Surfing the First and Second Waves in 2025:
A SOF Strategy for Regional Engagement

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by

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Preface

Special Operations Regional Engagement (SORE) is the topic of this study. Its enduring qualities are timeless in comparison to technological advancements. To frame the function, assume the challenges faced by the fictional Yankee moving back to face a medieval King Arthur's Court, or by the more contemporary Star Trek travelers "teleported" onto a planet resembling the earthly world of 1996. Although the travelers possess a multitude of techno-gadgets capable of mystifying and destroying the masses of earthly dwellers, they must abort the notion of dominating the planet with their intergalactic capabilities and, instead, work within the population they have encountered. They must assimilate the language, culture, clothing, and times; they must be familiar with the mores and values of the population they encounter. The travelers cannot influence the behavior of the "barbarian" dwellers if they do not possess the ability to evaluate the populace; wisdom to integrate and communicate on the local level; the knowledge and familiarity with the local methods of barter and trade; and collectively, operate at the inferior technical level they encounter—a level vastly different from which they have come. With this as a frame of reference, we expect the SORE forces of the next century to be faced with the same dilemmas challenging the fictional Connecticut Yankee in King Arthur's Court. This paper focuses on the ability to advance those forces technologically and firmly plant the need to retain specific rudimentary, but extremely perishable, skills which may fall prey to the "cyber-warrior" quest.

Executive Summary

The United States is riding high on the crest of "thirdwave" technology as it leads the world's rush into the Information Age. It must not become so fixated on the information-based future that it is unprepared to deal with 78 percent of the world's population who will still be living in preindustrial and industrial societies late into the twenty-first Century.[1] Our thesis is that Special Operations Regional Engagement (SORE) forces will be the United States' warriors prepared to successfully engage in these less developed, though no less threatening worlds of the first- and second-wave "the 'Niche Warriors' of 2025." Their timeless core competencies—skill in the use of unconventional equipment and tactics, excel in politically sensitive environments and operations, employ unorthodox approaches, exploit limited opportunity, and produce/use specialized information—make them "special" and distinguish them from conventional forces.

These core competencies underlie SORE-unique and specialized skills that make them the force of choice to meet this challenge. First, they possess the cross-cultural skills that will remain elusive for many but are needed to build and gain the trust of these underdeveloped nations—foreign language proficiency, cultural and area awareness, nonverbal communications, and interpersonal skills.[2] Second, they "blend" into the environments in which they operate, either using their cross-cultural skills or the new third-wave technologies at their disposal. Third, SORE forces are not employed to "fight the client's battle" but to train them to "defend themselves" without developing a dependency on SORE forces. There is a critical air power component to SORE that the Air Force must prepare itself to meet. Many first- and second-wave entities will face threats to their internal security that may require the proper use of air power. The fledgling air forces of these entities will require assistance in developing adequate tactics, procedures, maintenance, supply, and other support systems within their own technological limitations. Last, since conventional forces will no longer possess the expertise, the weapons or the equipment found in most of these first- and second-wave areas, it will be the responsibility of SORE forces to be the "experts" in the procedures, tactics, and support requirements necessary to prevent and counter the spreading threat that "outbreaks of small wars" pose to US national interests.

SORE activities are conducted across the spectrum of military operations, from peace to war, and focus their defensive and offensive operations on training, advising, and assisting. The defensive objective is to enable host nations or other internationally recognized entities to maintain their internal security against forces that promote lawlessness, subversion, and terrorism, using their own personnel and equipment. Although ideally conducted in noncombative environments, SORE forces may be employed or unavoidably find themselves in combative situations. Offensive operations target an occupying force or established entity threatening US national interests. It may employ guerrilla warfare, subversion, sabotage, intelligence activities, evasion and escape, or other activities of low visibility, covert, or clandestine nature[3] to counter these forces. Defensive or offensive operations may require independent or combined direct combat action by SORE forces. The reader should not construe this paper as an attempt to "freeze" in time the SOF foreign internal defense (FID) and unconventional warfare (UW) missions of today. Rather, the focus must be to ensure the US does not lose these essential capabilities and is caught ill-prepared or off-guard when "endless outbreaks of small wars"[4] indirectly threatening US security become the norm of first- and second-wave nations in 2025. SORE forces will meet these challenges head-on by exploiting the advanced technology of third-wave warfare to improve their ability to operate effectively in the 126 predicted first- and second-wave nations of the twenty-first Century.[5] They will not disrupt the evolutionary stage of those countries by introducing third-wave technology before its time but instead will work within the constraints of those countries' capabilities, using third-wave technology only to train, prepare, and protect themselves.

The first step is employing an assessment system to "select" the best recruits for these operations, followed by realistic training and preparation in a virtual reality training center. Secondly, communications, computer, command, control, and information (C^4I) systems that "blend" into SORE first- and second-wave environments, yet also provide "third-wave" capabilities and interoperability with conventional force systems, is paramount. Third, they must have the know-how and systems to counter threats in these regions and to assist in information warfare (IW) activities. Advances in psychological operations tools and access to "information weapons" will play a key role in SORE countermeasure capabilities and in their collateral role of IW. Lastly, since SORE is performed on a personal level, rather than from a standoff position as envisioned by conventional force or SOF precision strike operations, basic sustainment needs of the individual cannot be overlooked. Simple, portable methods to feed, water, and resupply SORE are needed.

Furthermore, lightweight and compact "energy" sources—to ensure power is available for C^4I systems, weapons, and support equipment—must be devised. The details of these tasks and systems, as well as how they will be employed, are the heart of this white paper.

Notes

[1] Charles W. Taylor, *Alternative World Scenarios for a New Order of Nations*, Strategic Studies Institute, US Army War College, 1993, 26–28.

[2] These were the components of crosscultural communications identified by USCINCSOC in a briefing to the students of the Air War College on 25 March 1996.

[3] Joint Pub 3-05.3, *Joint Special Operations Operational Procedures*, II-5.

[4] Alvin and Heidi Toffler, *War and Anti-War*, *Making Sense of Global Chaos* (New York: Warner Books, 1993), 103.

[5] Taylor, 26–28.

Chapter 1

Introduction

> *In numerous incidents during the last two decades, the inability of developed countries to protect their interests and even their citizens' lives in the face of low-level threats has been demonstrated time and again.*
>
> —Martin Van Creveld
> *The Transformation of War*

Although not necessarily a sole superpower in 2025, the US will be a leading third-wave nation.[1] As in the past and present, the US will look to identify a threat to national survival that it can understand and fight on its own terms. This potential peer competitor, like the Germany of the World Wars and Soviet Union of the Cold War, will, in all probability, be a nation or "entity"[2] that generally thinks, plans, organizes, trains, and equips its forces in ways similar to the US. Justifiably, it will be important to ensure the US is a capable competitor in, if not the leader of, the third-wave world. However, it will be equally important that the US not become so fixated on building an information-based "Maginot Line" that its flanks are left vulnerable to the first– and second-wave threats that Western ethnocentrism or "technocentrism" often misunderstands or overlooks entirely. This is particularly important when one considers 78 percent of the world's population (126 of 147 nations) will live in preindustrial or industrial societies in 2020.[3]

The thesis of this white paper is that in 2025, SORE forces will be the "niche warriors" that provide the capability for the US to successfully engage in the less developed, though no less threatening, worlds of the first- and second-wave.

Source*: 1994 United States Special Operations Command Posture Statement,* 49.

Figure 1-1. Teaching Rudimentary Skills

Scope

As the thesis indicates, it is not the intention of this white paper to address all aspects of special operations (SO) in 2025. Other valuable SO capabilities such as *Precision Strike* and *Peacespace Dominance* will be addressed in other white papers. The scope of this paper is limited to the *Regional Engagement* capability of SO. The term *regional engagement* refers to the capability to protect and pursue US interests where political and cultural sensitivity, as well as knowledge of first- and second-wave equipment, tactics, procedures, and related support, are critical. It will include potential missions such as

sabotage; subversion; guerrilla warfare; evasion and escape; counterinsurgency/secessionist/separatist operations; and training, advising, and assistance operations.

This is not an attempt to freeze in time what SO foreign internal defense (FID) and unconventional warfare (UW) operations do today. Its basic objectives will be similar. However, Regional Engagement in 2025 will exploit the advanced technology of third-wave warfare to improve its ability to operate in first- and second-wave nations without disrupting the evolutionary process of those nations. In other words, SORE forces will not introduce or train third-wave technology in first- and second-wave nations, but rather train and assist those entities in using their own technology. SORE forces will, however, exploit third-wave technology to protect, train, and prepare themselves for operations in these first- and second-wave nations.

Assumptions

The strategic backdrop for this paper is provided in the context of the 2025 Alternate Futures. These alternate futures cover a spectrum of possible scenarios and include various assumptions. The following are those assumptions, either synthesized from the alternate futures or developed by this writing team, that are most relevant to this paper's thesis:

- Agrarian, industrial, and information-based societies will exist and coexist in 2025.
- Despite advances in information technology, language and cultural skills will remain critical but elusive for many.
- Employment of humans in hostile, denied, and politically sensitive environments will be required.
- Increased urbanization will require "transparent assimilation" vice physical concealment.[4]
- Although other entities such as large transnational corporations, economic alliances, and nongovernmental organizations will become more significant players in the global community, the nation-state will remain an important actor.

Methodology

This paper is divided into three major sections and two appendices. The thesis, assumptions, and core capability serve as the common thread tying the tasks, force qualities, and underlying technologies to SORE mission needs and core competencies in 2025. The first section (chapters 2 and 3) introduces the reader to SOF core competencies, the core capability of SORE, organization, and our proposed concept of operation (CONOP) to employ this core capability. The second section (chapter 4) addresses and details the critical tasks that enable the CONOP. These enabling tasks are recruitment, assessment, training, observation, communication, decision, countermeasures, and sustainment. Movement is also an important enabling task. However, since movement support for SORE operations will come from non-SOF, host or sponsor, and/or SOF lift platforms (designed for precision strike) and are addressed in the *Airlift*, *Spacelift*, and *SOF Precision Strike* white papers, we will not address them here. The closing section (chapter 5) provides our conclusions and recommendations for the future. Two appendices support the body of this paper. Appendix A identifies and discusses the force qualities and attributes needed in the recommended systems, as well as the underlying technologies required to create those systems. Appendix B provides a brief definition of those underlying technologies.

Notes

[1] Refers to the definitions used by the Tofflers in their books, *The Third Wave* and *War and Anti-War*. The first wave encompasses agrarian-based societies; the second wave, industrial societies; and the third wave, information-based societies. See Alvin and Heidi Toffler, *War and Anti-War* (New York: Warner Books, Inc., 1993), 8–9.

[2] "Entity" refers to potentially significant nonnational players in the world arena, such as multi- or transnational corporations and other nongovernmental organizations.

[3] Charles W. Taylor, *Alternative World Scenarios for a New Order of Nations*, Strategic Studies Institute, US Army War College, *1993*, 26–28.

[4] For instance, today's UW operations such as evasion and escape focus on avoiding population concentrations. This assumes these missions will only be conducted in isolated areas. Based on this assumption, transparency is achieved by physical concealment. In an urban environment, avoidance of indigenous personnel will be more complex. Accordingly, SORE forces must "blend in" and be capable of handling unanticipated contact.

Chapter 2

Regional Engagement

> *. . . a bewildering diversity of separatist wars, ethnic and religious violence, coups d'etat, border disputes, civil upheavals, and terrorist attacks, [push] waves of poverty-stricken, war-ridden immigrants (and hordes of drug traffickers as well) cross national boundaries. In the increasingly wired global economy, many of these seemingly small conflicts trigger strong secondary effects in surrounding (and even distant) countries. Thus a "many small wars" scenario is compelling military planners in many armies to look afresh at what they call "special operations" or "special forces"—the niche warriors of tomorrow.*
>
> —Alvin and Heidi Toffler
> *War and Anti-War, Making Sense of Global Chaos*

Core Capability and Core Competencies

SORE's core capability encompasses two general components: defensive and offensive operations. The defensive objective of SORE is to prevent or free a society from subversion, lawlessness, and/or insurgency. This is primarily accomplished by training, advising, or otherwise assisting host military and paramilitary forces, with the goal of enabling the host to unilaterally assume responsibility for eliminating internal instability.[1]

The offensive objective of SORE is to influence a government or nongovernmental entity whose behavior is contrary to US regional interests. Offensive operations involve a variety of military and paramilitary missions in hostile, denied, or politically sensitive areas. These missions are characterized by long duration, indirect activities including guerrilla warfare, and other offensive, low-visibility, covert, or clandestine operations.[2] SORE forces conduct or train and assist clients in subversion, sabotage, intelligence

activities, evasion and escape tactics, and other activities of a covert or clandestine nature.[3] Operations themselves are generally conducted by indigenous forces organized, trained, equipped, supported, and directed in varying degrees by SORE forces.[4]

The SORE core capability and special operations force (SOF) core competencies are closely related. Although the targets and focus of regional engagement may vary over time, the five core competencies are timeless. SOF must (1) be skilled in the use of unconventional equipment and tactics; (2) excel in politically sensitive environments; (3) employ unorthodox approaches; (4) exploit limited opportunities; and finally (5) use and produce specialized intelligence. The following paragraphs further define the core competencies and link them to SORE. Specifically, SORE forces must be skilled in the use of unconventional equipment and tactics.

> The unusual demands of a SO mission define the training and equipment required. Often, accomplishing the SO mission calls for a unique mixture of specialized skills and equipment that may be outside the capabilities of conventional forces.[5]

In 2025, this will be manifested in two ways for SORE operations. First, SORE must possess crosscultural skills. In other words, they must be regionally focused, skilled in foreign language, and culturally attuned. Second, the force must be skilled in the employment of equipment, tactics, procedures, and support functions associated with first- and second-wave societies and warfare.

Given the nature of their projected employment, they must excel in politically sensitive environments and operations.

> Virtually every aspect of a SO mission is constrained by the politically sensitive context in which it is conducted. For instance, the cultural mores of a country may dictate a low-profile operation, while in another situation, larger political considerations may require a visible presence in an advisory capacity. [SO] are marked by the need for political sensitivity and require patient, long-term commitments to achieve national objectives.[6]

Patient and *long-term* are the key adjectives of this core competency. These terms neither characterize the nature of conventional force employment nor the American public's attitude about such employment. SORE operations cultivate the relationships and presence necessary to conduct missions where our interests are at stake in politically or economically sensitive areas, not otherwise accessible to conventional (third-wave) forces, yet with significant economies of force. SORE operations also provide the flexibility of using SOF visibly when a high-profile US presence is desired or covertly/clandestinely when no US signature is required, but human presence is necessary.

To meet these diverse profile employment efforts, SORE forces must employ unorthodox approaches.

> SOF missions do not negate the traditional principles of war. Rather, a different emphasis is placed on their combination or relative importance. In a SO mission, surprise achieved through speed, stealth, audacity, deception, and new tactics or techniques can be far more effective and efficient than a conventional force using traditional tactics based on massed firepower and tactical maneuvers.[7]

In 2025, conventional, third-wave operations and tactics may be characterized by very precise munitions delivered from unmanned platforms or the manipulation of data from a work station far removed from the intended target. In such a world, the ability to infiltrate a SOF team and remain long enough to build a relationship of trust with indigenous personnel will certainly be considered unorthodox, yet remain critically important.

These unorthodox, critical approaches will require strict windows of availability and criteria to meet successful fruition. Specifically, SORE forces must be capable of exploiting limited opportunities.

> Some SO missions . . . must capture the appropriate moment for complete success. Tactical advantage may be limited and fleeting. Repeat opportunities are unlikely, and failures will be politically and militarily costly.[8]

Although more characteristic of SOF *Precision Strike* missions, SORE operations, by exploiting the world-wide presence of deployed forces in politically sensitive areas, may provide information or be used to conduct missions where a narrow window of opportunity exists. This will be true for both low-visibility and high-visibility missions.

Again, relative to the exploitation role of SORE forces in these visibility missions and all other tasks, SORE members will use and produce specialized intelligence.

> SO missions are intelligence-driven and intelligence-dependent. They require immediate and continuous access to information from traditional as well as nontraditional sources. SO generally rely on formal intelligence structures, but, for certain sensitive missions, tactical and operational information must be developed using SOF assets such as advance or reconnaissance forces. Moreover, SOF need detailed national and theater intelligence products at the tactical level of execution, often in near–real-time.[9]

SORE forces will be an excellent, nontraditional source of information valuable to political, diplomatic, economic, and military decision makers. Long-term relationships developed with indigenous personnel and/or host governments and military officials may allow the gathering of information not otherwise possible through traditional military, diplomatic, or economic contacts.

