configured unit loads, but in training, this equipment must be stored and carried in the sustainment load, possibly using squad bags. Additionally, items such as Dragon night sights, grappling hooks and ropes, and engineer tools also need to be stockpiled at a point from which the battalion support platoon can push them forward as required.

The contingency load includes all the other items of individual and unit equipment a commander does not deem necessary for a particular operation—extra clothing and personal items and possibly Dragons and TOWs when there is no armor threat. The critical element here is for a commander to determine the makeup of the contingency load and to decide who will be responsible for storing it and for pushing it forward.

The weight an individual soldier carries, then, still depends upon his commander's ability to perform a risk analysis. In the past, planning for all contingencies has made our commanders overly cautious. Certainly no commander wants to be responsible for omitting something that his unit may need on a battlefield. At the same time, he must recognize that carrying additional weight increases fatigue and decreases mobility. In the analysis outlined here, commanders must accept risk on the basis of all available information while still ensuring mission accomplishment. They must learn to see that proper loads are tailored for each mission and must use whatever transportation assets they have to shuttle critical equipment forward to the fighting men.

Research indicates that infantry soldiers must be conditioned for more than running. In fact, most infantrymen in combat will do little running, but must be able to perform high levels of such anaerobic activity as sprinting, jumping, climbing, and low crawling once they make contact with an enemy unit.

For the infantryman, therefore, the important thing is his ability to sustain a given effort for a period of time, and his march speeds and loads must be so set that he will go into battle with a good reserve of anaerobic capability and energy with which to fight.

Accordingly, road marches with the proper loads must be incorporated into a unit's physical fitness program to improve the soldiers' load-bearing capacity under combat conditions. A train-up and sustainment program should incorporate several types of routines.

The train-up portion of the program might consist of four one-hour daily workouts and up to a day per week for road marching.

Two of the four workouts should be aerobic and should include such activities as exercising to music, circuits, intervals, relays, short (one hour) speed marches with loads, aquatics, bench stepping, target heart rate (THR) training, and unit runs.

The other two workouts should be for muscular strength and endurance to emphasize the upper body. These should include free weight and machine training, obstacle and confidence courses, partner-resistance exercises, pushups, situps, and pullup improvements.

The road marches should be progressive in nature, with the distances and times increasing until the established goal is reached. These marches can be combined with tactical exercises, and load bearing should be integrated into all training to the maximum extent possible.

The sustainment (and improvement) part of the program is based upon the seven physical training principles outlined in FM 21-20: Regularity, progression, overload, variety, balance, recovery, and specificity.

A full-length article detailing multiple approaches to physical training for light infantry units will appear in a future issue of INFANTRY.

Although technology is providing the infantryman with the tools he needs to fight 24 hours a day in any environment, it will not substantially reduce a soldier's load in the near future. In fact, as in the past, new items may add weight to an already overburdened fighting man.

We must do everything we can to reduce the soldier's load, and we must make sure he is in the best possible physical condition to carry the maximum loads that he can reasonably anticipate carrying in a combat situation.

Major Richard J. Vogel is assigned to the Light Infantry Task Force at the Infantry School. He was S-3 of the 2d Battalion, 9th Infantry, 7th Infantry Division (Light) during its conversion and training for light infantry. He represented the Infantry School during all light infantry brigade and division certification events.

Major James E. Wright is Chief of the Exercise Science Branch at the Soldier Physical Fitness School. He previously commanded a medical company in the 2d Armored Division. He has represented the Soldier Support Center to ADEA during the Lighten-the-Load study.

Lieutenant Colonel George Curtis, British Army, has served in Germany, Malta, Cyprus, Norway, West Indies, and Northern Ireland. He is presently the United Kingdom's Special Project Officer on a three-year tour of duty with ADEA at Fort Lewis, with special emphasis on lightening the soldier's load.

ECWCS

CAPTAIN WILLIAM N. HENSON

The Extended Cold Weather Clothing System (ECWCS) was developed by a joint working group (JWG) made up of several agencies, including the U.S. Army Training and Doctrine Command (TRADOC), the U.S. Army Infantry School (USAIS), the U.S. Army Combined Arms Center (CAC), the U.S. Army Development and Employment Agency (ADEA),

the U.S. Army Natick Research Development and Engineering Center (NRDEC), and the Marine Corps Development and Education Center (MCDEC). The ECWCS was tested over a period of three years by the U.S. Army Infantry Board (USAIB), the U.S. Army Human Engineering Laboratories (USAHEL), MCDEC, and the U.S. Army Cold Regions Test Center (USACRTC).

During the testing period, hundreds of soldiers and Marines wore the ECWCS under field conditions in the Sierra Nevada Mountains of California, at Fort Ethan Allen in Vermont, at Forts Wainwright and Greely in Alaska, and in Norway. Additional data were gathered by various special operation forces that wore components of the system. The ECWCS was type classified by the Army in the summer of 1985, and the first components of the uniform have already been issued to special operations and light infantry units.

