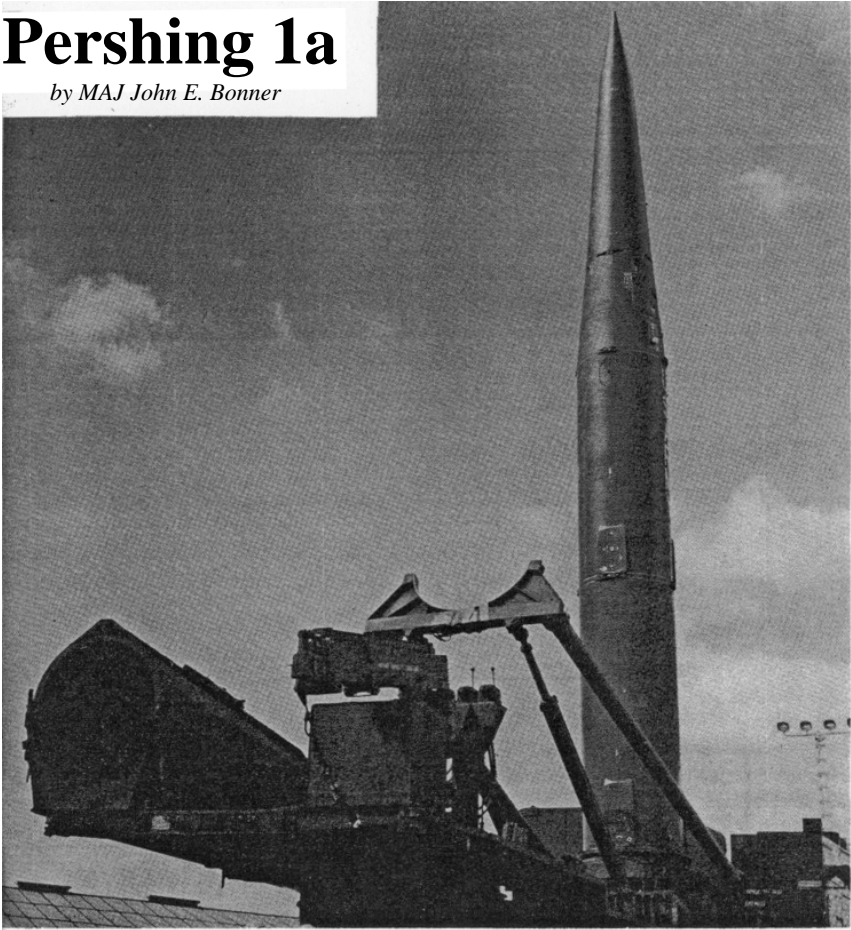


Pershing 1a

by MAJ John E. Bonner



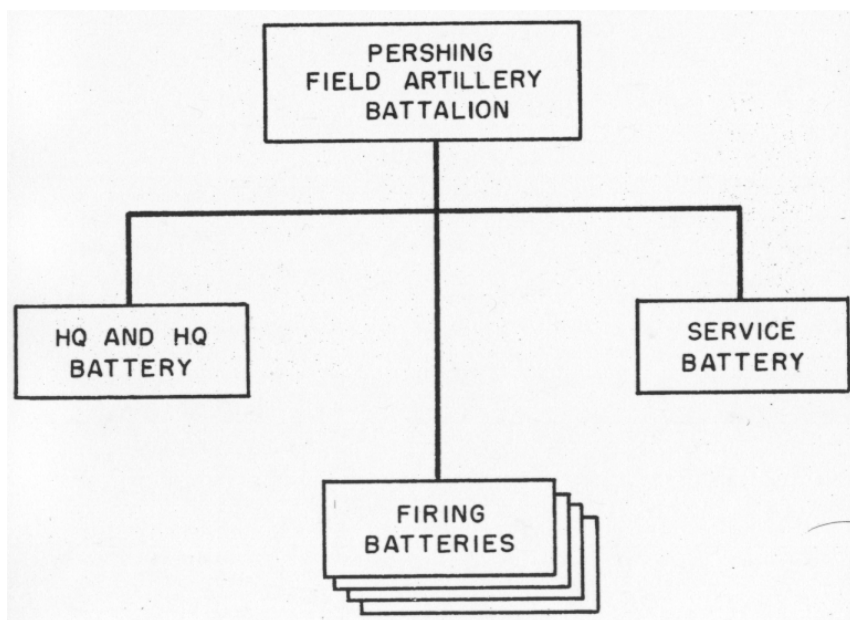
The Pershing 1a (P1a) is the US Army's longest range field artillery guided missile. In 1958, the Army determined that sufficient advancements had been made in missile technology to warrant the development of an entirely new missile system to replace the Redstone missile. This new system, named the "Pershing" in honor of General John J. Pershing, was developed with the Martin Marietta