Employment Opportunity

The opportunity to employ this SORE core capability will be ripe given any of the six 2025 Alternate Futures.[10] All include the possibility for instability associated with lawlessness, subversion, insurgency, separatism, secessionism and states or other entities that sponsor or conduct terrorism and other destabilizing activities. Clients may include host nations or virtually any legitimate international organization whose maintenance of stability in a given region is in the interest of the US (e.g., multi-/transnational corporations, nongovernmental organizations, and regional alliances or coalitions). SORE operations may also be targeted *against* such entities should they conduct or sponsor activities that promote instability or are counter to US interests. Opportunities for miscalculation also exist. As noted in the following, this is particularly true regarding language and cultural skills.

> The relevance of [training] programs . . . depends heavily on requirements that the US intelligence community cannot always predict. Egypt and Syria emerged as the most important Arabic dialects after the Arab-Israeli War of 1967. As a direct result of that decision, only 16 Arab linguists on active duty (less than one percent) had studied Iraqi before Saddam Hussein invaded Kuwait. No one predicted large-scale SOF employment in Kurdistan or Somalia, where Operations PROVIDE COMFORT and RESTORE HOPE took place. The maintenance of language skills is just as essential as initial learning but, for most linguists, peak proficiency occurs the day they receive their diploma.[11]

The above example provides for a positive opportunity. It illustrates how third-wave information technology can be exploited to improve our ability to engage in first- and second-wave warfare. For instance, the capability to transform information into knowledge and, ultimately, into wisdom will contribute to our ability to identify future flash points and subsequently adjust our language training. Similarly, improved technology such as the introduction of more sophisticated translating devices (although no substitute for face-to-face conversation in the spoken language)[12] and other learning enhancement devices and techniques will likely improve comprehension and retention.

Organization

It is not the intention of this white paper to become immersed in the intricacies of organizational structure, service component responsibility, or any other controversial organizational issues associated with

details and minutiae. Rather, the purpose is to identify and discuss the important characteristics of any SORE organization—be it a service or joint organization.

Regional Orientation

> *Americans often become "bulls in china shops" . . . The "American way" of dealing with problems sometimes fails in the international milieu. It is particularly important for American leaders . . . to be sensitive to national concerns and to listen carefully to . . . other nations.*
>
> —Perry M. Smith
> *Taking Charge, A Practical Guide for Leaders*

Source: *1994 United States Special Operations Command Posture Statement*, 17.

Figure 2-1. SORE Forces Interact With Indigenous Personnel

Gen Perry Smith's warning further underscores the importance of robust SORE forces possessing the components of an effective cross-cultural communications capability—foreign language proficiency, cultural and area awareness, nonverbal communications, and interpersonal skills.[13] An organizational structure, based on regional orientation, is critical to ensuring SORE forces maintain this vital crosscultural capability. In a fiscally unconstrained military, areas of regional responsibility could be made smaller and more numerous to limit the diversity of language, cultural, and military capability within any one area. Such an

arrangement would allow for highly focused training and proficiency in language skills, weapons, and tactics. In a technologically unconstrained world in which a transparent language translation capability, "gift of tongues," is available, division of regional responsibility would be less constrained or perhaps not necessary. However, based on the alternate futures and our developed assumptions, it is not likely such a favorable environment, either fiscally or technologically, will exist in 2025. With this premise in mind, figure 2-2 illustrates a notional division of responsibility that seeks some balance between diversity within a region and force structure size limitations. Since SORE operations are focused on first- and second-wave areas; North America (less Mexico), Western Europe, Japan, Australia, and New Zealand are not included in the regional coverage scheme. The specific boundaries shown, although not entirely unrealistic possibilities, are for illustrative purposes only.

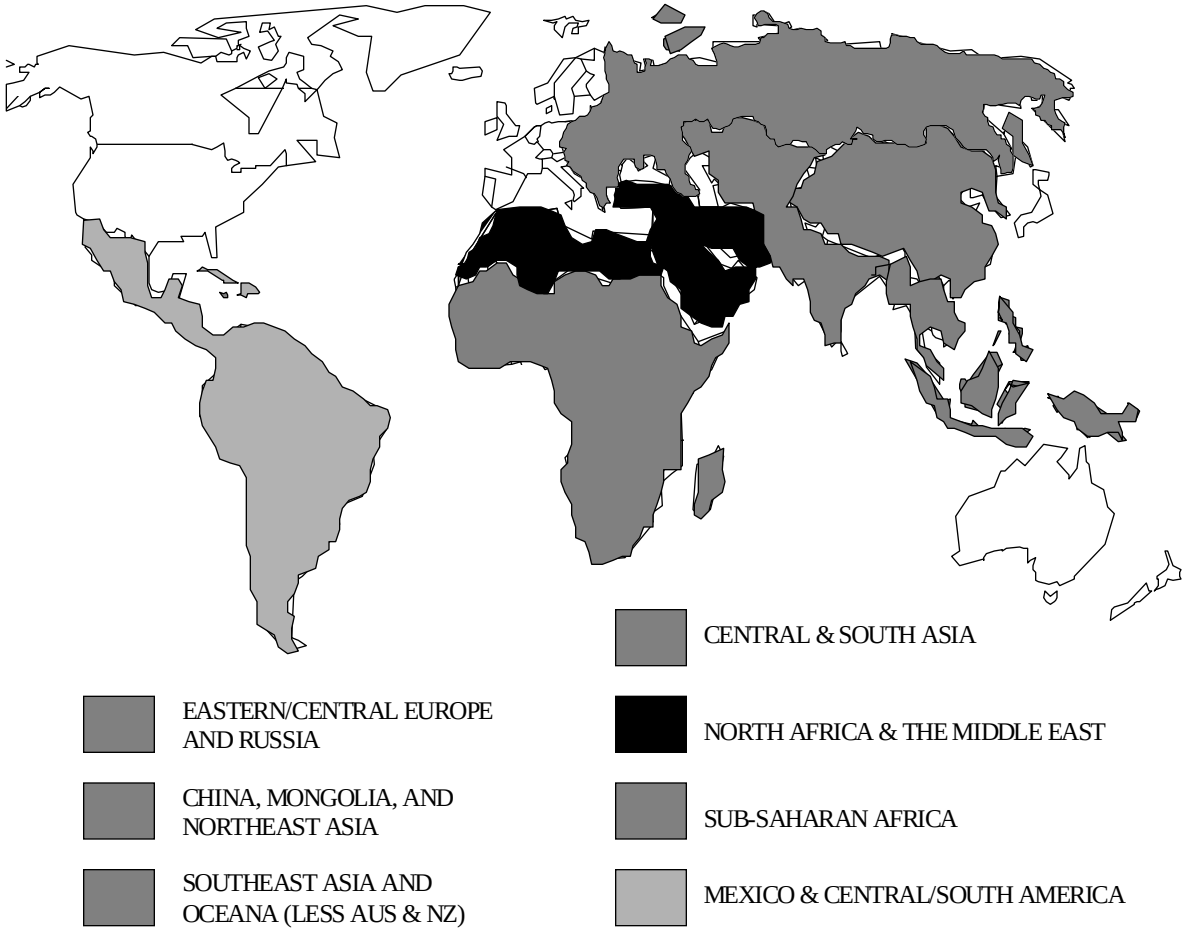


Figure 2-2. Notional SORE Areas of Responsibility

Force Size

The nature of the SORE mission will determine the size of the force. Offensive SORE missions such as sabotage or evasion and escape may require less than 10 people with little equipment. Conversely, a defensive SORE mission to train, advise, and assist a fledgling air force in air-to-ground tactics and procedures, in maintenance inspection methods, spare parts management, and weather observance and forecasting, may require a significantly larger team, in a more visible role. Nonetheless, either can be conducted more unobtrusively than large, conventional operations whose actions may be followed closely by the international media.

Decentralized Control and Execution

> *Greater battlefield awareness coupled with improved C^4I will require an individual who can make rapid and correct decisions. . . these changes imply a dramatically flattened command structure staffed by an extremely high caliber of individual at every level.*
>
> —*Warfighting Vision 2010, A Framework for Change*, 1 August 1995

Another important attribute of SORE organization will be a "flat" structure that emphasizes decentralized control and execution. The continuous, long-term, low-visibility, and crosscultural nature of SORE operations demand a force that can accomplish the mission with little more than clear articulation of the desired end state and associated rules of engagement (ROE). Within these broad constraints, the SORE operator can be trusted to rely on his/her extensive training to determine the best means of accomplishing the mission (in accordance with the ROE).

Focus of Expertise

The final attribute of a SORE organization is the focus of its expertise. The aviation training mission provides a good example. The ultimate objective of SORE defensive operations is to empower the client to protect itself and maintain stability using organic equipment, weapons, and, most importantly, personnel. In terms of aviation, it is not the primary objective to teach the rudiments of initial flying qualification or "wrench turning." It is assumed the client already has the capability to provide these basic skills. The focus of SORE operations is to improve the client's tactics and weapons employment, which may include training

and procedures associated with support functions such as supply, maintenance, and weather. This focus has force structure implications as well. Since pilots will fly in an observer role, it is only necessary for SORE operators to be familiar with the overall characteristics of aircraft flown in the regional area of responsibility. It is not necessary for them to be qualified in all aircraft in the region. Subsequently, SORE aviation units need only possess aircraft that closely resemble the characteristics of aviation platforms in that geographic area. This capability may be accommodated through leasing arrangements that allow the unit to change its aircraft inventory to reflect regional changes on a near–real–time basis. This approach is far less costly and time consuming than the traditional research, development, acquisition and life cycle maintenance associated with traditional military aircraft inventories.

This flexible, regionally focused organizational structure optimizes the core competencies and capability discussed in this chapter. Together, they provide the foundation for successfully implementing the CONOPs in the next chapter.

Notes

[1] Joint Pub 3-05, Doctrine for Joint Special Operations, October 1992, II-8.

[2] The terms covert and clandestine are often confused. Doctrinally, and for the purpose of this paper, they are defined as follows. A clandestine operation places emphasis on the concealment of the operation itself. A covert operation places emphasis on the concealment of the identity of the sponsor. In special operations, an activity may be both covert and clandestine and may focus equally on operational considerations and intelligence-related activities. (See Joint Pub 1-02 and Joint Pub 3-05.)

[3] Joint Pub 3-05.3, Joint Special Operations Operational Procedures, August 1993, II-1.

[4] Joint Pub 1-02, Joint Warfare of the United States Armed Forces, January 1995, I-X.

[5] United States Special Operations Command, The United States Special Operations Forces Posture Statement, 1994, 3.

[6] Ibid., 3.

[7] Ibid., 4.

[8] Ibid.

[9] Ibid.

[10] Refer to the Alternate Futures white paper for specific definitions.

[11] John Collins, CRS Report for Congress, Special Operations Forces, An Assessment 1986–1993, 30 July 1993, 1991.

[12] This assertion is further addressed under the "Advantages of SORE" section of chapter 3, Concept of Operations.

[13] These were the components of cross-cultural communications identified by USCINCSOC in a briefing to the Air War College on 25 March 1996.

Chapter 3

Concept of Operations (CONOP)

The Americans neglected to study history's many examples of supposedly outmatched combatants prevailing over better-equipped rivals. And they took it for granted that their potential adversaries would accept the American interpretation of the "revolution." But America's most likely opponents were invariably unlike America and thus not beholden to the American interpretation.

—Charles J. Dunlap, Jr.

The CONOPs for SORE in 2025 involves a broadening and enhancement of current foreign internal defense and unconventional warfare capabilities. This is particularly true for the aviation or specialized airpower component of SORE. Like the capability it employs, the CONOP has both a defensive and offensive component (see fig. 3-1).

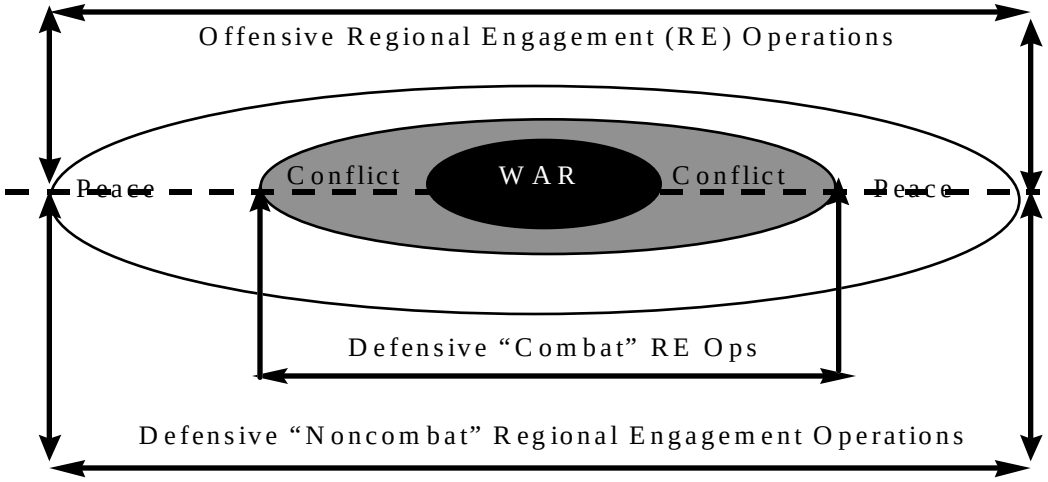


Figure 3-1. The Realm of Special Operations Regional Engagement

Defensive SORE

Given the diversity of the SORE missions within the "peaceful" realms, the defensive component can be further divided into combat and noncombat operations. Both focus on developing the indigenous leaders, organizations, and individual skills of host nations, or other entities determined to be legitimate and whose viability is considered to be in the interest of the US. In other words, these defensive SORE operations are centered on training, advising, and assisting. Ideally, potential customers are identified before they face an organized, destabilizing threat. In such cases, SORE operations would be conducted in a controlled environment that presents little threat of subjecting the team to hostile action. However, "when subversion, lawlessness, or insurgency, [separatism, or secessionist activities] threaten a friendly nation's stability, the NCA may direct US forces to provide support to friendly nation's counterinsurgency [et al] efforts. This support is distinct from . . . training or advisory assistance . . . because it involves the operational commitment of US forces . . ."[1] It is entirely likely that SORE operations may begin in a noncombat environment and transition to a combat environment.

An example of defensive operations may involve the employment of a SORE aviation team into a developing, second-wave nation. In such a case the team might assist the fledgling air force in developing doctrine, tactics, and procedures for conducting close air support of ground forces or combat search and rescue; a logistical system to support flying operations; and, perhaps, a limited weather observation and forecasting capability. Should the competency of this notional air force be so rudimentary, the NCA may be compelled to direct SORE forces to actually fly combat missions as part of the host nation's aircrews. Such a decision clearly raises the consequence of failure. However, due to the possibility of a rapid transition from noncombat to combat, SORE forces must always be prepared for such an eventuality.

Offensive SORE

The offensive component of SORE "includes guerrilla warfare, subversion, sabotage, intelligence activities, evasion and escape, and other activities of a low visibility, covert, or clandestine nature."[2] The core of offensive SORE operations, similar to the defensive component, is training, advising, and assisting. However, there are two essential differences. The first is the nature of the target. In offensive operations,

SORE activities are directed against an established entity or "occupying" force. The second follows from the political sensitivity of the first. The operation will almost always be conducted in a covert or clandestine manner to effectively mask US involvement. This last consideration may lead to the requirement to use sophisticated systems to infiltrate, exfiltrate, sustain, and communicate in a clandestine or covert manner. The challenge will be to exploit third-wave technology such that it will be transparent in a first- or second-wave environment.

An example of offensive SORE operations in the context of the "Zaibatsu" alternate future may involve the infiltration of a SORE team into a region dominated by a multi- or transnational corporation where vital American interests are at stake.[3] Such a mission may be characterized by training, advising, and assisting indigenous personnel in harassment activities. Such an operation might also facilitate or complement a SOF precision strike mission aimed at disrupting information systems.

Advantages of SORE

The advantages of possessing a core capability to conduct SORE operations in 2025 are several fold. First, since SORE operations are focused on first- and second-wave entities, emphasis will be on weapons, tactics, procedures, and support infrastructure considered crude or primitive, both today and 30 years hence (fig. 3-2). Conventional forces of 2025 will not possess these cruder weapons, and subsequently, have no expertise in their employment.

Source: USSOCOM Pub 1, *Special Operations in Peace and War*, 2–15.

Figure 3-2. SORE Forces Training in the First and Second Waves.

