machinegun round that is used when calling for artillery and mortars.

The U.S. Army Rangers were first issued the M240 two years ago but without the SF kit. When the SF kits were subsequently issued, Ranger units received training on the technique of map-predicted fires from the British, who were already using the M240 with SF kit. But this was only familiarization training because the U.S. Army had not yet purchased these kits. Therefore, the Rangers were unable to use the M240 in the map-predicted fire mode.

The M240 with the SF kit increases the maximum effective range of the gun to 2,700 meters. Tracer burnout occurs at 2,000 meters, which can make it harder to see the rounds and adjust them at greater distances. Experience has shown that the effect of the rounds on the target, such as flying sparks or kicked-up dust, can be visible enough to allow for adjustment of the sheaf. The tripod that comes with the SF kit allows for three firing positions—sitting, kneeling, and prone. Naturally, the gun barrel can be elevated to an angle sharp enough to allow for high-angle fires.

Initial feedback indicates that map-predicted fires can be ideal under the appropriate circumstances, but there are some drawbacks: Employing map-predicted fires is time-consuming. The highly perishable skills of the forward observer and the gunner require a great deal of sustainment training. The SF kit weighs about 40 pounds, and transporting it can be difficult, especially on long foot movements and airborne operations. The accuracy of the sheaf is entirely dependent upon the skills of the machinegun section. Nonetheless, map-predicted fires can be effective and accurate when performed by well-trained and highly skilled soldiers.

If the Army is willing to buy and field the M240 machinegun with SF kit, some basic changes will need to be made in training. For example:

- Establish a military occupational specialty or a special skill identifier for machinegunners, including medium and heavy (.50 caliber and MK 19 40mm grenade machinegun). Or, at the very least, assign the gunner duties to sergeants.
- Establish minimum qualification criteria, minimum sustainment training, and familiarization standards for gunners using all firing techniques.
- Establish doctrine and tactics for machineguns, stressing their inherent potential as combat multipliers.
- Train junior officers and NCOs on gunnery tactics and techniques.
- Rewrite the machinegun manuals and include tables, technical data, tactical employment techniques, and maintenance.
- Incorporate all the techniques for direct fires or map-predicted fires into the tactical employment of all our medium and heavy machineguns—especially the MK 19.
- Build adequate machinegun ranges that require gunners to fire directly, indirectly, singly, and in sections.
- Allocate enough ammunition for this type of training.
- Teach all infantry soldiers, as a common task, the forward observer skills of adjusting machinegun rounds.

We must also think ahead about how to use the company medium machineguns on tomorrow's battlefield. We must plan for indirect machinegun fires in an environment of directed energy weapons. We can easily develop machinegun tactics that will make them an integral part of our combined arms doctrine. The point is that the machinegun will be needed just as much in the future as it is today. And instead of thinking of how to replace it, we should be thinking of how we can enhance the effectiveness of new technologies with weapons and tactics that have stood the test of time.

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Load-Bearing System
For the 21st Century Land Warrior

COLONEL MORRIS E. PRICE, JR.
MAJOR ALLEN L. BORGARDTS

Carrying loads efficiently has challenged infantrymen since the beginning of organized warfare, and they have always found a way to "make do" with whatever equipment was provided. Two programs now seek to break this pattern: The 21st Century Land Warrior Integrated Technology Program and the Generation II (GEN II) Soldier System Advanced Technology Demonstration (ATD).

On the digitized battlefield of the 21st

Century, the dismounted infantry soldier will need a totally integrated load-bearing system, and such a system is currently being developed at the U.S. Army Soldier Systems Command's Natick Research, Development, and Engineering Center. The load-bearing component of the protective subsystem of the GEN II Soldier ATD provides a lightweight, integrated, modular solution that addresses the challenges of the next century.

The Natick Center completed a front-end analysis on load-bearing equipment in January 1995. This analysis included the history of load-bearing, an extensive field survey, and an on-site working group. The results of this comprehensive study verified what infantrymen have said for many years: Their load-bearing equipment was incompatible with other equipment, was not modular, and needed a better padding and fit system. The results of the analysis now drive Natick's future research and development efforts.

