well. Readiness levels are no accident or the result of random chance. They are deliberately generated for units to do missions.

Once generated, readiness has a limited shelf life. Within a given unit the readiness degrades for a variety of factors. This can be described as organizational entropy. Sustaining a high state of readiness requires

[4] *Chairman of the Joint Chiefs of Staff Instruction 3401.02B, Force Readiness Reporting* (Washington, DC: Department of Defense, 17 July 2014).

rotation of personnel, equipment, and/or units. Units can sustain a high level of readiness for about six months, and it then begins to degrade. Unit rotation schedules are built to allow for the efficient rotation, building, and resetting of readiness so the deployment length varies based on many factors such as the required readiness, unit inventory, unit training requirements, individual personnel rotation schedules, etc.

Readiness assessments are not a scorecard for a unit commander. They are a scorecard for the institution's ability to organize, staff, equip, and train forces. The large majority of readiness falls outside the purview of a unit commander, with training as the primary metric that the local commander influences.

Units at the battalion, squadron, and independent company level are the primary readiness reporting entities. This is logical as this is the lowest level that has the staff and computer systems needed to compile and submit the required reporting.

Current reporting requirements are extensive, detailed, and prescriptive. Between statute, policy, directives, and instructions, the requirements for reporting are hundreds of pages of detailed business rules, much of which is automated to facilitate the ease of use for frontline unit readiness officers.

Current readiness reporting is based on a twentieth-century construct where most units were employed as whole units. The proportion has flipped between units that are employed as a whole unit and units that are force providers to task-organized units.

Modern high-end capabilities enable the employment of smaller units. Many of these entities are below the battalion or squadron level. Most are standing subordinate elements of a battalion or squadron; others are task forces that are established as needed. Capturing readiness of the standing subordinate elements can be accomplished by including their information as part of their parent unit reporting. Understanding the readiness of a task force that has not been aggregated can only be implied by the readiness of its potential components. This requires the identification of these components as well as their readiness data as part of the parent unit's report.

A unit's overall readiness level (C-level) is one data point that is an index of many underlying factors. It is never intended to be the all-encompassing metric. It answers a singular question well, but it obviously cannot answer all questions. It is meant to facilitate rapid decision making. The good news is that we have much more information to support a wide variety of analyses besides the C-level.

There is nothing wrong with having an overall index. The beauty is that the elements of that index can be adjusted similar to the Dow Jones Industrial Index. In other words, the components change over time so that the index still provides a useful indicator of the health of the market.

Readiness of a unit is not a guarantee of success in combat. The odds are that a ready unit (by the definitions of current readiness assessments) will perform better than a unit that is not ready. There are plenty of examples of unready units still performing well, though, but the institution must have a way to measure resourcing and training units. Even if fully resourced and trained, a unit still requires leadership and support as it exists as part of a larger formation.

The structure, equipment, and training of a unit is designed to be effective against the pacing threat. It assesses the capabilities of units, not their vulnerabilities. All military units have some sort of vulnerability, such as tanks that are vulnerable to antitank missiles, infantry is vulnerable to indirect fire from artillery and mortars, and ships are vulnerable to torpedoes. We do incorporate the necessary techniques, tactics, and procedures into training so that units may operate as designed despite their vulnerabilities.

There is an inflexion point in vulnerabilities where a designed force can no longer retain the desired capability through updated structure, techniques, tactics, or procedures. For example, mounted cavalry could not address the vulnerability to massed small arms, machine guns, and/or indirect fire. No amount of modernization could retain the capability in a meaningful way. Now, militaries use armored vehicles, aircraft, and drones to provide the needed capability of rapid maneuver, reconnaissance, and economy-of-force once provided by units on horseback.

Recommendations for Improvements to Readiness Assessments

The author's recommendations are his own based on many years of experience with readiness reporting. Readiness reporting for units should continue on a monthly basis, with the ability to update if there is a major change of status or readiness. The Joint Force should be on the same submittal windows (each of the Services has different submittal windows). Regular reporting units should all submit their reports within the first 10 days of the month. Intermediate units whose reports are based on an aggregation of their subordinate units should submit between the 11th and 20th of each month. Three-star commands, component commands, and combatant commands should then be submitted between the 21st and the end of the month. This allows each higher level to roll up and review their subordinate units to build their report.