Second, even if technology is available for universal or programmable language translators, imagine how intimidating or socially offensive the use of such devices might be to a non-Western and/or lesser-developed people. Unless such translation devices can be made transparent to the receiver, they will be inadequate as a replacement for the language-skilled, culturally attuned individual. The following example illustrates this point.

> In Uganda last year during the efforts to assist the refugees from Rwanda, an Army Special Forces captain was tasked to introduce American aid representatives to the President of Uganda. The captain started off the conversation, introducing himself and greeting the president in the President's own language. This impressed the President greatly and smoothed the introduction of much more difficult topics and discussions. The captain's [language and cultural] training and previous deployments had allowed him to . . . make the telling first impression.[4]

Third, interpersonal relationships cultivated during SORE operations "strengthen ties with the host nation [or other entity] while building future 'contacts' that may not otherwise be available through traditional [or conventional] military or diplomatic channels."[5] Fourth, SORE operations are preventive in nature and therefore result in significant economies of scale. Early engagement of small, unobtrusive SORE teams in a variety of locations throughout the globe provide the ability to influence events before they become

media spectacles and take on a life of their own. These teams also provide a source of intelligence that can be placed in a cultural or societal context not possible with other sources.

Having described the offensive and defensive components, as well as the advantages of the CONOP, this paper now turns to its enabling tasks. In the chapter that follows, these tasks and their attributes are addressed and evaluated in detail.

Notes

[1] Joint Pub 3-05.3 *Joint Special Operations Operational Procedures*, II-5.
[2] Ibid., II-1.
[3] Refer to *Alternate Futures* 2025 White Paper.
[4] USCINCSOC Congressional Testimony, 27 March 1995.
[5] ***2025*** Concept, no. 900772, "Aviation Foreign Internal Defense," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

Chapter 4

Enabling Tasks

> *As scarce resources are allocated and the highly visible . . . systems receive the most attention, it is the grunt—often equipped much as his grandfather was—that is most often called upon to implement foreign policy . . . Many situations . . .will still require...the ability to interact with local populations, and the ability to make human "in the loop" decisions.*
>
> *—2010 Warfighting Vision, A Framework for Change*, 1 August 1995

Based on the concept of operations for SORE, very specific and defined enabling tasks emerge. Sequentially, the tasks of recruit, assess, train, observe, communicate, decide, counter, and sustain follow and are measured. In the tables throughout this chapter, the terms critical, desired, or ideal refer to the attribute's level of need for each task. A Critical attribute is required to accomplish the task. A Desired attribute allows for a reasonable expectation of enhancement that is within fiscal and technological possibility. In other words, a desired attribute may make task accomplishment or system outcome faster, more precise, or lighter weight, but the mission can still be accomplished without it in 2025. Lastly, an ideal attribute enhances task accomplishment and ultimately mission execution, yet may push fiscal and technological limits.

Recruit, Assess, and Train

> *My first plea is for the frontiers—not the mainstream. The mainstream, by definition, will have enough volunteers and preferences to garner the attention it needs to see us through the necessary doctrinal evolution. But what of the lonely, dangerous frontiers, with all of their uncertainties and risks? Will we have enough volunteers? Will those who volunteer have the wit, courage, and stamina that frontiers seem always to demand of pioneers? I hope that the frontiers of air and space doctrine will beckon those airmen who have the potential to be doctrinal pioneers.*
>
> —Carl H. Builder

Given that SORE operations in 2025 may occur with limited opportunity to prepare are politically sensitive and will occur in permissive, hostile and/or denied environments, selective recruitment, detailed and thorough training, coupled with continuous mission rehearsal and assessment, will be critical. The use of specialized equipment and unique skills dictate the need for an ongoing, comprehensive recruitment, training and assessment program. To this end, SORE forces will undoubtedly take advantage of developing technologies. As mentioned previously, their efforts may include direct support of first- or second-wave military or fielded forces, multinational corporations, or other governmental agencies.

If you tell me, I'll listen.

If you show me, I'll see.

If I experience it, I'll learn.

—Lao Tze, 430 BC

Source: http://www.afit.af.mil/schools/PA/gall3.htm. Artwork courtesy of Gene Lehman.

Figure 4-1. Illustrated "Virtual Reality" Center Concept to Provide Experience

To effectively meet these train-to-task missions, both on a continuing basis and for initial selective trimming of SORE candidates, development and use of virtual reality centers or the “holo-deck” type arenas, currently envisioned in the Star Trek TV series, should be pursued. These virtual reality centers would allow SORE forces to totally “immerse themselves” in the pending or projected mission(s) (ideally to include anticipated “environmental influences” i.e., rain, snow, mud, and cold to be encountered). For those previously qualified, the centers would provide ongoing refresher or reorientation training. For new accessions or potential candidates the center would serve as a proving ground to determine the acceptability of an untested recruit.

Further, potentially every member involved in a particular mission or deployment could rehearse his part with all the reality of executing the mission void of the potential ramifications of mistake in a sensitive environment. Mission rehearsal or selection parameters could be repeatedly played out with multiple contingencies and backup scenarios to force reactive and proactive player responses. The SORE virtual reality training centers could be linked with other similar centers allowing all participants, military and

civilian, who are not geographically collocated to interact, train, and rehearse as a single entity—as if actually accomplishing assigned tasks and responsibilities well in advance of true debarkation. Additionally, the centers should be linked to "real-time" national assets—intelligence, information and data collection, and battle management systems—to afford the injection of real–time conditions into mission training and rehearsal.

The SORE virtual reality training centers would allow mission particulars such as cultural awareness and immersion to include language skills to be "experienced" first hand. Similarly, operating with dangerous materials, highly specialized or first-wave one-of-a-kind equipment, and unique tactics could be repeatedly practiced or rehearsed, improving the quality of training and likelihood of mission success. The virtual reality training centers would be equally useful as proving grounds for evaluating potential SORE candidates.

Accordingly, SORE recruitment, assessment and training regimens and the system descriptions to support those regimens must be highlighted for operations in 2025. Initially, given the nature of SORE tasks, the potential conditions and environments in which those conditions will occur and the realistic assumption that SORE force structure will consist of a small number of selectively trained and experienced warriors, picking the "right troop" in 2025 could prove to be the cognizant driver in the accession process.

To illustrate the importance of selecting the highest caliber forces, USCINCSOC's testimony to Congress in March 1995 provides a concise vision of what those selection demands could hold for SORE forces of the future.

> It. . . requires a particularly mature, independent, and self-starting individual who can operate in small groups, often in harsh environmental conditions. Finding these kinds of individuals requires a special selection and assessment process that can gauge a person's suitability to these kinds of tasks. [1]

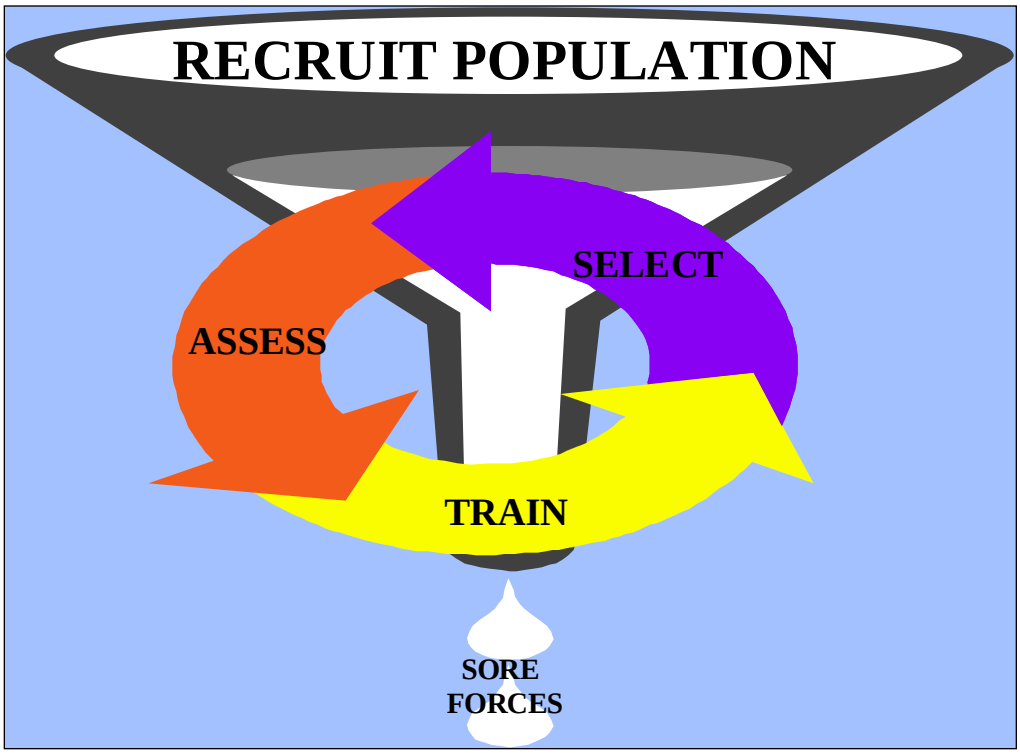


Figure 4-2. Recruit, Assess, and Train Selection Cycle

As mentioned, this "mature" population must come from the mainstream—either conventional forces or general population. Accordingly, the "Recruit, Assess, and Train Cycle" used to facilitate SORE force acquisition must be attuned to the pool of candidates available and weighted against the needs of protracted mission accomplishment. In that light, force designers must begin with the basics and construct a viable marketing program to attract potential SORE candidates. After an "acceptable" pool of candidates is identified, a vigorous assessment cycle must commence to determine which potential candidate(s) will "make the cut" for qualification training. Figure 4-2 graphically illustrates the conceptual framework for this initial recruitment and selection cycle. As noted, the recruited population may be large. After a series of "selective" psychological and physical screening tests, the pool will dwindle to reasonable proportions, similar to the manner in which NASA and the Navy screen their astronaut and SEAL candidates respectively.

While the recommendations for enhancing the collective recruit, assess, and train regimens for SORE forces follow, the concept of selective retention[2] must be assumed. Considering the enduring nature of our

core competencies, the same "selective" process of today must occur in 30 years, yet must be replete with the technological and medical advances anticipated. A grounded commonality remains; the process is continuous. As candidates enter the recruit funnel, the continual selection, assessment, and training regimen must be used time and again. The outcome of the cycle will result in culturally attuned, physically and mentally prepared SORE forces capable of implementing and sustaining the rigorous demands of the SORE CONOP. At any point within this cycle, a recruit will be dismissed or returned to conventional forces since SORE force employment and application is a "high-risk-of-failure" proposition.

Table 1 provides the attributes needed and desired in the initial selection/screening process and the follow-on assessment and training requirements. While these parameters will serve to initially select, continually assess, and later prepare SORE forces for specific areas of performance, the essence remains to develop an organic approach to refining the initial selection process.

Table 1

Recruit, Assess, and Train Attributes

Attribute	Recruit	Assess	Train
Cultural/Political Sensitivity	*Desired	Desired	Critical
Regional Orientation	Ideal	Desired	Critical
Language Proficiency	Desired	Critical	Critical
Negotiation Skills	Desired	Desired	Critical
Psychological Profile	Critical	Ideal	Ideal
Cognitive Learning Ability	Desired	Ideal	Ideal
Physical Attribute/Ethnicity	Desired	Desired	Desired
Adaptability	N/A	Critical	Critical
Interactive (Realistic)	N/A	Desired	Critical
Individually Tailored	N/A	Ideal	Ideal
Portability	N/A	Desired	Desired
Interoperability	N/A	Ideal	Critical

*Critical, desired, and ideal refer to "level of need" for task accomplishment.

In that vein, genetic engineering, testing, and selection parameters may prove to be an early discriminator to achieve this goal.[3] Similarly, during the initial process, advance testing should be adopted to apprise an applicant's potential to learn language based on brain hemisphere dominance, profile his/her psychological state to determine historical nurturing, and IQ testing to rate cognitive learning ability. Further, future mission requirements will dictate that physical attributes of the candidate(s) be considered in building the force structure verses simply filling projected losses. To restate, initial selection procedures will be critical to effectively field the highest caliber forces to achieve specialized and changing SORE mission objectives. Given the nature of the SORE mission and the potential expense associated with its follow-on training, mistakes must be kept to a minimum or be systematically revealed at any point in the selection and/or assessment process. Ultimately, the training of selected individuals will refine and result in cognizant members capable of effectively operating as SORE employed forces.

To meld the selection and training profiles and further qualify this process, an essential element will be to speed the learning process of the people selected and being trained within the virtual system. Some innovations and ideas relevant to this enhanced ability may range from artificially intelligent word processing,[4] to selective knowledge pills[5] ingested as situations dictate, to accommodate the increased need to absorb magnitudes of data over extended periods of time or for short durations. Overall, these concepts may provide the key links for allowing our selected SORE forces to receive and process the massive output of the envisioned Virtual Reality Center. Again, USCINCSOC's testimony appropriately addresses the criticality of the collective tasks:

> Units that conduct these operations invest a great deal of time and energy in language proficiency, cultural awareness, and regional orientation. It often takes years of study, in the actual area of operations, to develop the kind of understanding required to work with forces where the SOF operator has no command authority but must accomplish the mission through cooperation and mutual understanding. This must be followed by a training program that teaches not only the language and regional specifics, but also how to deal with and operate in unusual situations where there usually are no doctrine or guidelines and they have no authority to issue orders but must use persuasion to solve a myriad of challenges they confront.[6]

Collectively, recruitment, assessment, and training will be critical to the effective fielding of SORE forces in 2025. Without these building blocks of successful selection and preparation, the end game of their actions cannot be assured or predicted with any certainty. However, by applying specific standards to these criteria, we will dramatically increase the probability of success by fielding a select group of brilliant

warriors, selected, educated, trained, and employed in diverse regions of the world. As noted by Lt Gen Jay W. Kelley in his unpublished article addressing the Brilliant Warrior concept as applied to professional military education—"Brilliant Warriors must be critical thinkers."[7] The rigorous recruit, select, and train regimens described in this chapter will help produce the "brilliant warriors" of 2025.

Observe, Communicate, and Decide

> *Advanced materials and electronic developments will lead to enhanced SOF communications capabilities. These [will] include features such as miniaturized command, control, and communication functions as well as embedded artificial intelligence for situational decision making. . . . . To keep pace with mission requirements, SOF will require enhanced, next- generation communications equipment.2*
>
> —*United States Special Operations Forces Posture Statement*, 1994

Three enabling tasks of SORE's core capability—observation, communication, and decision—have been grouped together because they are an inextricably linked process. Observing data, without communicating it, is of little value. Even if the ability to observe is enhanced and methods of transmitting data are improved, there is no value added unless there is a means of turning that information into knowledge useful to the decision maker. Therefore, it would be a mistake to look at these tasks individually, since the process must facilitate all three.

Brig Gen William E. Harmon, USA, program manager for the Joint Tactical Fusion Program wrote, "The most sophisticated intelligence collection in the world is worthless if the information it provides does not reach the commander in a timely manner."[8] The authors of *New World Vistas: Air and Space Power for the 21st Century* also agree. They assert, "The power of the new information systems will lie in their ability to correlate data automatically and rapidly from many sources to form a complete picture of the operational area, whether it be a battlefield or the site of a mobility operation."[9] Restated, the ability to collect, fuse, and process data into a usable form and then ship the information to the decision maker on demand is crucial. Whether the process is "third wave" as discussed by *New World Vistas*, or crude "first- or second-wave" where the process may be as simple as "seeing" with one's own eyes, "telling" someone what you saw, "discussing" it, and then acting—the need for effective interweaving of these three tasks remains high. For

familiarity, the term C^4I (communications, computers, command, control and intelligence) is used to refer to the "observe-communicate-decide" process—not a technological system, but rather a process.

Table 2 lists the twelve attributes imperative to the observe-communicate-decide process. The first seven—interoperability, divergence or fusion, portability, transparency, face-to-face contact, security, and resolution—are critical to SO regional engagement operations and are captured in four overriding requirements. These requirements are discussed at length in this section. The remaining five attributes are desired, not critical, and are briefly discussed.

Table 2

Observe, Communicate, and Decide Attributes

Attribute	Observe	Communicate	Decide
Interoperability	*Critical	Critical	Critical
Divergent and/or Fused	Critical	Critical	N/A
Portability	Critical	Critical	Desired
Transparency	Critical	Critical	Critical
Face-to-Face Contact	Critical	Critical	Critical
Security	Critical	Critical	Critical
Resolution	Critical	N/A	N/A
Range (global/local)	Desired	Desired	Desired
Speed (near real time)	Desired	Critical	Desired
Capacity (giga-terabits/sec)	Desired	Critical	Desired
Survivability	Desired	Desired	N/A
Accuracy	Desired	Desired	Desired

*Critical, desired, and N/A refer to "level of need" for task accomplishment.