The analysis showed that dismounted soldiers now operate with two basic configurations of load-bearing equipment (Figure 1). The all-purpose lightweight individual carrying equipment (ALICE) consists of a medium or large pack and an equipment belt with suspenders that attaches magazine cases and other pieces of equipment.

The ALICE system, which is 20 years old, has both positive and negative aspects. On the positive side, it is durable, fairly stable with heavy loads, and more comfortable than an internal frame system in hot or temperate climates. On the negative side, the load cannot be tailored efficiently, and soldiers often use a butt pack or patrol pack to compensate. In addition, the system does not accommodate cold weather items well and cannot be adjusted.

The integrated individual fighting system (IIFS) consists of a large field pack with internal frame/combat patrol pack, a 40mm grenade vest, and an individual tactical load-bearing vest. The system is designed for supporting the additional weight of cold weather operations and for Special Operations forces (SOF). The patrol pack has been used with the ALICE system as an interim solution.

Due to quality problems with the initial issue of the IIFS, there were many failures and most units went back to the old ALICE. The IIFS was adopted by light forces and SOF for use in temperate regions, but it was found to be too hot in these environments and it was too large for airborne use. Heavy loads (in excess of 80 pounds) proved unstable and often broke the internal frame.

The ALICE and IIFS systems were designed separately, and problems occurred in the field when components were combined. Extensive field surveys indicated that neither the ALICE nor the IIFS field pack met the needs of the dismounted soldier.

In 1992 the Natick Center successfully demonstrated that the dismounted infantrymen could best be supported as a "soldier system." The soldier integrated protective ensemble (SIPE) ATD showed the capabilities that a systems approach—and the integration of state-of-the-art technologies—can provide for the individual dismounted infantry soldier.

The objective of the SIPE ATD was to demonstrate a modular, integrated head-to-toe individual fighting system that improved the soldier's combat effectiveness while providing balanced protection against multiple battlefield threats. The load-bearing portion of the program demonstrated a modular approach and a flexible design that could be tailored to missions.

The SIPE demonstration was not a test of prototype hardware intended for immediate fielding. The components were bulky, heavy, and unacceptable for long-term field use. The demonstration was the genesis of both the Land Warrior Program and the 21st Century Land Warrior/GEN II Soldier ATD, both of which are managed by the Soldier Systems Command. These programs will revolutionize load-bearing for the 21st Century soldier.

Land Warrior

The Land Warrior Program will field approximately 4,800 systems in the years 2000-2003. These items include an integrated load-bearing and body-armor system with the functional integration of all mechanical, optical, and electrical components. The load-