Readiness should still build logically from resources to capability. People + equipment + time to train = readiness. The pillars should be the same type of index, and it is recommended that the 1–4 index is the best combination of simplicity and balance to show a differentiation.

The pillars of the overall index should be personnel, equipment, ordnance (if applicable), training, and mission. The business rules for how to assign the level to each pillar needs to be based on the concept of employment for a given unit type: employed as a whole unit, employed as a force provider, a hybrid of providing forces while retaining a mission, and those that are employed-in-place at their home location. Since the business rules are all encapsulated within an IT system, the newer technology can support more detailed business rules. This eliminates anomalies, false negatives, and false positives for units where the current single method does not calculate in a meaningful way.

The personnel pillar should be as automated as possible and consider the total strength, critical skills, leadership fill (by noncommissioned officer, senior noncommissioned officer, company grade, and field grade officer), with supporting tenure bands for unit cohesion. This type of detail is based on automation and management of the "faces to spaces" within a unit.

The equipment pillar should be streamlined to a single pillar instead of two. The supporting data remains so no analytical capability is lost. The equipment is based on the Service nominated and maintained list of mission essential equipment by unit type. This list could also be streamlined to a single list that allows for a weighted average versus the current process of two lists. For equipment that is not mission capable (NMC), it needs to indicate if it is down for supply or maintenance and items that are NMC for greater than 30 days.

The training pillar should be broken into currency, pace, proficiency, and complexity to better understand and track the qualitative factors of training. This could be assessed at the mission or task level, though task level comes with more complexity to manage and use the data.

The mission assessment portion should be converted to the 1–4 scale and should be included in the overall readiness (C-level) calculation. Having two different scales within a single report is confusing and produces inconsistent data.

A MET at the unit level should be required to have personnel, equipment, and training standards, as well as output standards. The Services may include certification standards where they are appropriate and be allowed to weight standards to assist in calculating a MET assessment between one and four. The Joint Staff should consider some common output standards for like capabilities to improve the usefulness of readiness data in war planning.

The metadata of unit types requires a significant update to current doctrinal standards that allows the Joint Force to group units and unit types easily.

New Readiness Framework

Readiness is often looked at with a "fight tonight" point of view, and while that is important, the larger strategic readiness challenge is balancing between current readiness and future readiness. No nation can afford the readiness it wants; careful consideration must be taken to allocate what a nation can afford to provide for current and future readiness.

Maintaining a database of readiness reports joined with employment, modernization, and force structure changes allows for the building of reliable forecast models. As the models mature, more variables can be included. These are interrelated and modular models as there is a unique model for each unit type or community as the relative impact of each variable is distinct for each unit type. These forecasts of the supply of ready forces across time allow for a detailed look at future readiness and the impacts of decisions today on future readiness.

With current readiness analysis, we can show the trade space between required readiness to meet the demands of the day-to-day operations as the minimum requirement to the upper end of how much the institution can generate with current resources. This allows for the management of risk and prevents overinvesting in current readiness at the expense of future readiness.

Extended operations in Iraq and Afghanistan reduced the investment in many areas of modernization. There is a period of rapid modernization underway to gain, maintain, or extend advantages in various capabilities. The focused period will reestablish a healthy balance late in this decade; that is, the sustainable and balanced framework that generates sufficient ready forces to accomplish the national strategy and continuously invests in modernization.

Readiness is more than tactical and operational unit readiness. A strategic readiness framework and assessment must also be considered. The other pillars of strategic readiness include installations, infrastructure, mobilization, munitions, the industrial base, allies, and partners. Including these in regular reviews can better open the true understanding of the capability to deter, fight, and win across the range of military operations.

The other pillars of strategic readiness are not neglected but traditionally are stovepiped. Bringing them together and determining trade space for decision makers is the value of a comprehensive strategic readiness assessment.