The *four overriding requirements* needed for successful employment of SORE's observe-communicate-decide task in 2025 are (1) interoperability and fusion with third-wave C^4I systems with appropriate range, speed, and accuracy qualities, as well as a divergent detection and resolution capability; (2) portable field equipment that is lightweight, secure, and survivable; 3) C^4I equipment that "blends" into

first- and second-wave nations—either using twentieth-century equipment or camouflaged, customized equipment that is transparent in first- and second-wave worlds; and (4) face-to-face communications to keep the "human in the loop." Each requirement is impacted by various aspects related to the technology already available in the conventional forces or by the environment in which it will be employed. These aspects are addressed along with each requirement in the following paragraphs.

First, we must recognize most of SORE's third-wave C^4I support will come from non-SOF resources. The primary third-wave support will be interoperable, robust networks that provide an integrated C^4I network where image, voice, and digital data are fused for transmission and receipt. An underlying concern with conventional fused systems is that "fusion" does not simply provide an "average of two data sets," but rather a divergent detection and resolution capability necessary to support the precise nature of SOF targeting requirements. Furthermore, fusion may be difficult to attain. As *New World Vistas Study* stresses ". . . robust interpretations of sensor data are hard to develop from mathematical considerations alone . . ." and commonsense reasoning about the process of fusion must be understood and automated.[10] With or without fusion, the network must also be near real-time, secure, survivable, and provide redundant transmission paths. These capabilities are not only needed for SORE but also for the conventional forces.

Information obtained from conventional C^4I systems and divergent detection and resolution sources will be used in defensive SORE operations where the mission is focused on assisting and training sponsor forces in a noncombative environment. These sources will provide a secure, reliable C^4I link "back home" and simultaneously provide interoperability and intelligence sharing with coalition forces, host nations, or clients. As noted in Joint Pub 3-07, "US intelligence sharing ranges from strategic analysis to current intelligence summaries and situation reporting for tactical operations. An adequate intelligence collection and dissemination capability is often one of the weakest links in a host nation's military capability."[11] However, we must be careful about what third-wave knowledge we share and how we share it. We do not want to provide "intelligence" obtained from third-wave sources or to provide the host a direct "link" to our systems unless we plan to leave it behind for the host's future use. Otherwise, when the forces depart, the host will be at a loss.

This concept is best explained by using an example from our CONOP where US SORE forces are training a host and then are tasked to join the flying crews of sponsor nations when the environment shifts into

a combative mode. It would be tempting to offer third-wave intelligence sources to pinpoint enemy actions and to assist the sponsor in developing an operations plan, just to protect our own SORE pilots. However, this action risks leaving the host more vulnerable than when we arrived. A better approach is for SORE forces to take advantage of their "link" to intelligence systems during the non combative phase, to keep in tune with changing events in the area and to formulate the best method to optimize the host's existing forces and resources to locate and eliminate the threat. For example, they might help the host set up a human intelligence (HUMINT) network or retrofit an existing aircraft with reconnaissance gear to gauge the nature of the impending threat. Teaching the host how to use their own resources versus "plugging" them into ours is much more beneficial to their future development.

Another key use of these same third-wave systems is predicting and dealing with the effects of urbanization. Population trends indicate that by 2010, 50 to 65 percent of the world's population will live in urban areas.[12] We have already seen the impact of urbanization on US operations in Somalia, Haiti, and Bosnia where starvation, disease, pollution, and mass migration are staggering. The United States' "capability to operate and conduct military operations in built-up areas and to achieve military objectives with minimum casualties and collateral damage requires more precise weapons, surveillance, sensing, target detection, and situational awareness enhancements."[13] Payback for developing divergent detection and resolution will be realized in this case, since "precision" will be critical.

The future holds great promise for systems that collect, fuse, and distribute information. The most likely candidates are a Global Surveillance, Reconnaissance, and Targeting System (GSRT),[14] an ultraprecise, jam–resistant global positioning system (GPS),[15] and worldwide surveillance, collection, and reconnaissance done from commercial, possibly international conglomerate platforms producing high–resolution mapping and worldwide weather monitoring.[16] Again, the key is to provide a "fusion" capability that does not simply produce an "average of two data sets," but rather a divergent detection and resolution capability necessary to support SOF precision identification and targeting requirements, particularly offensive SORE operations.

Similarly, there are many possibilities for improved communications networks in the future. The three most likely successors, Distributed Satellite Systems, Fiber and Satellite Networks, and direct link between satellite and aircraft, are described in *New World Vistas: Air and Space Power for the 21st Century.*[17]

Since these systems are addressed in the *Information Operations, Counter Information,* and *S & R Information Operations* white papers, we will describe them only briefly in the Systems and Underlying Technologies appendices. However, SORE "packaging" of these third-wave C^4I systems for use in first- and second-wave nations may differ from conventional packaging. This "unique" packaging will be addressed in the third requirement.

The second requirement deals with the C^4I systems necessary for covert or clandestine operations normally associated with offensive SORE.

> [These type of SOF] missions are intelligence-driven and intelligence– dependent. They require immediate and continuous access to information from traditional as well as nontraditional sources. SO generally rely on formal intelligence structures, but, for certain, sensitive missions, tactical and operational information must be developed using SOF assets such as advanced reconnaissance forces.[18]
>
> Quite simply, SOF operations will require the full array of intelligence products available to conventional forces, such as indications and warning data, orders of battle, threat tactics, weapon systems characteristics and capabilities, communications, environmental, and maritime factors.[19]

SORE forces will need lightweight, mobile, secure, and survivable equipment that works well in harsh, austere environments, that ensures low visibility for covert or clandestine operations, and that inherently guarantees synchronization and security of small teams fighting subversion, lawlessness, insurgency, and terrorism. The same equipment will be needed for teams that must "up close and personally" verify information on enemy capabilities, intentions, and activities that are unverifiable through conventional surveillance and intelligence means. This equipment must have the range and capacity for teams to communicate securely with command and control centers, with each other, with intelligence sources, and/or directly to weapons delivery systems.

A miniature C^4I unit, constructed of micromechanical devices where a "single chip" is the entire system, could be embedded in a helmet, on a sleeve, or in a wristband. The system could be voice, gesture, or thought controlled as deemed plausible in *New World Vistas: Air and Space Power for the 21st Century's*[20] concept of Human/Machine System Fusion.[21] The All Seeing Warrior concept[22] or the Tactical Information Display Helmet[23] are both excellent examples. Another possibility is to build very small aperture antennas (VSAT) into the receiver systems which are capable of transmitting video and sophisticated computer-generated data around the world.[24] These VSATs could be mounted on or embedded in a C^4I helmet,

wristband, or any other "handy" device. In each case, either non-SOF or specialized SOF C^4I systems, with capabilities similar to the systems used for *SOF Precision Strike*, would be appropriate.[25] Collectively, a potential problem may arise in providing appropriate power supplies to these microsystems without "frying" the chips. For possible solutions to this and other power problems, please refer to the "sustain" section that follows.

Source: P. J. Griffiths Magnum, "Wireless Networks," *Scientific American*, September 1995,: 53.

Figure 4-3. Camouflage Is Critical.

The third requirement highlights the uniqueness of a third-wave SORE force which must "operate and blend into" first- and second-wave worlds. It portends that, even if available, standard third-wave C^4I systems may be inappropriate for SORE operations. For example, even though high-tech, third-wave communications systems will exist for team-to-team communications, like the Tactical Information Display Helmet,[26] it does not "look and feel" like the sponsoring nation's equipment, nor does it "blend" into their low-tech environment. Rather than blend into the local environment, the helmet would merely flaunt SORE force presence and jeopardize their low profile assistance. Therefore, we may not want to employ it, since using it would defeat our purpose of training and developing the sponsored forces with their own equipment and in their own technological era.

To eliminate these problems, two solutions or approaches are suggested. First, we must be fully aware of and knowledgeable about the current technological state of our host. Next, we must be prepared to use the host's C^4I equipment or to deploy equipped with organic first- or second-wave equipment. We cannot expect

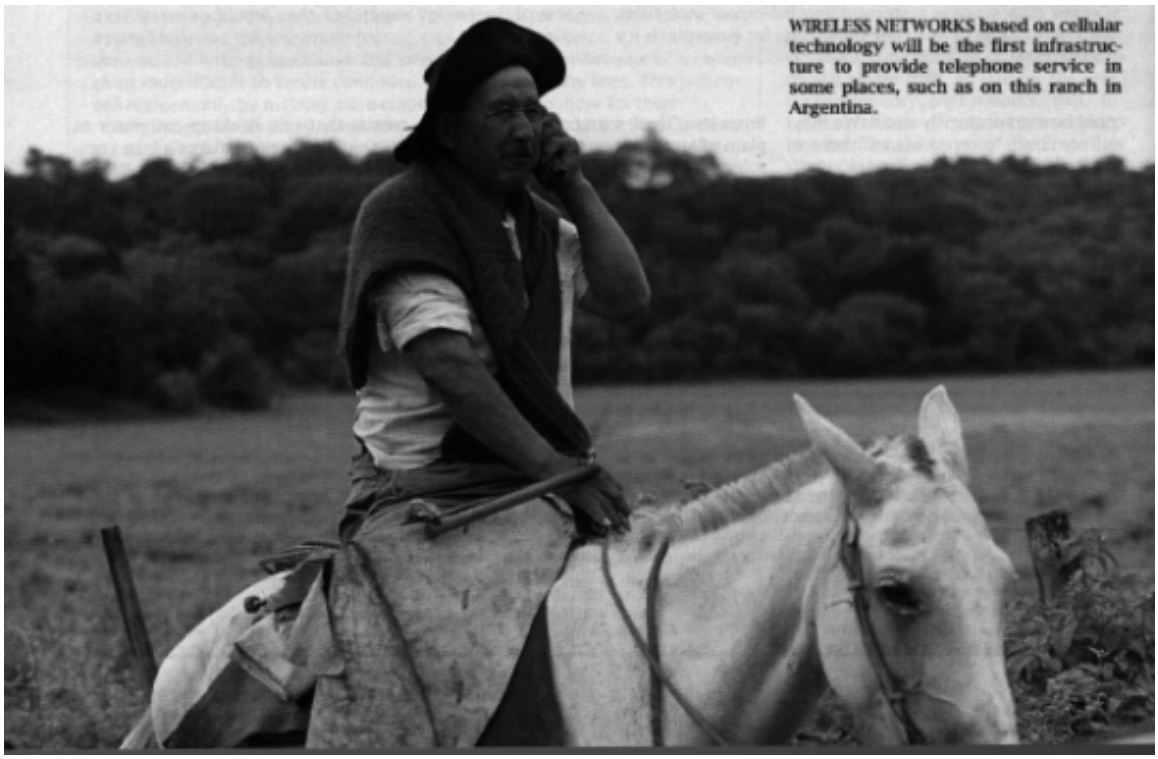
their equipment to be as sophisticated as ours nor can we count on them to have sufficient C4I assets to support us while in-country.[27] Therefore, in 2025, we must plan to arrive at the doorstep with their generation of equipment, which may be only slightly different from today's. This amplifies the need for SORE teams to be trained in a myriad of "old" and "new" technology, from 1980s' -vintage to 2025 "third-wave" high-tech systems. This is particularly true for defensive SORE operations.

The second approach is to take advantage of third-wave technology to hide or camouflage "third-wave" capabilities in first- and second-wave C^4I equipment (retrofit) or to design high-tech systems in low-tech form or objects (mimic). The goal is to have third-wave C^4I technology available to the SORE team, yet conceal its presence from the local population and/or host. The concealment serves two purposes. First, it ensures our SORE teams have reliable, secure communications and up-to-date intelligence for their planning and protection. Secondly, it prevents SORE teams from intimidating or offending their hosts or tempting them with advanced technology before its time, since they must evolve at their own pace, not ours.

Without camouflage in these primitive environments, reliable, secure, interoperable C^4I may not be available to our SORE teams. The need for secure communications and updated intelligence even in a nonhostile environment is summarized in Joint Pub 3–07.1:

> A thorough intelligence analysis must focus on the political, social, scientific, technical, and economic aspects of the area as well as on an analysis of hostile elements. Active intelligence support must continue through to the end of the employment of military forces in support of a program. This continuous intelligence effort will gauge the reaction of the local populace and determine the effects of US efforts, as well as evaluate strengths, weaknesses, and disposition of opposition groups in the area.[28]

To arrive equipped with the third-wave C^4I tools desired, embedding the already mentioned "single chip C^4I system" alongside the rudimentary crystal inside a 1990's vintage Land Mobile Radio hand set (brick) may serve our purposes. The retrofitted "brick" would furnish the appropriate first-wave camouflage for our third-wave C^4I, allowing us to meld into the environment with a means to communicate on their local technological level, yet allowing third-wave interface for the SORE team.



Source: Richard Pasley, "Wireless Networks," *Scientific American,* (September 1995), 52

Figure 4-4. "Blending in with the Locals."

Designing C^4I systems resembling or "mimicking" 1990s' era equipment— such as an aircraft mechanic's toolbox, a cigarette lighter, a wristband, or a canteen— exemplifies the notion. Another candidate would be a satellite communication antenna that looks like an ordinary "leaf." Similarly, miniature listening devices in the shape of lifelike insects, such as the "Fly on the Wall"[29] or "Robobugs"[30] concepts, could easily and transparently be distributed by the SORE teams to accommodate the collection task.

The fourth and final requirement—a critical component of SO today and just as valuable in 2025—is face-to-face communications. Keeping the "human in the loop" will be important for two main reasons.

> First, . . . SOF in direct combat with the enemy or in offensive operations have as their focus preparing foreign forces, either military or paramilitary, to conduct operations on a wide range of tasks from combat to nation building, in peace, as well as war. Successful conduct of these operations relies on the ability of SOF teams to establish rapport with and positively influence those they train.[31] Secondly, in addition to standard conventional force products, SOF analytical requirements may include internal security force order of battle information, reaction time and size of opposing forces, weapon systems available to the security force, daily routine and habits of the security force and local population, security force communications, and detailed physical characteristics (such as construction materials) of specific buildings in the target area,[32] precision intelligence on urbanization trends and movements, or verification of questionable data.

As stated by Dr Larry Cable in a 1996 lecture to students of the Air War College, information of this nature, although it may be verified and enhanced by technological means, is most likely to come from HUMINT sources. He further stipulated that SOF's ability to make contact with and to gain the local security forces' confidence may provide one of the best tools of intelligence gathering and unconventional warfare.[33]

As such, these operations place a high premium on not only knowing the language of the people being taught but in having a thorough understanding of the culture and the area where these operations take place.[34] Even with extensive preparation, cultural differences and language barriers remain a major obstacle. Hence, taking advantage of training in "virtual" environments as well as employing an unobtrusive, possibly a "hearing aid" style, translator should overcome these barriers. Either way, it is important to note that, although technology might speed up the cultural indoctrination process and minimize the language barrier, unless the translator is transparent to the receiver it may only intimidate a lesser developed nation or tribe and/or offend nations of lesser development. With this in mind, exploiting the proposals for portable or handheld translators identified in the 2025 concept database should minimize their size and awkwardness.

More importantly, and as noted in Joint Pub 3-05.3, "because SORE forces focus on developing indigenous leaders, organizations, and individual skills, they conduct operations primarily on a personal level, rather than through transfer of hardware."[35] Thus, the focus of technology should be on improving the human's ability to learn new information faster, retain it longer, and assimilate ideas more rapidly in order to prepare them in less time for operations in countries with differing cultures, languages, dialects, and regional orientation interests.[36]

As a final note, the real focus of third-wave technology should be directed at enhancing the effectiveness of assimilating the individual versus "arming" them with "techno-gadgets." Collectively, the emphasis should be on the processes and systems that accelerate or advance language and cultural assimilation skills and improve the person-to-person contact so vital to SORE mission success.

Counter

> *Since World War I, airmen have had to control the air environment effectively to employ airpower. What is more, air and space superiority are virtually sine qua non for employing ground and naval forces. Information is the next realm we must control to operate effectively and with the greatest economy of force.*
>
> —*Cornerstone of Information Warfare*
> Department of the Air Force

The application of C^4I countermeasures is another important enabling task of SORE. In fact, it is an integral component of any war–fighting concept that combines denial and influence of information, deception, disruption, and destruction to counter adversary C^2 while simultaneously protecting friendly C^2.[37] The five principle military actions used to achieve these results are operations security, psychological operations (PSYOP), military deception, electronic warfare (EW), and destruction. Up front, we recognize that most of SORE C^4I countermeasure systems will come from non-SOF resources since conventional and SOF will face similar "electronic" threats.