The ECWCS is designed to replace both the present cold-wet and cold-dry uniforms while providing better environmental protection and reducing the weight of the soldier's load. During testing, depending on which of the components were used, the ECWCS provided environmental protection down to minus 60 degrees Fahrenheit. A head-to-toe system that incorporates the latest available technology, the ECWCS, as issued, consists of the following:

- A long sleeve turtleneck undershirt and long underwear made of expedition-weight polypropylene (PP). This is a synthetic material that allows moisture from the body to pass through it quickly. It therefore also dries quickly.
- A 100 percent polyester fiberpile shirt. This shirt, designed to serve as an inner insulation layer, provides excellent warmth. Because of its loose weave, it should not be worn as an outer garment. It, too, dries quickly and allows body moisture to pass through to the outer layers of the ECWCS.
- Standard field trousers. The field trousers provide an excellent outer layer when conditions are not extremely wet or windy.
- Standard four-ounce-per-yard polyester batting field trouser and field jacket liners. These are modified to include buttons on the jacket and trousers, which allows other items to be worn independently and permits a soldier to put on or take off the trouser liners without having to take off either his trousers or his footwear. (This feature is particularly useful when the ECWCS is worn during activities in which a soldier must stop and move frequently.)
- A vapor-permeable parka and overtrousers. These components are made from nylon coated with a polytetrafluoroethylene (PTFE) membrane commercially known by the brand name Gore-Tex. This breathable fabric allows water vapor to escape from the garment but will not let water droplets from the outside in. The trousers have gusseted legs so that they can be put on over footwear; they should be held up with the standard suspenders already used with the field trousers. The parka has both zipper and snap closures and features a rain hood, five pockets (two at the hip, one on the left arm, and two large map pockets in the liner of the parka), pit zippers under both arms for ventilation, a nylon liner, and a rank tab.
- Either a Nomex balaclava or the BDU hat can be used for head protection.
- Fiberpile bib overalls, for use in regions of the world where ambient air temperatures fall below minus 60 degrees Fahrenheit. These overalls are issued as an additional layer to be worn next to the PP underwear. They also have zippers on the leg seams.

Presently, the standard white vapor barrier boot and the arctic trigger-finger mittens are issued for use with the ECWCS. Work is progressing on improved hand- and footwear and an improved hood for the ECWCS parka. Test results have shown that the present rain hood does not provide enough protection in extremely cold and windy conditions. (The PTFE outer wear also is excellent as a rain suit in warmer climates to replace the wet-weather suit.)

The ECWCS is a layered system that can be adjusted to a soldier's activity level and the specific weather conditions. Because the layers transfer moisture from the wearer's skin to the outer layers of the uniform, a soldier can be more active at colder temperatures while keeping drier than with the present system. Heavy labor at cold temperatures will quickly overload the system, however, so proper ventilation is still essential to prevent overheating.

A soldier should not need to wear the entire system except at the coldest temperatures (below minus 40 degrees Fahrenheit.) The amount of clothing worn must be adjusted to meet each soldier's needs, and commanders should dictate only that the outer layer be worn. (This should always include the PTFE parka and either the field trousers or the PTFE trousers.) When taking part in such activities as skiing or road marching, in most cases a soldier should have enough on if he wears only the PP underwear and the outer shell layer. In fact, during operations in areas where the temperatures change quite drastically during the day, some users have been known to change into regular underwear to prevent overheating. A soldier may have to change layers quite frequently as his activities and the temperature conditions change.

The ECWCS requires care that is somewhat different from that of the present cold weather system. When it is first issued, a soldier should try on all of the garments to make sure those that form the outer layers are large enough to fit over the inner layer without causing undue compression of the insulation or discomfort to the wearer. (Experience has shown that the PTFE outer layers should be about one size larger than the standard items the user normally wears.) The soldier should also check to see that the tape along all the seams on the inside of the PTFE items covers the seams completely. The item is unserviceable if the tape is loose or does not cover all the stitches.

WASHING

When washing the ECWCS the soldier must be careful to follow the instructions. The PP underwear, for example, should never be washed in hot water or placed in a heated dryer. If it is, it will shrink. The best method is to machine or hand wash it in cold water and hang it up to dry.

The average PP item will dry in less than one hour in a heated shelter. Soldiers have found that it will also dry quickly if it gets wet while being worn.

Maintaining ECWCS components, with the exception of the PTFE items, is the same as maintaining standard clothing. The PTFE components do require special care when repairs are attempted. Field repairs can be made with fabric tape (NSN 7510-00-074-5157). The wearer should simply turn the item inside out and cover the tear with the tape. Permanent repairs to any holes in the PTFE must be sealed with sealing tape and a seam sealer.

Name tags should not be sewn on the PTFE parka, and rank insignia should be pinned only to the rank tab provided on the front of the PTFE parka.

Special care should be taken with this clothing system around heat sources, because the components will melt at much lower temperatures than standard materials. Continued research into improving the fire retardancy of the components is being conducted by Natick Laboratories.

The introduction of the ECWCS gives the U.S. fighting man a state-of-the-art cold weather uniform that is as good as any in the world. Commanders must properly train their soldiers to take full advantage of the improved performance of a clothing system that significantly improves their ability to live and fight in a cold environment.

Captain William N. Henson was a test officer in the U.S. Army Cold Regions Test Center during testing of the ECWCS. He has also served as a test officer for the U.S Army Infantry Board and is now a brigade S-3 in the 2d Infantry Division in Korea.

The Feet

Mission-Essential Equipment

LIEUTENANT LARRY T. STAATS

On today's battlefield where mobility is one of the decisive factors in the success of a mission, the importance of having a dependable means of transportation cannot be overemphasized. This is precisely why taking care of the feet must be an integral part of preventive maintenance for light infantry units. Just as the combat readiness of a mechanized unit is affected by the condition of its vehicles, so the combat readiness and effectiveness of a light infantry unit is dependent upon the serviceability of its soldiers' feet.

Most foot complaints can be prevented by proper hygiene. In fact, most conditions that require hospitalization and most disabilities result from minor conditions that have been neglected or maltreated.

Several preventive measures can be taken, and it is the responsibility of leaders and trainers to make sure they are being taken. (See also "The Traveling Toe," by William N. Gordge, INFANTRY, March-April 1979, pages 9-13.)

Before marches, toenails should be cut short and square — straight across to avoid ingrown toenails. The feet should be kept clean and dry by foot powder and clean, dry well-fitting boots and socks (preferably with wool cushion