Decision Support

Readiness reporting and readiness data is most importantly decision support for senior leaders. Data-informed and data-driven decisions are not the same. Data-informed decisions must be made in time and space, but providing detailed supporting data allows the decision maker to known when, how large, and how long the impacts of a given decision will be. It may or may not change the decision, but it does inform the follow-on mitigation planning.

Data-driven decisions are those you did not know you needed to make until the data analysis showed that something is happening or may happen. To change that outcome, a decision is needed. Here is the true power of data analytics: to identify those decision points.

Decision support is not decision certainty. All data analytics, even as the amount of data proliferates, are incomplete. Forecasts are probabilistic as well as operating in a realm of competition with a thinking, dynamic adversary. Decision support is about quantifying levels of risk in terms of when, how long, and how big, so leaders make better decisions, faster.

The judgment and experience of leaders is never in question; decision support is not automating the making of decisions. The computer or AI is not deciding for us—the human role is essential.

The data expansion has created a new fog of war. The original fog of war concept described the need to make decisions with limited knowledge, like moving in fog. The new version is the need to make decisions with too much knowledge. It can be called analysis paralysis or trying to gain all the data to drive down perceived risk. The effect is the same. People must still act to gain and maintain the initiative. Acting faster than the competitor interrupts their decision cycle, forcing a step back to reevaluate. Do this fast enough repeatedly and the opponent may never get to their own decision until it is too late.

Data does not say or show anything. Analysts use data and visualizations to extract insight from data and present it to leadership in an understandable way. This confers power to analysts to shape or steer decisions. Leaderships is well aware of this, and this can create tension in the process. Building trust is essential to rapid, high quality decision making.

Gaining and Maintaining Momentum

With the new readiness framework and improvements to readiness reporting, there are challenges to getting improvements to stick. How do we institutionalize positive change? There is an imperative. There is active competition among nations. We did not start competition when there was a strategic pivot from the Global War on Terrorism to great power competition. The competition was always there whether people realized it or not. Change is around us and it would be dangerous to ignore it. We have successfully deterred another world war for more than 75 years, but it has not been without numerous instances and levels of armed conflict.

Like any large institution with widely diverse purposes, there are common roadblocks to change. These are grouped into three broad categories: human, technology, and political factors. The description of these factors is tailored to readiness, but they exist in any enterprise. Forewarned is forearmed: roadblocks cannot be eliminated, and they are part of the maneuver space like rivers and mountains.

Does all this give us better outcomes? The desire is to improve the odds of better outcomes across numerous echelons and time horizons. Our understanding, policies, metrics, reporting, and assessments have improved in many ways. Some parts are still clunky and need revision. Do we need to increase the readiness of the force? Only in some select areas. The monthly readiness of the force should be based on the ability to generate the ready forces needed for the deterrence strategy and sustain the residual readiness of the rest of the force as a springboard when needed. This has layers, from active forces in various lower states of readiness to guard and that become ready as they are needed. This is far more efficient than arbitrary goals that burn precious resources as the readiness, once obtained, has an expiration date.

The window of opportunity is open for the understanding of readiness. There is an evolution through punctuated equilibrium for the readiness enterprise. Rapid and substantial changes made from 2020 and a few years after will naturally slow down and stabilize for about 20 years. By that time, new technology, force structures, and capabilities will ignite another wave of thought and change.

The readiness paradox is that we cannot be ready, as we measure it, for all things at all times. We must try and determine how much readiness we can afford and balance it across time and the range of armed conflict. With dynamic competitors that adjust to our balancing act, once you think you have the ideal balance it is short lived. Even with mountains of data, it is an illusion of complete information, but it is not. It still lives in a haze of uncertainty. We do not gamble with the readiness of our forces, we must take measured, calculated risks to improve the probability of success in our favor.

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During the last seven years, he has led the charge on readiness reporting reform and increasing the utility of readiness data to support senior leader decision making. Most importantly he led the design and rollout of the readiness forecast model within the Marine Corps that is being adopted across the department.

Mr. Hull is married with three grown children and two grandchildren. He lives in Stafford, Virginia. He and his wife, Stacy, are both graduates of the University of Tennessee in Knoxville.

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