Table 3

Counter Attributes

Attribute	Counter
Interoperability	*Critical
Fusion	Critical
Portability	Desired
Transparency	Desired
Range	Desired
Capacity	Critical

*Critical, desired, and ideal refer to "level of need" for task accomplishment.

Some protection can be gained by enforcing good operations, computer, and communications security (OPSEC, COMPUSEC, and COMSEC) procedures. Poor OPSEC is not a new problem, but one that permeates SO operations today.

> A major problem in all SOF activities is denial of critical information about friendly intentions, capabilities, and activities to hostile elements. This is due to the fact that groups engaged in lawlessness and insurgency operations may be corrupted members of penetrated foreign governments. US and foreign personnel involved in SOF programs should be provided extensive OPSEC training to ensure effectiveness of their operations.[38]

Coding/decoding methods, encryption/decryption devices, as well as a host of new security technologies could aid in solving the problem. As Dr Martin Libicki points out, "Although the contest between bit senders and bit blockers gets more sophisticated on each side, new technologies (multistatic radar, digital signal processing, spread-spectrum, public-key encryption and authentication) favor the bits getting through, uninterrupted, as well as without spoofing."[39]

PSYOP as "an aspect of information warfare as old as history"[40] will continue to be an invaluable countermeasure. The targets may not change, but the means to counter or affect them will. Communications support for PSYOP should concentrate on cultural assimilation, simple, and effective ways to deliver the information to the locals, and methods to negatively or positively persuade those individuals.

> Psychological operations . . . multiply [the] effect of military capability by communicating directly to their enemies the power of the US or coalition forces, threat of force or retaliation, conditions of surrender, safe passage for defectors, incitations to sabotage, support to resistance groups and other messages[41] as well as strengthening economic and diplomatic sanctions, and emphasizing the adversaries' isolation or weaknesses.[42]

Source: USSOCOM Pub 1, *Special Operations in Peace and War*, 2–17.

Figure 4-5. PSYOP in Action.

Direct PSYOP support for SORE operations should be concentrated before arrival, to facilitate positive communication with the local population. This preparation may use different media (radio, leaflets, TV, holographics, etc.) to persuade or influence. In 2025, more advanced broadcasting and projection systems, which can operate from workstations in CONUS, and leaflets distributed with precision guidance systems to target audiences should be considered. Along the same lines, a Holographic Projector[43] could be used as a deception or PSYOP tool projecting images in the sky above the target audience. Translators could make television, radio, holographic broadcasts, or direct contact with enemy troops or citizens more effective. In fact, direct broadcast television (DBTV), which has more than a 100–channel capability and sells for less than $1,000 today, should be capable of providing "information on demand" in the future.[44] DBTV could be an inexpensive way to affect first- and second-wave nations in 2025.

DBTV would not only be useful as a preparation tool, it could pay high dividends as an "offensive" PSYOP tool. Just as TV mesmerized the US in the 1960s and China in the 1990s, it could be equally distracting or alluring to preindustrial and industrial nations in 2025. Broadcasting "free TV" 24 hours a day to specific targets groups could render them "immobile, infuriate the masses, or launch them into new directions." For example, broadcasting MTV, "Soaps," Talk Shows, and/or Educational TV for teens, and "fictional CNN" for the general public, business, military, and government could pay high dividends with minimal investment. The key is knowing the desired goal and the target audience, and then broadcasting the appropriate propaganda to achieve it.

Finally, "PSYOP is not only a user, it is a producer of intelligence, capable of contributing to the overall national effort as well as servicing its own needs."[45] To further explain, the extensive regional collection and assessment conducted for PSYOP may produce intelligence useful for other special or conventional operations. For example, the assessment data could be incorporated in the Virtual Reality Training Center for up-to-date regional awareness training.

In a collateral role, offensive and defensive SORE forces might be tasked to assist and support other information warfare (IW) activities—particularly in the "controlling information" role where SORE forces exploit the enemy's systems while protecting their own.[46] Since IW masks preliminary preparations and movements, overloading the enemy's command decision making allows us to precisely apply our combat power at his most vulnerable points.[47] Therefore, the SORE forces' role might be as simple as verifying the

"Information Warrior's" information target. In-country acceptance of SORE forces makes them prime candidates for verifying "unconfirmed" data, providing realistic knowledge of exploitable targets for psychological operations or information warfare targets,[48] or for attaching monitoring devices (i.e., "tagging") on potential targets in the region.

Similarly, offensive SORE forces may be tasked to influence enemy perceptions using strategic perception management (SPM)[49] or one of the many other counterinformation systems directed at military deception, electronic warfare, and destruction. Many of these systems will be available through non-SOF or specialized SOF systems. Therefore, rather than address transatmospheric reconnaissance aircraft (TRA),[50] information systems weapons or electronic countermeasures,[51] defensive information warfare,[52] or high powered microwave and high power laser directed energy weapons (HPM)[53] in this paper, precise information can be found in the white papers dedicated to information dominance, such as *Information Operations, Counter Information,* and *S & R Information Operations*.

Finally, defensive SORE forces may be required to restrict the use of third-wave systems with a host entity unless the technology is camouflaged. The rationale is twofold. First, the open use of advanced technologies, such as handheld translators may be offensive to the receivers and subsequently impede interpersonal interaction. Second, since the ultimate goal of defensive SORE is to advise, train, and assist host-entities in the use of their own aerospace equipment, it is counterproductive to make them dependent on an advanced system and then remove it when SORE forces leave. Furthermore, teaching them how to effectively use their own air assets allows them to bring their own airpower to bear on the source of internal instability without simply "handing" them our advanced technology.

Sustain

I don't know what this "logistics" is . . . but I want some of it.[54]

As we make the mad rush into the next century, we cannot forget the basics of force survival. Although technology will play a pivotal role in many areas, the heart of all those advances will remain the individual. This is especially true for SORE forces. They may deploy to built-up, fully equipped host entities who possess and maintain "creature comforts" and infrastructures conducive to successful operations and training.

A more likely scenario, however, would be to employ SORE forces in preindustrial environments where conditions are more stark and less habitable. In these situations, their survival depends on "carrying-in" organic support. In this scenario, they must be self–reliant, innovative, and adaptable. This will be especially true for offensive SORE forces that may be isolated from more direct means of sustainment or support.

Assuming the latter is the norm, four main SORE sustenance needs must be considered: food, water, portable energy sources, and ammunition. Each is critical to the "survival" of the individual SORE warrior. Looking at the construct of Col John Warden's five-ring analysis of "The Enemy as a System,"[55] each SORE force member is, in fact, a system with its own ring of "organic essentials." Following his premise, SORE forces' survival can be affected if enemy actions are directed against this ring, or if inadequate attention is paid to ensuring that the needs of this ring are met. Accordingly, given our thesis that the "man-in-the-loop" is the prime actor and "effector" of change in 2025's less developed regions, improvements to these essentials must be foremost in our advances.

Following Warden's analogy, all systems require certain organic essentials to survive. Without an energy source (food, oxygen, and water), the human system will cease to operate. At the center of the human system is the decision-making mechanism—the brain. Organic essentials allow the brain to process inductive and deductive logic—-without which, one cannot effectively function as a "Brilliant Warrior," to use General Kelley's term. Obviously, without these basic essentials, a human body cannot survive. This observation may appear simplistic and it is. However, the essence remains—we must pursue methods and technologies that provide SORE forces the day-to-day capability to exist in any environment and for indefinite periods of time. Table 4 provides the task attributes and level of need to meet these requirements.

Table 4

Sustain Attributes

Attribute	Sustain
Portable	*Critical
Customized	Desired
Unobtrusive	Critical
Automatic	Ideal
Precision delivery	Critical

*Critical, desired, or ideal reference "level of need" for task accomplishment.

To begin, an individual must be put through a battery of tests to determine individual organic levels and nutritional needs. Then a survival package which is lightweight and compact can be devised and tailored for each force member. To accomplish this, we must pursue advances in food development such as biochemical-enhanced "hyper speed growth" seeds cultivated on portable substrates. Unfortunately, the "Chia Pet" is probably the only universally advertised "speed growth" method conceptually known to the general public today. Something similar to the Chia Pet concept, that is simple, fast, unobtrusive, and man-portable is needed to replenish SORE forces' nutrients "while on the go." The approach should seek to exploit chemically enhanced seeds, nuts, or grains which grow and produce "food" within a 24– to 72-hour period or less.

Source: Miguel L. Fairbanks, "Technology for Sustainable Agriculture," *Scientific American,* September 1995, 149.

Figure 4-6. "Fast Food" Production for Deployed SORE Forces.

These pursuits could be complimented by refined metabolic rate screening results obtained during individual assessment. The results of this screening, combined with nutritional-matching discussed above, will ensure enhanced performance during employment. A potential candidate is the human optimization of metabolic and behavioral response (HOMBRE) concept. With this system, we may be able to determine each SORE force member's metabolic type, then selectively enhance cognitive and physical performance through specific nutritional regimens.[56] Enhanced and peak performance on short–term tasks will help ensure success in any given environment.

Water purification agents and collection devices must be improved and made portable for forces in the field. A quick solution may be to use absorbent receptacles to collect dew, obtaining small quantities of

water for force sustainment in a dry environment. Long-term, more exotic sources may be the manufacture of dry chemicals which, when combined, bond at the molecular level to produce water. An even more far-reaching approach may be to filter and purify body fluids to act as an interim water supply should extreme conditions arise. Presumably, humans can exist for weeks without adequate food since the body will compensate and feed off internal reserves. However, water must be available within days, or death will result.

Given the multitude of electronic and kinetic gear used by SORE forces, portable power sources will be crucial. Several technologies must be pursued to provide these sources. For example, since water is critical to existence, methods to extract power from the hydrogen compounds in these water sources could be adapted to SORE force needs, thus doubling the benefits of having the water! Similarly, battery packs must be more compact, lighter, rechargeable, and retain longer life on a single charge.

Assuming the philosophy that man is a machine, the potential exists to create and implement technologies to exploit human movement and central or autonomic nervous system activity as low-grade energy sources to provide that potential power supply.[57] Discounting initial insertion and aviation-related missions, SORE force members will take the tried–and–true method of transport—they will walk. We must harness and exploit that energy dispensing action. For example, the physical motion of walking may lead to development of "boot chargers" located in the heels of a force member's boots. The charger would operate or recharge as the member performs his/her daily routines. In the same vein, a plethora of other technologies are projected which may provide alternative portable energy sources. They may range from lightweight, solar panel collection systems for daylight operations, to ambient lunar light collection panels for day-night capability, to miniaturized power-generating factories on a single microchip[58]. The technological leaps made in researching and powering solar-powered automobiles and satellites, as well as microscopic machines, should be investigated for SORE force application.

Finally, SORE force application may involve covert, clandestine, or hostile action. Accordingly, provisions must be made to arm and resupply the SORE warrior with first-to-third wave ammunition. While nonlethal application of force may be preferred, the nature of the SORE mission dictates possession of lethal weapons. When all else fails, a "gun," whether loaded with kinetic energy, high-powered microwave, or 1990s' depleted uranium projectiles must be available to SORE forces. Expedient replenishment and

replacement of first-, second- and third-wave ammunition sources must be considered. Potential solutions are precision-guided delivery systems and energy weapon recharging via direct satellite link. In both cases, sensors will monitor inventory levels and track source supply points automatically and replenish as needed. The latter concept is a "passive-push" replenishment system similar to today's Just-in-Time or Trickle Charge systems. This approach minimizes administrative communications that may compromise covert or clandestine units and optimizes use of limited replenishment assets. Without the "tools of the trade," SORE forces will be ineffective and at risk.

With sustainment, the enabling task discussion is complete. Having addressed those tasks and their relative importance, the next section of the paper summarizes our findings and includes some broad recommendations. For a detailed prognosis and evaluation of the systems and their underlying technologies, please refer to appendices A and B.

Notes

[1] USCINCSOC Congressional Testimony, March 1995.

[2] SORE force members will be recruited, assessed, retained, and employed based on actual performance. If a member's performance falls below acceptable levels, he/she will be returned to conventional forces or separated.

[3] As noted in W. F. Anderson's article "Gene Therapy," *Scientific American*, September 1995, 96-98B, significant progress in the realm of gene modification to affect gene-based disease has been made. Assuming quantum progress continues well into the next century, selective gene screening and DNA typing may well be applied to potential candidates. Anderson does not advocate an era of "eugenics" to alter composite gene pools. Similarly, the authors of this paper do not advocate the "super human" genetic application nor experimentation. However, the intent of this approach is to use DNA and genetic make-up as a tool for selecting the pool of SORE candidates who theoretically will be capable of replicating successful SORE operations based on those SORE forces whose genetic makeup is similar.

[4] ***2025*** Concept, no. 900501, "Artificially Intelligent Word Processor," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[5] ***2025*** Concept, no. 900562, "A Selective Knowledge Pill," ***2025*** Concepts Data Base (Maxwell AFB, Ala: Air War College/***2025***, 1996).

[6] USCINCSOC Congressional Testimony, March 1995.

[7] Jay W. Kelley, Lt Gen, USAF, "Brilliant Warriors," (Draft article for Joint Forces Quarterly), 14.

[8] James P. Marshall, "Near Real-Time Intelligence of the Tactical Battlefield," *Theater Air Campaign Studies Course Book*, , Maxwell AFB, Ala.: Air Command and Staff College 1996, 235.

[9] USAF Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century*, summary volume (Washington, D.C.: USAF Scientific Advisory Board, 15 December 1995), 11.

[10] USAF Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century* (unpublished draft, the information applications volume, 15 December 1995), 5.

[11] Joint Pub 3-07.1, *Joint Tactics, Techniques, and Procedures for Foreign Internal Defense*, 20 December 1993, I-13.

[12] Dr James Kvach, Armed Forces Medical Intelligence Center, ***2025*** Lecture, 31 January 96.

[13] Joint Staff Memorandum to the SECDEF, 19 December 1995, Subject: *Volume 4 (Future Capabilities*), *Joint Planning Document for FY 1998 through FY 2003* (JPD FY98-03), Enclosure, 3.

[14] *Spacecast 2020, Air University into the Future*, Operational Analysis, Air University, 22 June 1994, 34.

[15] Ibid., 35.

[16] *New World Vistas*, summary volume, 10.

[17] *New World Vistas*, summary volume, 62.

[18] Air Command and Staff College *United States Special Operations Forces Posture Statement*, 1994, 4.

[19] Joint Pub 3-05.3, *Joint Special Operations Operational Procedures*, 25 August 1993, VI-2.

[20] *New World Vistas*, summary volume, 62.

[21] Voice recognition and voice generation, gesture recognition and response, multilingual translation and generation, and brain control of computers technologies will all contribute to making sure the human is not the limiting factor.

[22] ***2025*** Concept, no. 900263, "The All Seeing Warrior," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[23] ***2025*** Concept, no. 900317, "Tactical Information Display Helmet," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[24] John L. Petersen, *Road to 2015, Profiles of the Future* (Corte Madera, Calif.: Waite Group Press, 1994), 190–193.

[25] Power and energy supply obstacles must be overcome when developing and employing these "micro" systems. Those organic needs are addressed in the Sustain section of this chapter.

[26] ***2025*** Concept, no. 900317, "Tactical Information Display Helmet," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[27] Nor does it allow us the opportunity to exploit our own technology in their environment—this will be explained in approach two.

[28] Joint Pub 3-07.1, *Joint Tactics, Techniques, and Procedures for Foreign Internal Defense*, 20 December 1993, IV-1.

[29] ***2025*** Concept, no. 900280 "Fly on the Wall," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[30] ***2025*** Concept, no. 900341, "Robobugs," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[31] Joint Pub 3-05.3, *Joint Special Operations Operational Procedures*, 25 August 1993, VI-2.

[32] Ibid.

[33] Dr Larry Cable, University of North Carolina, Wilmington, AWC Lecture, 31 January 1996, permission granted.

[34] USCINCSOC Congressional Testimony, 27 March 1995.

[35] Joint Pub 3-05.3, *Joint Special Operations Operational Procedures*, II-5.

[36] ***2025*** Concept, no. 900624, "Hand-held Translator," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[37] *JFACC Primer*, Second Edition, February 1994, 24.

[38] Joint Pub 3-07.1, *Joint Tactics, Techniques, and Procedures for Foreign Internal Defense*, 20 December 1993, IV-6.