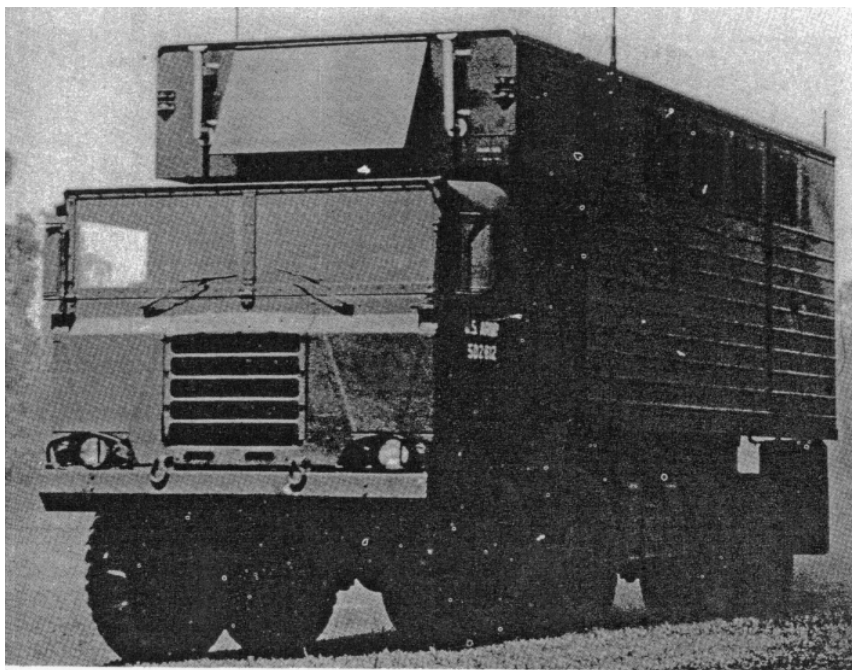
Corporation as the prime contractor. Since 1946, Pershing has been playing a vital role as a nuclear deterrent in Europe, shielding the free world. To further improve the Pershing system capabilities, the Pershing 1a was developed and was deployed in 1969. The P1a system fulfills the requirements for increased reliability, added flexibility, ease of maintenance, and improved reaction time. The Pershing missile used in the P1a

system is the same as that used in the Pershing system; improved ground support equipment, at the firing position and in the maintenance areas, provides greater flexibility for deployment as well as a faster reaction time. All units of the system are transported by improved wheeled vehicles that provide for rapid movement over roads and unimproved terrain. The P1a system includes a specially designed communications set which is unique within the field artillery and which provides reliable communication over long distances (100 miles). The Pershing 1a system is normally employed in the quick reaction alert (QRA) role in support of SACEUR'S scheduled program of

fires. However, the system will retain its follow-on mission of general support of the field army.

The Pershing 1a battalion consists of a headquarters and headquarters battery, a service battery, and four firing batteries. The Pershing 1a battalion is a self-contained organization that includes the elements required for operational control, communications, administration, and logistical support. There are four Pershing 1a battalions within the US Army. One battalion is located at Fort Sill, Oklahoma, and the other three battalions constitute the 56th Artillery Brigade in Germany. Peculiar to the 56th Artillery Brigade is





Battery Control Center

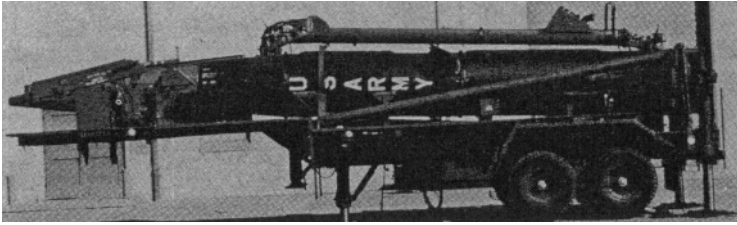
the assignment of one infantry battalion. Elements from this infantry unit provide physical security for each of the P1a battalions while the battalions are employed in the QRA role.