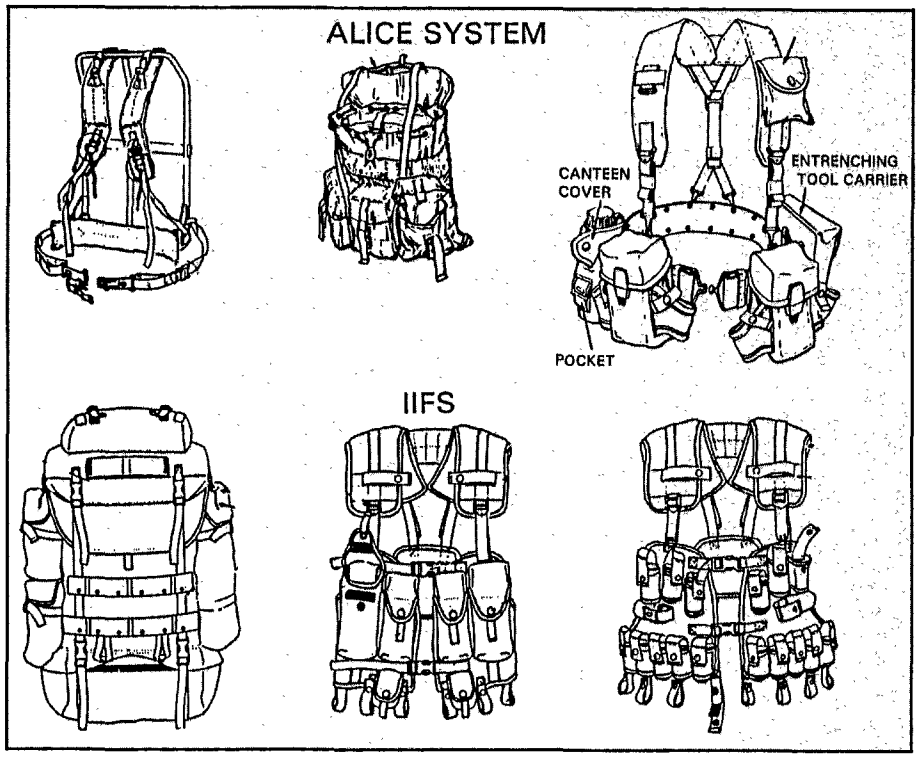

Figure 1

bearing component (LBC) consists of fighting load, patrol pack, frame, approach-march pack, and sustainment pack, and has a capacity between 4,500 and 5,500 cubic inches.

The fighting load module includes a vest with removable ammunition pouches to carry the soldier radio, computer, global positioning system (GPS), and the required antennas. The waist belt uses removable pouches and carriers. The straps have increased padding and can adjust the load from the shoulders to the hips (a single point of release is required). The patrol pack has a volume of 800 to 1,200 cubic inches. The approach march pack, or "rucksack" module, attaches to an independent pack frame, carries heavy and bulky items, and has external side pockets with additional points of attachment. The sustainment pack allows a soldier to carry additional loads or outsized items; its volume has not been determined.

The Land Warrior Program fields proven technological advances in the near term and will accept technology from the GEN II Soldier ATD.

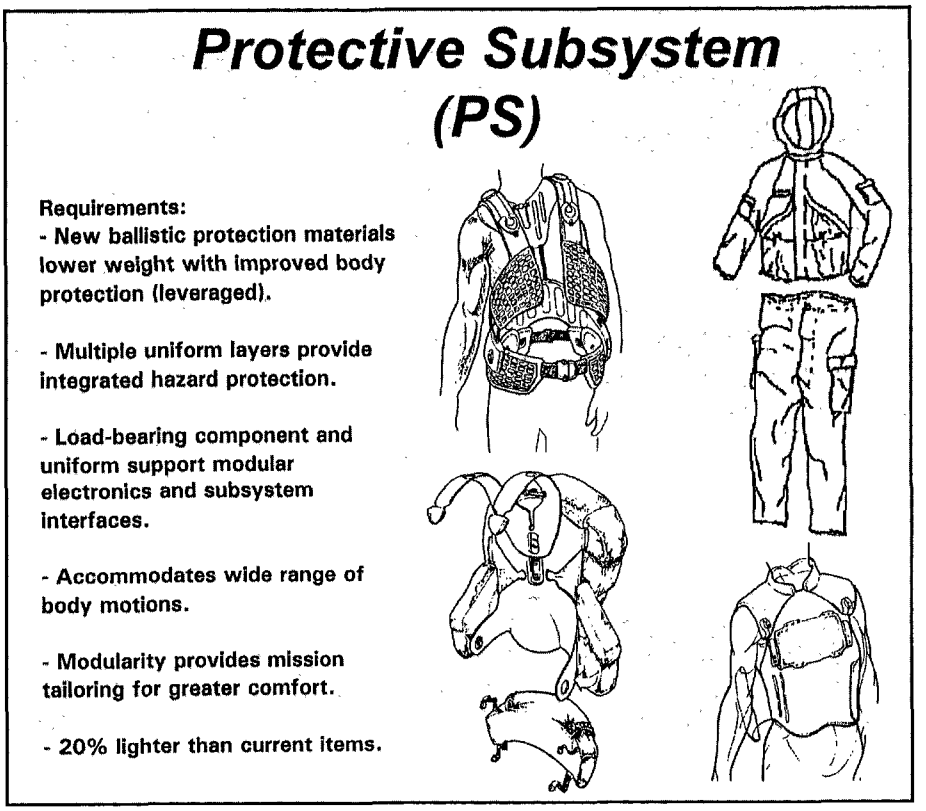

Figure 2

21st Century Land Warrior and GEN II Soldier ATD

The purpose of the 21st Century Land Warrior and the GEN II Soldier ATD is to "push the technology envelope" in areas that require further maturation. This challenge requires the Protective Subsystem (PS) Integrated Product Team to envision the Force XXI soldier on the battlefield equipped with a totally integrated, modular fighting system that makes the most of technological advances. This translates into an LBC that has increased mission flexibility and an ability to integrate all the components of the 21st Century Land Warrior into a comfortable, acceptable soldier system.