[39] Dr Martin Libicki, "What Is Information Warfare?" *Strategic Structures Course Book*, Vol II (Maxwell AFB, Ala.; Air Command and Staff College, 1996), 684.

[40] Ibid., 685.

[41] Frank L. Goldstein, "*Psychological Operations—Principles and Case Studies*," (Maxwell AFB, Ala.: Air University Press, forthcoming), 5.

[42] Jeffrey B. Jones and Michael P. Mathews, "PSYOP and the Warfighting CINC," *Joint Forces Quarterly*, Summer 1995, 29.

[43] *Spacecast 2020, Air University into the Future*, 36.

[44] Wayne A. Downing, General, USA, "Joint Special Operations in Peace and War," *Joint Forces Quarterly*, Summer 1995, 25.

[45] Goldstein, 147.

[46] *Cornerstones of Information Warfare*, Department of the Air Force, 11.

[47] *Warfighting Vision 2010, A Framework for Change*, 1 August 1995, Joint Warfighting Center, Doctrine Division, Fort Monroe, VA, 12.

[48] Dr Cable, AWC Lecture, 31 January 1996, permission granted.

[49] Jeffrey Cooper, *Another View of Information Warfare, Conflict in the Information Age,* SAIC, 30.

[50] ***2025*** Concept, no. 900351, "Transatmospheric Reconnaissance Aircraft (TRA)," ***2025*** Concepts Data Base, (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[51] *New World Vistas*, summary volume, 60.

[52] Ibid., 10.

[53] Ibid., 46.

[54] Used in opening remarks delivered by The Honorable John H. Dalton, Secretary of the Navy, while christening the USNS PATUXENT (T-AO-201), at Avondale, La., 23 July 1994. Specifically, Mr. Dalton's context was: "Those are the words of Fleet Admiral Ernest King shortly after he became Commander-in-Chief of the US Fleet and Chief of Naval Operations. The year was 1942. America had suffered a surprise attack and her leaders realized that a long, bloody war lay ahead . . . a war that would consume vast quantities of fuels, supplies and materials. It was a war in which all Americans, from admirals commanding fleets to the men and women working in the shipyards and factories on the "home front," would learn the word 'logistics' and its importance in achieving victory." Although the context may change, the concept as applied to SORE needs remains timeless. In order to achieve victory, we must ensure the "logistics," vis-à-vis, sustain requirements, are provided to our fielded SORE forces.

[55] Col John Warden, USAF, Retired, "The Enemy as a System," *Strategic Structures Course Book*, Maxwell AFB, Ala.: Air Command and Staff College, 1996, 437–439.

[56] R. Wiley, HOMBRE Concept Submission, *Technology Initiatives Game 95*, Item 111-1.

[57] ***2025*** Concept, no. 900123, "Body Heat As A Low Grade Energy Source," ***2025*** Concepts Data Base (Maxwell AFB, Ala: Air War College/***2025***, 1996).

[58] Kaigham J. Gabriel, "Engineering Microscopic Machines," (*Scientific American*, September 1995), 118–121.

Chapter 5

Conclusions and Recommendations

> *Like Greely, I too would urge young men to go west—would urge airmen to look to the frontiers of air and space power. New doctrine is desperately needed there. The doctrinal gaps . . . are probably as great as those faced by the ACTS [Air Corps Tactical School] pioneers 60 years ago as they contemplated the doctrinal gap between an air service and an air force. Stalking and conquering frontiers are clearly the Air Force heritage. That alone should tell us where the future lies.*
>
> —Carl H. Builder

Currently, the Air Force is struggling with its frontier missions and those missions' place in doctrine. Most are familiar with our frontiers in space and information. Air Force leadership, past and present, has placed significant emphasis on coming to grips with the Air Force role in these areas. Other frontiers have not been lavished with as much attention. The aviation piece of SORE may provide a breakthrough in this regard. Although not a "glamorous" mission, it is nonetheless a vital one if the Air Force is to come to understand its role in this frontier of warfare.

In 2025, the United States will face challenges to its leadership and interests from nations and entities in the first-, second-, and third-waves. SORE forces will be the military forces organized, trained, and equipped to engage in the first- and second-waves to protect and further US interests. SORE is not just a ground or riverine mission suited to "green berets" and SEALs. There is a critical air power component to SORE that the Air Force must prepare itself to meet. Many first- and second-wave nations and entities will face threats to their internal security that require the proper use of air power. The fledgling air forces of these entities will require assistance in developing adequate tactics, procedures, maintenance, supply, and other support systems within their own technological limitations.

The challenge to all SORE forces is fourfold. First, they must possess the cross cultural skills necessary to build the trust that underlies productive interpersonal relationships. Second, they must use these same crosscultural skills to make themselves as "transparent" as possible in the environments in which they operate. This is particularly true for SORE offensive operations which are almost always covert or clandestine. Third, they must exploit the advanced technology at their disposal, to prepare and protect themselves in the context of first- and second-wave societies. Lastly, SORE forces must ultimately ensure clients do not develop any dependence on them, lest we set the stage for failure when we depart.

The myriad of challenges can be overcome and the capabilities achieved using both SOF and non-SOF resources. In fact, many systems forecast for SORE operations in 2025 may not be SOF-unique. However, to ensure the SORE tasks are accomplished, a combination of conventionally developed, commercially leased resources, or specially designed SOF-unique systems must be available to ensure SORE conceptual employment goals are met.

We recommend the following concepts and systems be pursued for SO Regional Engagement operations: (1) Designing a recruitment and selection system—Virtual Reality combined with genetic and cognitive learning ability screening; (2) Developing a similar or exclusive Virtual Reality Training/Battlefield Awareness Center for training, rehearsal, and assessment; (3) Retrofitting first- and second-wave C^4I equipment with "third-wave" technology (the Land Mobile Radio "Brick" example); (4) Designing third-wave equipment, "mimic systems," camouflaged in first- and second-wave form (a C^4I system disguised as an aircraft mechanic's toolbox or a SATCOM antenna shaped like an ordinary leaf) or designing third-wave technology that "fits" first- and second-wave signature (the "Fly on the Wall" or "Robobugs" collection devices; or "The All Seeing Warrior" contact lens); (5) Procuring standoff PSYOP broadcasting and projection systems as well as precision-guided delivery systems; (6) Minimizing language barriers with "transparent" translators; (7) Taking advantage of standard third-wave C^4I systems such as the Global Surveillance, Reconnaissance, and Targeting System, Global Positioning System, Strategic Perception Management systems, distributed satellite systems, and direct satellite link to large aircraft and URAVs, to name a few, for interoperability and compatibility across all services; and finally; (8) Pursuing sustainment systems such as fast growing food, chemically bonding water capsules, microchip power

supplies or "recharging combat boots," as well as some type of "passive push" replenishment systems and concurrent nutritional enhancement regimens—HOMBRE.

Our final recommendation is to capture the requirement for a SORE capability in defense planning guidance. Without such emphasis and resultant funding, the research and development of these systems' underlying technologies will not be possible. Without these "parts-pieces," the systems needed will not be fielded, and our "2025 SORE Warriors" will be out of place in "King Arthur's Court." As Carl Builder notes:

> It takes farsightedness and guts to build an armed force that will only be called to fight in, say, a decade. One has to guess, as best one can, what resources will be available, what kind of opponent the force will be called on to face, and what kind of environment they will have to operate in. Those fundamental questions settled, the time comes to decide how to best meet the challenges ahead.[1]

The time is now to make these decisions. The current draft of Air Force Doctrine Document (AFDD) 1 is not a pioneer effort regarding air power in Special Operations. It is the hope of the authors that this white paper will contribute to the "pioneer" spirit that Carl Builder calls for in the development of future air power doctrine.

Notes

[1] Martin Van Creveld, *The Transformation of War* (New York: Free Press, 1991), 117.

Appendix A

Systems and Underlying Technologies

We cannot always be on the leading edge of technology ourselves. It is too expensive. We have adopted a program of prudent innovation, choosing carefully which technological paths to take and fully leveraging the research conducted by the Services, other government agencies, and the private sector.

—USINCSOC Congressional Testimony
27 MARCH 1995

Special Operations will require training, C^4I, countermeasure, sustainment and movement (transportation) systems, and/or concepts that can support a wide variety of missions, ranging from nation assistance or civil-military activities in friendly environments, to assistance of conventional forces in hostile environments, to special operations in enemy-held, enemy-controlled, or politically sensitive environments. These systems must provide the SORE warrior the tools necessary to carry out missions of controlling, exploiting, and enhancing overall force effectiveness.

This appendix is divided into seven sections—train, observe, communicate, decide, counter, sustain, and move. Each section identifies those systems that are SORE unique or reliant on other sources, ranging from conventional forces, commercially leased, host "entity," to SOF-unique systems developed for another "arm" of SOF. "Dependencies" matrices are provided for each function, where a quick picture of those systems can be referenced—table 6 discusses training; tables 8 to 10 show C^4I; table 12 reflects countermeasures; table 13 details sustainment, and movement systems are spelled out in table 14. Within each major section, the enabling task's attributes and measures of merit (MOM) are laid out in table 5 for training, 7 for C^4I, and 11 for countermeasures. The system descriptions follow in the text.

Recruit, Assess, and Train Systems

SORE recruitment, training, and assessment regimens and the system attributes are presented in table 5. The table presents the attributes required of a training system with the respective measures of merit needed to gauge the effectiveness of that system. The effectiveness is based on the outcome and qualities of the individual skills learned. The system (as defined) must act as a filter and trainer for potential SORE candidates. For example, in the selection and training process, a person's ability to adapt to a culture, learn a language, operate a vintage aircraft, or act as an individual negotiator in his/her region of employment must be the outcome and will be the measure. Hence, the matrix shows those requirements and effectively rates them on a scale of critical to ideal, as discussed in chapter 4. In addition, the force qualities' level of need is targeted against its application to each task—recruit, assess, or train. As a note of caution, the systems may fill the requirements of all tasks, however the scale of importance will vary greatly depending on the status of the process (i.e., stage of recruitment, level of assessment after selection, or mission training requirements based on specific tasking). On a linear scale, as the system outcome draws closer to actual employment, level of criticality increases. Within the table, common criticality levels reflect an **X.** Where levels of importance vary, the task affected falls under the relevant criticality column.

Table 5

Recruit, Assess, and Train System Tasks, Qualities and Measures

TASK	CRIT/DES/IDL			Force Quality	Measure of Merit
R, A, T	**X**			Cult/Pol Sensitivity	Multi-Wave Skilled
R, A, T	**T**	**A**	**R**	Regional Orientation	Number of Regions Support
R, A, T	**X**			Language Prof	Number of Languages Prof
R, A, T		**X**		Negotiation Skills	Number of "Successful" Results
R, A, T	**R**		**A/T**	Psychological Profile	Based on Empirical Data
R, A, T		**R**	**A/T**	Cognitive Learn Ability	Retention Testing/Evaluation
R			**X**	Physical Attributes	"Look the Part"
A, T	**X**			Adaptability	Number of Variations Possible
A, T	**T**	**A**		Interactive/Realistic	Number of Scenarios/Waves
A, T			**X**	Individually Tailored	Number Trained/What Level
A, T			**X**	Portable	Time/Transport Require to Move
A, T	**T**	**A**		Interoperable	Near Real-time Input and Update

R=Recruit, A=Assess, T=Train, Crit=Critical, Des=Desired, Idl= Ideal, X=Common

Several training systems and concepts exist or are projected which may be unique to SORE recruitment, assessment, and training or may be drawn from other sources. As depicted in table 6, these systems could be beneficial but are not essential to SORE training.

Table 6

Training Systems' Dependency Matrix

RECRUIT, ASSESS, TRAIN SYSTEMS	SORE Source	NON-SOF Source	OTHER SOF Source	HOST Source
Virtual Reality Trainer	**X**		**X**	
HOMBRE	**X**			
Rehearsal System		**X**	**X**	
"Gumping" A/V Lib		**X**		
Selective Knowledge Pill			**X**	
AI Word Processor		**X**		

The Virtual Reality Training Center/Virtual Battlefield allows participants, despite their geographic location, to simultaneously visit the same virtual battlefield in whatever type of tank, plane, ship or system they will be tasked to use. They "see" the battlefield from their own individual perspective which enables simultaneous viewing of the battlespace or the peacespace by all participants. Similarly, this approach will allow for real-time simulations—giving the force commander real-time, hands-on experience in the battle or peace space, and will afford the opportunity to try modified and divergent tactics and will interpret results, while the mission is in virtual progress. This virtual battlefield approach offers the specialization and evaluation required without the potential for deadly mistakes prior to employment. Similarly, this approach also tracks real-time actions taken as they are played out for subsequent mission preparation and use by other teams.[1]

To create a realistic "virtual" environment will require technology from multiple sources. Data fusion and image–processing techniques will be needed to acquire, transfer, analyze, display, and interpret raw intelligence to change it into useful, usable information in real time.[2] Virtual reality and holography technology must be available. As these technologies proceed, not only will they be used for the Virtual Battlefield System at home, but they will allow fielded SORE forces to take advantage of full-color, three-dimensional projection transmitted to their employment location on demand.

Similarly, high performance computing[3] with extremely high–performance digital vector and massive parallel processor architecture will be needed to process the plethora of data in real time. Without this high-speed capability, information saturation will inevitably occur. Molecular nanotechnology follows the same principle of building "things from the bottom up." Working at the individual atomic level, it must be possible to exploit this bottom-up approach to training the regional warrior, from accession through separation, using molecular sized machines to put information together in predetermined configurations.[4] If we assume nanotechnology will effectively size information to the molecular level, we can then use the principle of condensed charge technology to produce small, tightly bound dense clusters of electron charges of enormous power relative to their size and effectively integrate the spark, or more accurately micro-arc discharges, into our system to take advantage of the phenomenon.[5] Assuming human-system interface can be achieved, information can then be made, controlled, and used on command by the SORE member on the ground.[6] As situations and environments change, regional engagement operators must not be surprised by the unexpected. Recurring training, by "plugging in," to the "home-based" system will be the most effective method to keep surprise to a minimum.

Further, to optimize the cognitive learning skills of the individual, the Human Optimization of Metabolic and Behavioral Response (HOMBRE) system attempts to match the nutritional regimen of SORE intermediary metabolic profiles to systematically and sequentially enhance the needed cognitive performance.[7] The system will match the regimen to the individual and occupy a "feed and forget" phenomenon to promote and predict successful performance.[8] While the input and feeding may be needed for short durations, the possibility exists that this approach can be applied over longer periods as the situation dictates. Further, reverse engineering may allow for the same process to be applied in selecting SORE candidates, after sufficient data is obtained, which will point toward the most effective metabolic rates to screen and recruit for new accessions.

Determination of metabolic genotypes will be one of the underlying technologies needed for this enhancement process to be possible. The notion of gene typing and selective enhancement is feasible. The requirement and capability for enhanced signal and pattern discrimination capability currently exist.[9] The system matches the prognosis regimen to the individual instead of mass application and thus increases

probability of predicted outcome. Using this approach, metabolic rates can be limited and thus be more effective. The process can work in concert with other systematic enhancements or serve in a stand-alone capacity.

Dependencies or Training Systems Provided by Non-SORE Sources

Advancing development by related forces or scientific fields should make these systems available from other employment efforts. Accordingly, SORE application and system modification should occur as these technologies evolve. For example, if available through other sources, the "Rehearsal for all Missions System,"[10] could provide an additional resource for realistic training, while the "Gumping Audio and Video Library"[11] could provide the highly motivated individual another tool to train at their own pace and convenience. The "Artificially Intelligent Word Processor"[12] might be used for day-to-day training and preparation of conventional forces or corporate employees, or for tracking individual work progress automatically without the associated cumbersome filing and status system of today. The final conceptual approach to developing a "selective knowledge pill" relates directly to enhancing brain functions by intentionally introducing chemical imbalances in the central nervous system stem core. Detailed research must be conducted before this aggressive application can occur; however, the same principle as applied to behavior modification can be used. Obviously, SORE force training would benefit from these advancements, yet development should not occur based solely on RE mission requirements.

C^4I Systems

Table 7 displays the attributes needed in SORE observe-communicate-decide systems. The matrix shows the relationship between the task, its "level of need," the force quality or attribute needed to support the task, and the measure to determine the system's merit. Again, within the table, a single "**X**" in either the critical, desired, or ideal column indicates the same "level of need" crosses all three tasks. When the level of need differs among the three tasks, the individual task's "level" is indicated by its "initial" in the appropriate—critical, desired or, ideal—column.