The Pershing 1a firing battery consists of three firing platoons, each capable of processing firing data and testing, assembling, erecting, and firing the missile. The firing battery also has the necessary equipment and personnel to support the firing platoons in communications, mess, survey, and maintenance requirements.

The Pershing ground support equipment within the firing battery includes one battery control central (BCC), nine erector-launchers (EL), three programmer-test stations

(PTS)/power stations, and one radio terminal set AN/TRC-80. The ground support equipment is transported by two types of 5-ton vehicles—the M656 cargo truck and the M757 tractor-truck. These vehicles are powered by 210-horsepower, 6-cylinder, multifueled engines. They can be operated over all types of roads and highways at speeds up to 50 miles per hour and have a cruising range of 300 miles. Three M656 cargo trucks are used to transport the battery control central, a programmer-test station/power station, and the radio terminal set AN/TRC-80.

The battery control central is a modified expandible M4 van mounted on an M656 cargo truck. The BCC provides a centralized facility



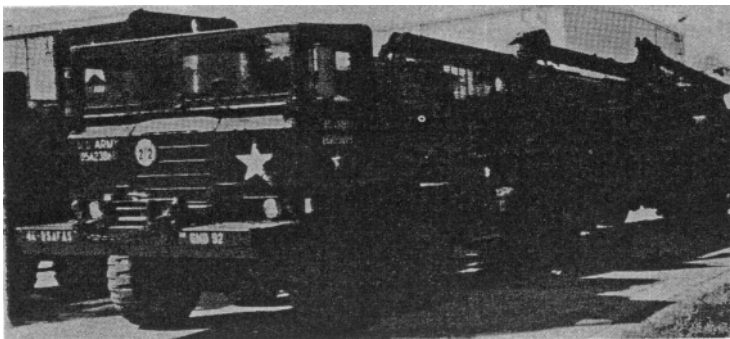
Erector-launcher

for consolidation of all release communications and for battery command and control functions. The interior of the van is divided down the middle into two functional areas: the command and control area on the right side and the recording area on the left side. The command and control area contains the equipment required for conducting command and control functions. Equipment in the recording area is used for administrative and recording functions in support of command and control operations. Electrical power for operating the BCC is provided by a trailer-mounted 15-kilowatt generator, which is towed behind the M656 vehicle.

The erector-launcher is an equipment-mounted semitrailer towed by a prime mover tractor M757. The erector-launcher provides a platform

for missile assembly, transports and erects the missile, and provides a level, stable platform for launching the missile.

The fast reaction time of the Pershing guided missile system is mainly the result of the automatic features incorporated into the programmer-test station. The PTS contains completely transistorized, self-verifying equipment. During system operations, the PTS functions as a mobile fire control center. It accepts targeting information, solves the gunnery problem, verifies the flight readiness of the missile, and presets guidance and warhead sections for flight. It can detect its own malfunctions, as well as those of the missile and ground support equipment. The PTS has the capability of testing individual missile sections,



Erector-launcher with M757



AN/TRC 80

less warhead, in their shipping containers, either individually or cabled together.

The power station provides all of the electrical and pneumatic power required by the Pershing missile and ground support equipment. The electrical outputs are 120-volt, 400-hertz AC power and 28-volt DC power. The pneumatic outputs are high-pressure air and conditioned air. The power for the outputs is provided by a high-speed, multifueled, gas turbine engine which operates at 42,000 revolutions per minute.

The radio terminal set AN/TRC-80 uses the tropospheric scatter principle of radio transmission. Tropospheric