The LBC is critical to the success of both the PS and the system as a whole. The SIPE demonstration showed that increases in individual capabilities through technology are limited to the successful design of the load-bearing component. Lightweight, integrated modularity is required to support the dismounted soldier system on the digitized battlefield. The GEN II Soldier ATD is poised to make this vision a reality.

The Natick Center is currently designing the LBC and other PS components to meet the requirements and goals stated in Figure 2. The LBC optimizes load transfer between the shoulders and the hips and uses materials that are lighter and offer more protection. The LBC supports and integrates all of the 21st Century Land Warrior components. The weight of the complete system (all components) is projected at 20 percent less than that of today's equipment. GEN II Soldier fielding is set for 2003-2004, and early successes can be inserted into the Land Warrior system at any time. Several design considerations differentiate these two programs: The GEN II Soldier LBC includes the full integration of all 21st Century Land Warrior components, body armor, and interconnections of subsystems, as opposed to the functional integration in Land Warrior.

The LBC harness (Figure 3) includes an integrated individual soldier computer/radio (ISC/R) and a weapon interface subsystem processor (WISP). These are in a structural housing that conforms to the body's contours and aligns with its center of gravity. The LBC harness is designed to carry the complete fighting load and is worn at all times. A grid attachment on the chest and waist belt allows maximum load tailoring. The waist belt also provides ballistic protection.

The butt pack (Figure 2), which attaches to the bottom of the rucksack or to the fighting harness, has a capacity of approximately 1,200 cubic inches. The approach-march pack fits into the shoulder straps of the harness and uses the harness waist belt, eliminating the duplication of straps as well as discomfort. The pack's "rabbit ear" design allows the soldier to easily don the pack, using only one arm.

All of the subsystem wiring is embedded in the harness itself so that there are no loose wires. The GPS receiver is also built into the LBC. Figure 4 shows a better view of the