Table 7

C^4I Tasks, Force Qualities, and Measure of Merit Matrix

TASK	CRIT/DES/IDL			FORCE QUALITY	MEASURE OF MERIT
O,C,D	**X**			Face to Face Contact	100% w/locals / min with C^2 at HQ
O,C,D	**X**			Transparent	Blends into 1st/2d wave worlds
O,C,D	**X**			Interoperability	With standard C^4I systems
O,C	**X**			Divergent and/or Fused	Intel, surv, comm, weather, etc.
O,C,D	**X**			Secure	95%
O,C,D	**O/C**	**D**		Portable	Under 1 lb.-unobtrusive
O,C,D		**X**		Range	Global and Local
O,C,D	**C**	**O/D**		Capacity	Giga/terabits/sec
O,C,D	**C**	**O/D**		Speed	Near Real-time
O	**X**			Resolution	High
O,C		**X**		Survivability	All Wave
O,C,D		**X**		Accuracy	95%

O=Observe, C=Communicate, D=Decide, Crit=Critical, Des=Desired, Idl=Ideal

In all the *unique* SORE systems listed in tables 8 through 10, "transparency" or "packaging" is the principle priority. If forces cannot "blend" into their first- and second-wave environments, success in their operational employment will be suspect.

Observation or Collection Systems

Table 8 lists the collection systems sourced by SORE and those expected to be available through other sources. All would be useful to the SORE warrior; however, only the first- and second-wave "retrofitted or mimicked" systems should be organically sourced by SORE. All the other systems should be available through other awareness as indicated in the table.

Table 8

Observe Systems' Dependency Matrix

"OBSERVE" SYSTEMS	SORESource	Non-SOF Source	SOF PS Source	Host-Entity Source
Retrofitted 1st/2d Wave	**X**			
"Mimicked" 1st/2d Wave	**X**			
All Seeing Warrior		**X**	**X**	
Fly on the Wall/Robobugs		**X**	**X**	

A host of retrofitted and "mimic" observation systems resembling twentieth-century objects should be valuable in first- and second-wave environments. For example, embedding (retrofitting) host entities' collection equipment with third-wave technology or designing listening and audio devices resembling ordinary 1990s' "stuff" such as an aircraft mechanics toolbox, canteen, or cigarette lighter should be pursued. The underlying technologies for these retrofitted or "mimicked" systems might be metal-oxide semiconductors, CPUs on a single microchip, high performance computing, electromagnetic communications, and divergent detection and resolution technology. Critical dependencies include technologies that interface system actions to communication networks for interoperability, fusion, and long–haul transmission.

Dependencies or Observation Systems Provided by Non-SORE Sources

The remaining collection systems will be equally valuable to conventional forces and should be fielded by non-SOF resources. The "All Seeing Warrior," a contact lens-like display for a warrior which provides all sensor, surveillance, reconnaissance, intelligence, and aircraft data at the blink of an eye, creating a seamless, real-time display for unsurpassed situational awareness[13] is a potential candidate. The same underlying technologies needed to build other collection platforms apply, with the addition of nanotechnology to miniaturize the system, as well as a safe, nonirritating material to make the lens comfortable. Critical dependencies include commercial adaptation, data compression and transmission technology, divergent detection and resolution technology, and fused, interoperable communication systems.

The "Fly on the Wall"[14] or "Robobugs"[15] concepts provide the foundation ideas where miniature, remotely controlled "robot bugs" embedded with audio and video sensors or lasers are used for data collection or destruction. Underlying technologies are Alife techniques, nanotechnology, metal-oxide semiconductors, and single-chip CPUs.

Communications Systems

All of the systems identified in table 9 are required for SORE forces to communicate among themselves and/or back to headquarters. Only the "real" first- and second-wave equipment or the "retrofitted and mimicked" systems should be sourced by SORE. All the other systems are equally valuable to conventional forces and the commercial sector, thus should be available through alternate sources.

Table 9

Communications Systems' Dependency Matrix

"COMMUNICATE" SYSTEMS	SORE Source	Non-SOF Source	SOF PS Source	Host-Entity Source
First / Second Wave Equip	**X**			**X**
Retrofitted 1st/2d Wave Equip	**X**			
"Mimicked" 1st/2d Wave	**X**			
Translators		**X**	**X**	
Tactical Info Display Helmet		**X**	**X**	
VSAT		**X**	**X**	
Distributed Satellite Sys		**X**		
Fiber and Satellite Sys		**X**		
Direct link to URAV/ Lg A/C		**X**		
Transatmospheric Recc Aircraft		**X**		

Actual first- and second-wave communications equipment may be needed in 2025. Standard twentieth-century communications equipment like today's communications systems—land mobile radios (bricks), high

frequency (HF) radios, tactical satellite systems (TACSAT), telecommunications devices such as digital switching systems, and computers must be available and kept operationally current. This equipment may be the only viable method for SORE forces to interface with host equipment.

The most important force qualities in the next two concepts are transparency, interoperability, and fused or divergent data. Without these third-wave qualities, we cannot guarantee that SORE forces operating in crude surroundings will have access to third-wave technology and/or systems.

The first concept is retrofitting or camouflaging "third-wave" micromechanical single chip systems into the host's low-tech apparatus. For example, a 1990-vintage land mobile radio equipped with a C^4I microchip could provide the communication link needed for all ranges and levels—from first through third-wave environments.

The other method is designing custom communications systems that "mimic" or "fit" into a first- or second-wave environment. For example, a satellite communications antenna that looks like an ordinary "leaf" that can be easily set up by "planting" it in the ground would be invaluable in the jungle or an urban area. Or, as described in the "observe" section, equipment built to look like 1990s' everyday articles but are actually sophisticated, third-wave communications equipment, could be invaluable collection aids.

The primary underlying technologies for all of these systems will be metal-oxide semiconductors, CPUs on a single microchip, and high performance computing. In addition, these systems will require interface to the communications networks described in the following section.

Dependencies or Communications Systems Provided by Non-SORE Sources

First, a wide array of language translators suggested in the 2025 concept database should be available and beneficial to the SORE warrior, especially in PSYOP where translation could enhance television and radio broadcasts or direct contact with enemy troops or citizens. However, unless transparent, they would have minimal use to the SORE warrior in the field. Therefore, a translator resembling a "hearing aid" would be the most beneficial. Other potential systems include the "Universal Language Translator,"[16] a pendant-size translator capable of translating voice both to and from a receiver, and several variations of the same concept, the "Hand-held Translator," the "Portable Language Translator," and/or the "Universal Translator."[17]

A tactical information display helmet, a helmet that provides the warrior a full spectrum of C^4I displayed across a face screen and controlled via voice or gesture,[18] coupled with a very small aperture antenna (VSAT) capable of transmitting audio, video, and sophisticated computer–generated data around the globe,[19] would be a tremendous combat field device. However, the helmet may be perceived as threatening in a nonhostile environment, and thus unusable until engaged in a combative operation. Again, underlying technologies include, but are not limited to, metal-oxide semiconductors, CPUs on a single microchip, and high performance computing with a strong dependency on interface to the communications networks described below.

The key to all the C^4I systems discussed thus far, and in the next two sections; whether for collection, communication, decision-making, or countering, is interoperability via fiber and/or satellite networks. As cited in the *New World Vistas Report*,

> Distributed satellite systems, partly or wholly commercial, are a natural way to provide affordable connectivity where fiber is nonexistent. We depend more and more on commercial terrestrial communication networks because they are redundant, reliable, survivable and cost effective. We seem to insist, however, on developing military satellite communication (SATCOM) systems in spite of their exorbitant cost and limited performance.
>
> During the next decade commercial SATCOM systems will exceed the capacity, reliability, and survivability of the military system. Commercial systems will have multiple ground stations which connect to the world wide fiber system. They will eventually use laser cross-links and down-links that will dramatically increase redundancy of the systems. It is likely that the commercial systems can be used for military purposes more reliably than can dedicated systems. This will be especially true if other nations develop anti-satellite systems.[20]

An alternative is using direct satellite link to large aircraft and URAVs, which requires a much smaller architecture and is less expensive.[21] Authors of *New World Vistas* reinforce the notion. Specifically, they assert that: "Certainly direct satellite links should be provided to all air lifters, AWACS, Joints STARS, URAVs and tankers. Commercial carriers will probably suffice for the air lifter links and perhaps for the tanker links."[22] They detail the communication ties in great depth. For example,

> We estimate that MHz bandwidth is possible [for direct communications between high performance aircraft and satellite] if the fighter aircraft has a conformal phased array antenna. Cost of this is very high. It is now true that fighter aircraft are seldom out of range of communication with large aircraft such as a tanker, AWACS, or Joints STARS.
>
> As high altitude URAVs, enter the theater in large numbers, line of sight communications between them and a fighter aircraft will be reliable. A URAV at 60,000 feet can transmit line of sight to a fighter at 20,000 feet over a range of over 400 NM. Line of sight is not

> necessarily the limit of communication range for a high power transmitter . . . reliable communications over long range to standard antennas onboard a fighter aircraft can be accomplished without direct satellite links.[23] The deployment of airborne transmitters and satellite receivers in a bistatic[24] geometry . . . may be the ultimate system to provide what AWACs and Joint STARS provide today.[25]

A similar alternative may the application of the transatmospheric reconnaissance aircraft methodology of providing real-time surveillance when ASAT knocks out our satellites. It operates below ASAT level and above SAM level.[26]

Warfighting Vision 2010, A Framework for Change suggested commercial adaptation for improving future communication networks.

> C^4I for the Warrior concept integrates commercial and military networks and systems. This "Systems of Systems" maximizes feasibility, interoperability, capability, cost, security, availability, precedence and assures military service . . . Artificial Intelligence (AI) supports more efficient fusion and fully integrated multimedia, multi-functional processors capable of near real-time decision aiding. Multilevel Security (MLS) solutions include multiple layer encryption, combined with electron, benign, transparent cryptographic key distribution and automated key management approaches. Network security devices provide the flexibility to maintain security without degrading operational effectiveness. Data compression and transmission technologies involve increasing speed and efficiently while decreasing the cost of processing and transferring digital information, including voice, data, imagery and video. Computing before communicating is increasingly important as computer technology outpaces increased bandwidth technology.[27]

Collectively, these technologies will be the underlying building blocks necessary for successful integration of SORE communications requirements. The need for many of these technologies will be widespread, serving a diverse audience ranging from business, to government, to the military, and to the general public. Therefore, availability of these technologies and systems should be common place and not sourced by SOF alone.

Decision Systems

As table 10 indicates, none of these decision systems will be developed solely for SORE forces. However, all would be extremely beneficial for SORE operations, especially in their collateral mission of Information Warfare. The purpose of presenting these systems in this white paper is to ensure the conventional forces pursue development.

Table 10

Decision Systems' Dependency Matrix

"DECIDE" SYSTEMS	SORE Source	Non-SOF Source	SOF PS Source	Host Entity Source
GSRT-Global Surv/Recon/Trk		**X**		
GPS-Global Positioning Sys		**X**		
Holographic C^2 Sandbox		**X**		

The most important force quality indicators or attributes required in these decision systems or "Systems of Systems" are interoperability and fusion of multiple sources of information. Range and "packaging" will also prove important for SORE operations. These requirements are noted by previous authors of both *Spacecast 2020* and *New World Vistas*. Specifically,

> The Global Surveillance, Reconnaissance, and Targeting System (GSRT) provides omni-sensorial collection, processing, and dissemination in real time. Creates virtual reality images of the area of interest and could be used at all levels of command to provide situation awareness, technical and intelligence information, and two-way command and control.[28]

> Similarly, an ultra precise, jam resistant Global Positioning System (GPS),[29] which would be an advancement over today's GPS, could provide . . . increased accuracy on the order of centimeters, fusion with other sensor assets, enhanced on-board computational capabilities, and a high data rate transmitter using low power and spread spectrum technology. [The RE force member] would employ a system of coded signals to provide multi-level, fused information and selectable accuracy to deny capability to all but selected [or verifiable] users.[30] It should provide precise and absolute positioning and timing which has a 30 cm spatial accuracy and 1 nanosecond (Ns) timing accuracy.[31]

A Holographic C2 Sandbox is another potential decision aid for a commander "back at headquarters" or to the SORE "grunt" in the field. It would provide a complete picture of the battlefield by injecting information on a real-time basis. This system, like the GSRT system described above, requires image processing, holographic neural technology, and wide baseline interferometric synthetic aperture radar imaging technology.

Counter Systems

Table 11 displays the critical attributes needed in counterinformation or countermeasure systems designed solely for SORE or available to SORE. The matrix shows the relationship between the task, its "level of need," the force quality or attribute needed to support the task, and its measure of merit.

Table 11

Counter Tasks, Force Qualities, and Measures of Merit Matrix

TASK	CRIT/DES/IDL			FORCE QUALITY	MEASURE OF MERIT
Counter		**X**		Transparency	Blends into 1st/2d wave worlds
Counter	**X**			Interoperability	With standard C^4I systems
Counter	**X**			Fusion	Intel, surv, comm, weather, etc.
Counter		**X**		Portability	Under 1 lb.-unobtrusive
Counter		**X**		Range	Global and Local
Counter	**X**			Capacity	Giga/terabits/sec

Crit=Critical, Des=Desired, Idl=Ideal

As table 11 shows, the most critical attributes to counter adversary information exploitation attempts are interoperability, fusion, and capacity. The only countermeasure systems unique to SORE, as depicted in table 12, directly support PSYOP missions—-the advanced broadcasting system and the holographic projector. The other systems are generic to all forces' requirements and should be developed/sourced by collateral entities.

Table 12

Countermeasure Systems' Dependency Matrix

"COUNTERMEASURE" SYS	SORE Source	Non-SOF Source	SOF PS Source	Host-Entity Source
Advanced Broadcasting Systems	**X**		**X**	
Holographic Projector	**X**		**X**	
Direct Broadcast TV		**X**	**X**	**X**
SPM-Strategic Perception Mgt		**X**		
HPM		**X**	**X**	

Interoperability, capacity, and range are imperative to transmit large quantities of data to the target. For example, an advanced broadcasting system, which may be nothing more than a simple loudspeaker system but allows delivery from a standoff point or is capable of distributing leaflets with precision to its target audience, will require a wide "bandwidth" for execution. The same is true for the Holographic Projector[32] which could communicate US objectives by projecting "holographic" images directly into the region of concern. A few of the underlying technologies associated with these systems are image processing, holographic neural technology, and wide baseline interferometric synthetic aperture radar imaging, as well as standard communications networks.

Dependencies or Counter Systems Provided by Non-SORE Sources

Direct Broadcast Television, a 100 channel, relatively cheap system (less than $1000) today, should be capable of "information on demand" in 2025. It will be an inexpensive way to broadcast PSYOP messages to desired audiences. It is being researched and fielded by the commercial enterprises; therefore, off-the-shelf purchase of these types of systems is suggested.

Many types of information system weapons and electronic countermeasures will be devised by the various services. Two possibilities are

> High Powered Microwave and High Power Laser Directed Energy Weapons. These speed of light weapons, with the full spectrum capability to deny, disrupt, degrade and or destroy,

> will continue to evolve and may eventually replace most traditional, kinetic energy explosive driven weapons and self protection countermeasure systems.
>
> However, there are five innovative technologies required for "energy frugal" directed energy weapons. Specifically, they are high, light weight optics, HPM antennas using thin membrane fabrication, high-power short-wavelength solid-state lasers, high average power phase conjugation, new approaches to adaptive optics and phased arrays of diode lasers.[33]

Whether used in combination or in singular application, these technologies and their ensuing systems may prove invaluable for SORE countermeasure efforts, especially in collaboration with information warfare practices. Finally, we must remember the eloquence of the *New World Vistas* report in addressing the collaborative and defensive efforts. Specifically,

> Defensive IW will be pursued by the commercial community because of the obvious effects that malicious mischief can have on commerce. The military problem is, however, likely to be different enough that some effort will be required. The commercial solutions should be monitored closely for possible application or technology breakthroughs.[34]

One approach for SORE application may be to build a Strategic Perception Management system. Under this concept, new tools provided by the "Information Revolution" are so formidable that when they are employed to affect enemy perceptions, they could provide a war-winning, or at least war-deterring capability.[35] This may be the ultimate countermeasure for the technologies developed to measure, enhance, compensate, or convince the friendly decision maker.

Sustain Systems

Sustenance of the individual will be crucial for SORE operations. A host of technological leaps and applications will suffice to meet these needs. The focus, however, must be to meet the organic essentials of the human system by providing the nutrition, water, power, and ammunition required. Table 13 provides the dependencies as they relate to development of the systems.