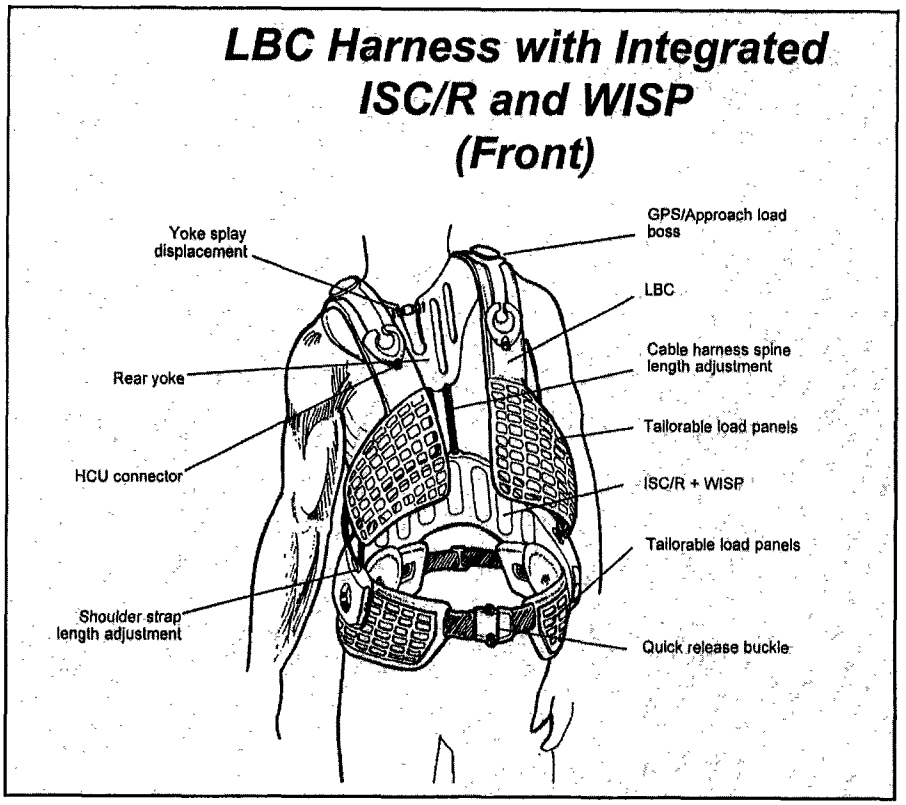

Figure 3

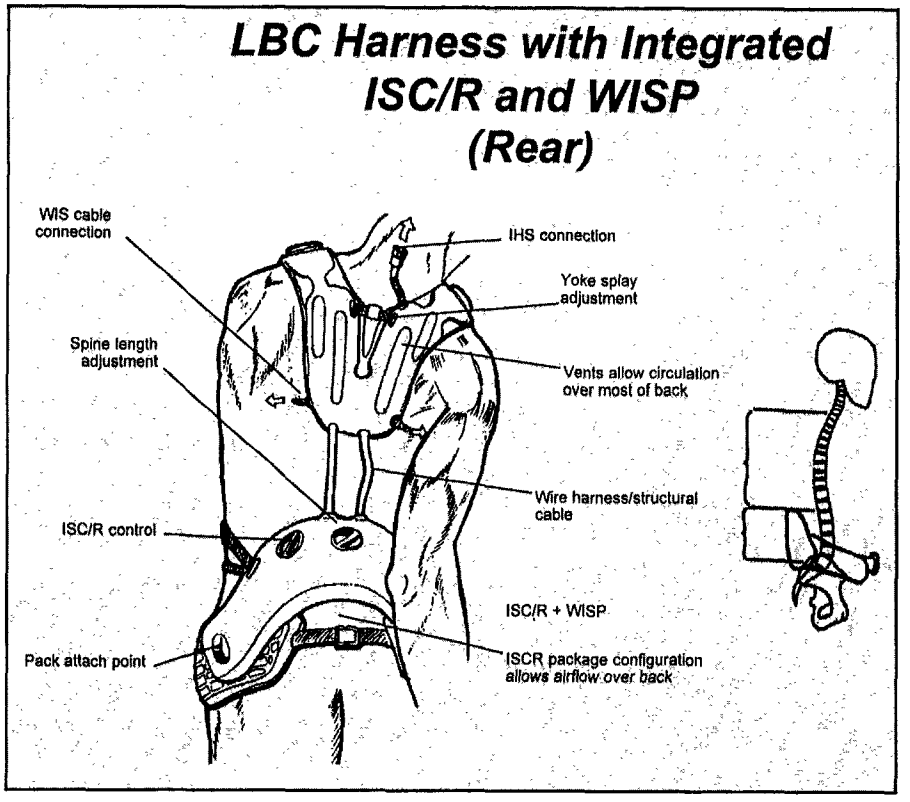

Figure 4

embedded ISC/R and WISP. The GEN II Soldier has complete access to all critical controls. The integrated headgear subsystem plugs directly into the LBC through one connection at the rear of the harness. The LBC is fully compatible and integrated with the uniform and body armor, allowing for the addition of a small-arms protection upgrade plate.

The LBC also accommodates all the other 21st Century Land Warrior components such as a personal status monitor, chemical agent detector, XM-45 protective mask, modular weapon system, and Javelin antiarmor weapon. The design phase is also considering such issues as weapon capability and a forward observer forward air control version for the Marine Corps.

Both the LBC harness and the approach-march pack can be put on and taken off quickly. The rucksack can be dropped, while the fighting load stays with the soldier. Heat stress is projected to be less than with current systems. The GEN II Soldier system is fully compatible with airborne operations. A unique "whale tail" flap allows for the attachment of oversized or bulky items to the back of the rucksack.

The PS product team is working closely with the users and contractors to develop a totally integrated load-bearing system. A platoon in the 82d Airborne Division will be the experimental platoon for the ATD to be held in 1998. The platoon's input will drive design changes as breadboards and prototypes are developed. The Dismounted Battlespace Battle Lab at Fort Benning and the U.S. Marine Corps are also heavily involved in the design process. The contractor developed an early LBC mockup that gave users and designers an opportunity for early feedback and input into the initial design concept.

The GEN II Soldier program is heavily immersed in integrated product and process development. All contractors and Government personnel are trained on methods that ensure proper design, early coordination for the best use of resources, and most important, continuous user involvement. This approach has led to the development of a user system engineering requirements panel consisting of both Army and Marine Corps representatives. The structure ensures continuous user input

throughout the development process. The panel gives developers and contractors valuable field information so that the needs of the GEN II Soldier load-bearing development are not lost to the system's higher-profile electronics. This effort includes a training program that exposes the contractors to the needs of the dismounted infantryman so they can better understand and respond to comments from users in the field.

The Force XXI battlefield will require full integration of the dismounted land warrior in the digitized net. To accomplish this, the Army's load-bearing capabilities must also advance. The SIPE ATD was an excellent beginning in the development of a head-to-toe soldier system. Land Warrior capitalizes on proven technologies while the GEN II Soldier ATD continues to evaluate new and maturing technologies.

The success of the 21st Century Land Warrior and the GEN II Soldier System ATD programs depends on an effective, systemic approach to load-bearing design. The Soldier Systems Command and its Natick Research and Development Center are working to ensure that the digitized, dismounted land warrior of the 21st Century will have a totally integrated and comfortable load-bearing system.

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Major Allen L. Borgardts recently completed a tour as the Special Operations research and development project officer and deputy manager of the Generation II Soldier ATD at Natick. He previously commanded a motorized infantry company in the 9th Infantry Division and assignments in the 82d Infantry Division. He is a 1983 ROTC graduate of Methodist College and holds a master's degree from Babson College.

The Company Air Assault Raid

LIEUTENANT COLONEL ROBERT L. CASLEN, JR.

An air assault force achieves versatility and strength in offensive operations by combining the capabilities of rotary aircraft with those of the infantry and other combat arms to form a tactically tailored air assault task force. Offensive air assault operations are not merely the movement of soldiers to an attack position; they are deliberate, precisely planned, and vigorously executed combined arms combat operations, designed to strike over extended distances and terrain barriers to attack the enemy at points when and where he is most vulnerable.

Most air assault operations are characterized by deliberate and detailed planning, coordination, and preparation, and the success of these operations depends upon detailed intelligence. For these reasons, the most basic and suitable offensive operation for an air assault unit is a deliberate attack.

The advantage of an air assault raid is that it can project a combined arms capability to any depth on the tactical battlefield, where it can quickly mass firepower in key locations and at critical times to destroy enemy forces and equipment. Achieving depth quickly on the battlefield gives the tactical commander a distinct advantage. When an air assault company task force goes deep as a combined arms team, it brings massed combat forces and combined arms firepower to bear upon the enemy, destroys the enemy and his equipment, and may be quickly extracted for follow-on operations. The key difference between the air assault deep raid and the air assault deep attack is that the raid does not intend to hold terrain. An air assault task force performing a raid will achieve maximum destruction on the target and withdraw from the objective area once the mission is complete.

The planning, preparation, and coordination required to accomplish this mission are more complex than for any other attack a company commander can expect to make. For this reason, this article will discuss this operation in detail in each of the battlefield operating systems and through the five-phase reverse planning sequence associated with planning air assault operations.

An air assault company raid may have any or all of the following objectives:

- Destroy enemy forces.
- Disrupt enemy command and control.
- Disrupt lines of communication by destroying bridges and dams or blocking tunnels.
- Deprive the enemy of resources.

Before proceeding with the details of the reverse planning sequence, it is important to identify the command and control relationships for the operation. Normally, air assault combined arms operations have an air assault task force commander (AATFC), an air mission