Table 13

Sustain Systems' Dependency Matrix

SUSTAIN SYSTEMS	SORE Source	Non-SOF Source	SOF PS Source	Host-Entity Source
"Chia pet"- Fast Food	**X**			
Portable Water Supplies	**X**	**X**		
Portable Power Generators		**X**		
Passive push Replenishment		**X**		

Before we can feed SORE force members, we must determine individual organic levels and nutritional needs. Then a lightweight and compact survival package can be devised and tailored for each force member. To accomplish this, we must pursue advances in food development such as biochemical-enhanced "hyper speed growth" seeds cultivated on portable substrates. Something similar to the "Chia Pet" concept, that is simple, fast, unobtrusive, and man-portable is needed to replenish SORE forces' nutrients "while on the go." The approach should seek to exploit chemically enhanced seeds, nuts, or grains which grow and produce "food" within a 24- to 72-hour period.

Refined metabolic rate screening, combined with nutritional-matching, will ensure enhanced performance during employment. A potential candidate is the HOMBRE concept. With this system, we may determine each SORE force member's metabolic type, then selectively enhance their cognitive and physical performance through specific nutritional regimens.[36]

A quick solution for water purification or collection may be to use absorbent receptacles to collect dew, obtaining small quantities of water for force sustainment in a dry environment. A long-term, more exotic source may be the manufacture of dry chemicals which, when combined, bond at the molecular level to produce water. An even more far-reaching approach is filtering and purifying body fluids to act as an interim water supply, should extreme conditions arise.

Several technologies must be pursued to provide portable, organic power sources. For example, methods to extract power from the hydrogen compounds in water sources could be adapted to SORE force needs, thus doubling the benefits of having the water.

Similarly, battery packs must be more compact, lighter, rechargeable, and retain longer life on a single charge. In that light, the potential exists to create technologies that exploit human movement and central or autonomic nervous system activity as low-grade energy sources.[37] Further, since SORE forces will spend a lot of time walking, this "energy" must be harnessed and exploited. For example, "boot chargers" located in the heels of a force member's boots could be used to operate or recharge as the member performs his/her daily routines. These combinations may, in turn, be applied to battery charging to accommodate the need.

In the same vein, several energy technologies are projected which may provide alternative portable sources. They range from lightweight, solar panel collection systems, to ambient lunar light collection panels; to miniaturized power-generating factories on a single microchip.[38] The technological leaps made in solar power, as well as microscopic machines, should be investigated for SORE force application. Expedient replenishment and replacement solutions might be precision-guided delivery systems and energy weapon recharging via direct satellite link. In both cases, sensors will monitor inventory levels and track source supply points automatically and replenish as needed. The latter concept is a "passive-push" replenishment system similar to today's Just-in-Time or Trickle Charge systems. This approach minimizes administrative communications that may compromise covert or clandestine units and optimizes use of limited replenishment assets.

Move or Transportation Systems

Any special transportation requirements needed by SORE forces will likely be provided by non-SORE resources. As table 14 indicates, non-SOF, Precision Strike SOF, and/or Host-Entity resources with fulfill our movement requirements.

Table 14

Move Systems' Dependency Matrix

"MOVE" SYSTEMS	SORE Source	Non-SOF Source	SOF PS Source	Host-Entity Source
Av Foreign Internal Defense		**X**		**X**
Exfiltration/Infiltration Systems		**X**	**X**	**X**
Strap-on/Strap-off for SO Acft		**X**	**X**	

While these new systems will be advantageous to SORE, none are SORE-unique. Hence, SORE forces will rely on application, access, and use of collaterally developed methods to meet their transport needs. Therefore, these systems are not described in this paper. The reader can refer to the *Precision Strike, Airlift and Spacelift* white papers for details.

Notes

[1] John L. Petersen, *Road to 2015, Profiles of the Future*, (Corte Madera, Calif.: Waite Group Press, 1994), 46.

[2] Ibid., 57.

[3] Ibid.

[4] Ibid., 58.

[5] Ibid., 61.

[6] Ibid.

[7] Wiley, R., *Human Optimization of Metabolic and Behavioral Response (HOMBRE)* Technology Initiatives Game '95, Naval War College Compendium, 1995.

[8] Ibid.

[9] Ibid.

[10] ***2025*** Concept, no., 200007, "Rehearsal for All Missions System," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[11] ***2025*** Concept, no., 900577, "Gumping Audio and Video Library," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[12] ***2025*** Concept, no., 900501, "Artificially Intelligent Word Processor," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[13] ***2025*** Concept, no., 900263, "The All Seeing Warrior," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[14] ***2025*** Concept, no., 900280, " Fly on the Wall," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[15] ***2025*** Concept, no., 900341, "Robobugs," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[16] ***2025*** Concept, no., 900340, "Universal Language Translator," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[17] ***2025*** Concept, no. 900624, "Hand-held Translator," Concept, no. 900560, "Portable Language Translator," and Concept, no. 900607, "Universal Translator," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[18] ***2025*** Concept, no., 900317, "Tactical Information Display Helmet," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[19] Petersen , 190–193.

[20] USAF Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century*, summary volume (Washington, D.C.: USAF Scientific Advisory Board, 15 December 1995), 27.

[21] Ibid.

[22] Ibid.

[23] Ibid.

[24] See *New World Vistas Study* for complete definition.

[25] Ibid., 23.

[26] ***2025*** Concept, no., 900351, "Transatmospheric Reconnaissance Aircraft," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[27] *Warfighting Vision 2010, A Framework for Change*, 1 August 1995, Joint Warfighting Center, Doctrine Division, Fort Monroe, Va., 12.

[28] *Spacecast 2020, Air University into the Future*, Operational Analysis, Maxwell AFB, Ala.: Air University, 1994, 34.

[29] *New World Vistas*, summary volume, 10.

[30] *Spacecast 2020*, 35.

[31] *New World Vistas*, summary volume, 25.

[32] *Spacecast 2020*, 36.

[33] *New World Vistas*, summary volume, *60.*

[34] Ibid.,10.

[35] Jeffrey Cooper, *Another View of Information Warfare, Conflict in the Information Age*, SAIC, 30.

[36] Wiley, Item 111-1.

[37] ***2025*** Concept, no., 900123, "Body Heat as a Low Grade Energy Source," ***2025*** Concepts Data Base (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[38] Kaigham J. Gabriel, "Engineering Microscopic Machines," *Scientific American*, September 1995, 118–121.

Appendix B

Definitions of Underlying Technologies

Central Processing Units on a Single Microchip where the power of 16 Cray YMP super computers will be manufactured for under $100 on a single microchip that will contain about 1 billion transistors. These will be used to create micromechanical devices, micromachines, microrobots, microsensors, and be integrated with microelectronics devices on a "single chip."[1]

Condensed Charge Technology "produces small, tightly bound dense clusters of electron charge of enormous power relative to their size. Integrates spark, or more accurately micro-arc discharges, into, not out of, a system thereby taking advantage of the many beneficial properties inherent to the phenomenon. It can then be made, controlled, and used on command."[2]

Data Fusion Technology whereby multivariate data from multiple sources are retried and processed as a single, unified entity. Fundamental to C^2, with Intel being a major component.[3]

Electromagnetic Communications. Development and production of a variety of telecommunications equipment used for electromagnetic transmission of information over any media. Analog or digital information ranging in bandwidth.[4]

High Performance Computing. Development of extremely high performance digital computers with vector and massive parallel processor architecture. Needed to process massive amounts of data in real time.[5]

Image Processing. A process that will acquire, transfer, analyze, and display real-time imagery for use in a variety of systems.[6]

Holographic Neural Technology. Software written in complex numbers (real and imaginary) using holographic principles and quantum theory, allowing information to be superimposed or enfolded by a convolution of complex vectors, requiring only one to three passes to map the desired information.[7]

Metal-oxide semiconductor is a microtransistor with nanometric dimensions.[8]

Molecular Nanotechnology. Building things from the bottom up. Starts with individual atoms and uses molecular-sized machines to put systems together in predetermined configurations.[9]

Non-Binary Computing[10] where speed of data computing will be increased by magnitudes of order beyond today's current standards.

Virtual Reality. Holographic full-color, three-dimensional projection where the information can be digitized and transmitted to remote locations. Will enable a person to operate complex systems from remote locations or project themselves into an artificial environment.[11] For example, "picturephones may protect the person on the other end of the line into the middle of your room as a 'light sculpture'."[12]

Wide Baseline Interferometric Synthetic Aperture Radar (SAR) Imaging. 3D dimensioning where images can contribute important data.[13]

Zero-point Energy is the process of taking energy out of the air and converting it directly into heat or electricity with no other by-products. Zero-point energy is the ambient energy left in space after all of the heat has been removed—absolute zero. Basically, it is taking energy out of the electromagnetic fluctuations in a vacuum.[14]

Notes

[1] John L. Petersen, *The Road to 2015, Profiles of the Future*, Corte Madera, Calif.: Waite Group Press, 1994, 29.
[2] Ibid., 61.
[3] *Spacecast 2020, Air University into the Future*, Maxwell AFB, Ala;: Air University Press, 1995, 56.
[4] Ibid.
[5] Ibid., 57.
[6] Ibid.
[7] Petersen, 44.
[8] Ibid., 29.
[9] Ibid., 58.

[10] ***2025*** Concept, no. 900357, "Micromechanical Devices," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

[11] Petersen, 45.

[12] Ibid., 62.

[13] ***2025*** Concept, no. 200005, "Multiplatform Interferometry," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996) and USAF Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century*, summary volume (Washington, D.C.: USAF Scientific Advisory Board, 15 December 1995), 43.

[14] Petersen, 159.

Bibliography

ARTICLES/MAGAZINES

Andre, David J. "The Art of War-Past, Present and Future" *Joint Forces Quarterly*, Autumn 1995.

Builder, Carl H., "Doctrinal Frontiers*" Airpower Journal*, Winter 1995.

Cooper, Jeffrey "Another View of Information Warfare, Conflict in the Information Age*"* SAIC, 30 August 1995.

Dunlap, Charles J., Jr. "How We Lost the High-Tech War of 2007" *The Weekly Standard*, 29 January 1996.

Jones, Jeffrey B., and Michael P., Mathews, "PSYOP and the Warfighting CINC" *Joint Force Quarterly*, Summer, 1995.

Libicki, Martin Dr. "What Is Information Warfare" *Strategic Structures Course Book, Vol II*, Maxwell AFB, Ala.: Air Command And Staff College, 1996.

Marshall, James P. "Near Real-Time Intelligence of the Tactical Battlefield," *Theater Air Campaign Studies Course Book*, (Maxwell AFB, Ala.: Air Command and Staff College, 1996.

Scientific American, Key Technologies for the 21st Century September 1995.

Warden, John A. "The Enemy as a System" *Strategic Structures Course Book*, Maxwell AFB, Ala.: Air Command And Staff College, 1996.

Books

The Chicago Manual of Style. 14th ed. Chicago: The University of Chicago Press, 1993.

College of Aerospace Doctrine, Research, and Education. *AU Press Author Guide*. Maxwell AFB, Ala.: Air University Press, March 1995.

———. *AU Press Style Guide for Writers & Editors*. Maxwell AFB, Ala.: Air University Press, December 1994.

Hamel, Gary, and C. K. Prahald, *Competing for the Future, Breakthrough Strategies for Seizing Control of Your Industry and Creating the Markets of Tomorrow* Boston, Mass.: Harvard Business School Press, 1994.

Kennedy, Paul. *Preparing for the Twenty-First Century*, New York: Random House Publishing, 1993.

Pasmore, William A. *Creating Strategic Change* New York; John Wiley and Sons Inc., 1994.

Petersen, John L. *The Road to 2015, Profiles of the Future* Corte Madera, Calif.: Waite Group Press, 1994.

Schwartau, Winn *Information Warfare—Chaos on the Electronic Superhighway* New York: Thunder's Mouth Press, 1994.

Schwartz, Peter *The Art of the Long View* New York: Doubleday Dell, 1991.

Toffler, Alvin and Heidi *War and Anti-War, Making Sense of Global Chaos* New York: Warner Books, 1993.

Van Creveld, Martin *The Transformation of War* New York: Free Press, 1991.

Concepts—2025 and Technology Initiatives Game

2025 Concept No. 200005 "Multiplatform Interferometry" ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 200007 "Rehearsal for all Missions System" ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900123 "Human Body Heat As a Low Grade Energy Source" ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900263 "The All Seeing Warrior," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900280 "Fly on the Wall," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900317 "Tactical Information Display Helmet" ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900340 "Universal Language Translator" ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900341 "Robobugs, " ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900351 "Transatmospheric Reconnaissance Aircraft (TRA)," ***2025*** Concepts Data Base, (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900357 "Micromechanical Devices" ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996)(Proprietary).

2025 Concept No. 900460 "Portable Language Translators," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No., 900501, "Artificially Intelligent Word Processor," ***2025*** Concepts Database (Maxwell AFB, Ala: Air War College/***2025***, 1996).

2025 Concept No. 900562 "A Selective Knowledge Pill," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900577 "Gumping Audio and Video Library," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

2025 Concept No. 900624 "Hand-held Translator" ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/2***025***, 1996).

2025 Concept No. 900772 "Aviation Foreign Internal Defense," ***2025*** Concepts Database (Maxwell AFB, Ala.: Air War College/***2025***, 1996).

Wiley, R. *Human Optimization of Metabolic and Behavioral Response (HOMBRE),* Technology Initiatives Game '95, Naval War College Compendium, 1995.

Publication/Reports

Air Force Doctrine Document 1, *Air Force Basic Doctrine* (draft), 15 August 1995.

Allotey, Sam, et al. *Planning and Execution of Conflict Termination* ACSC Research Project 95-05-053, May 1995.

Cornerstones of Information Warfare Department of the Air Force, 1995.

Goldstein, Frank L. "*Psychological Operations—Principles and Case Studies*" Air University Press, Maxwell AFB, Ala.: 1995.

Hammond, Grant T *The New "PPBS": Pork, Politics, Budgets and Strategy and the Active and Reserve Components in the US Military*, National Security Strategy Chair, Air War College, Maxwell AFB, Ala., Draft Paper for Presentation to the American Political Science Association Annual Meeting, 31 August 1995.

JFACC Primer Second Edition Government Printing Office, February 1994.

Joint Publication 1.0. *Joint Warfare of the United States Armed Forces* January 1995.

Joint Publication 3-05. *Doctrine for Joint Special Operations* October 1992.

Joint Publication 3-05.3. *Joint Special Operations Operational Procedures* August 1993.

Joint Publication 3-07.1. *Joint Tactics, Techniques, and Procedures for Foreign Internal Defense* December 1993.

Joint Staff Memorandum to the SECDEF, 19 December 1995. Subject: *Volume 4 (Future Capabilities*), *Joint Planning Document for FY 1998 through FY 2003* (JPD FY98-03), Enclosure.

Spacecast 2020, Air University into the Future Maxwell AFB, Ala.: Air University Press, 1995.

Taylor, Charles W. *Alternative World Scenarios for a New World of Nations* Strategic Studies Institute, US Army War College, 1993.

USAF Scientific Advisory Board. *New World Vistas: Air and Space Power for the 21st Century*, Summary Volume. Washington, D.C.: USAF Scientific Advisory Board, 15 December 1995.

———. *New World Vistas: Air and Space Power for the 21st Century*. Unpublished draft, the Information Applications Volume. 15 December 1995.

United States Special Operations Command Publication 1 *Special Operations in Peace and War*, January 1996.

United States Special Operations Command *The United States Special Operations Forces Posture Statement* Government Printing Office, 1994.

Warfighting Vision 2010, A Framework for Change, Joint Warfighting Center, Doctrine Division, Fort Monroe, Va., 1 August 1995

Speeches/Lectures

Cable, Larry Dr. University of North Carolina, Wilmington Air War College Lecture, 31 January 1996

Cognitive Engineering for Information Dominance 2025 Briefing, Lt Col Martin L. Fracker, Human Resources Directorate, Armstrong Laboratories, Human Systems Center, Brooks AFB, Tex. 16 October 1995.

Collins, John CRS Report to Congress *Special Operations Forces, An Assessment 1986–1993*, July 1993.

Downing, Gen Wayne A., USA, USCINCSOC *Senate Armed Services Committee Congressional Testimony* March 1995.

Medical Implications in the Future Dr James Kvach, 2025 Briefing, 31 January 1996.

Shelton, Gen Hugh M., USA, USCINCSOC Air War College Lecture, 25 March 1996.