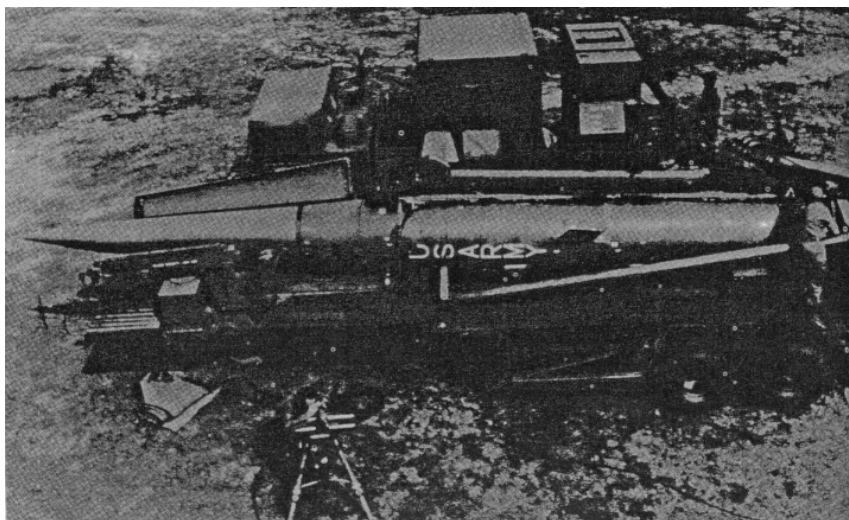
scatter transmission is a technique whereby very-high-frequency radio waves are directed to and reflected off particular points of the troposphere by the transmitting radio. These reflected radio waves are picked up by the receiving radio by means of a directional antenna, which is pointed at the same point in the troposphere. Since the tropospheric scatter process is very directional, it provides a high degree of immunity to jamming and interception. The AN/TRC-80 has the capability for simultaneous use of one duplex voice channel and one half-duplex teletype channel for point-to-point communications over a range of 100 miles. The radio can

be remoted at a distance of 5 miles. The radio is completely self-contained and includes a 10-kilowatt, 400-hertz generator located in a compartment in the rear of the shelter. Knowing the azimuth upon which to align the antenna and having the radio pretuned to the required frequency, a crew of three men can put the set into operation within 10 minutes after arriving at a position. The AN/TRC-80 provides secure reliable voice and teletype circuits necessary for the completion of Pershing's assigned mission.

In its quick reaction alert role, Pershing takes its place alongside the Navy's Polaris and the Air Force's Minuteman and Titan systems as a deterrent against aggression. In this capacity the Pershing units in Europe are assigned strategic targets upon which to maintain continuous coverage. This coverage is kept continuous through a systematic rotation schedule of the various firing batteries. These

batteries locate themselves at preselected firing sites away from their home kasernes. The firing platoons within these batteries accomplish this 24-hour-a-day mission while performing normal training, operational exercises, and daily maintenance. Each of the battalion's four firing batteries spends approximately 3 months of the year in a field alert status at these preselected sites. Two of the remaining three firing batteries also have a strategic mission while on a garrison alert status within their home kasernes. The fourth firing battery is in a released configuration and performs maintenance on its equipment for the rotational period.

The battalion direct support maintenance platoon, within the service battery, consists of highly trained specialists in the ordnance, engineering, and signal maintenance fields. These technical specialists operate in contact teams.



BCC with EL

Transition to the new Pershing 1a system has brought about many changes in the Pershing system, such as the move from tracked vehicles to wheeled vehicles as prime movers; development in the state of the art which eliminated bulky electrical chassis and replaced them with solid-state, transistorized cards and modules; and installation of a new computer and adapter complex which allows self-testing, verification of the missile's flightworthiness, and malfunction diagnostic testing.

The development of improvements for the Pershing system is not complete; several programs are currently in the planning or development stage. One of these programs, the Pershing Missile and Power Station Development Program, involves changes in the missile, the power station, and the guidance and control (G&C) section. Many of the bulky, troublesome components of the current G&C section will be replaced. The new components will allow for a more reliable, trouble-free guidance section for the Pershing missile. In addition, components within the Power Station will be relocated to provide for a better maintenance capability.

The trajectory accuracy prediction system (TAPS) will allow a coded signal to be transmitted from the missile in flight to the battery control central vehicle. This signal will give the indication that the missile

functioned properly and that warhead separation occurred as programmed.

An automatic azimuth-laying device would eliminate the need for manual insertion of the firing azimuth through azimuth-laying procedures. It is envisioned that a north-seeking gyro system which would allow the proper firing azimuth to be entered into the missile's guidance control computer directly from the PTS can be developed.

The results of Pershing firings and firing exercises have proved to be so successful that consideration is being given to extending the life cycle of the system by further modifications to the present P1a missile system. The materiel needs document for these modifications is in the early stages of development.

Pershing has been, is, and will continue to be a major part of the nuclear deterrent shielding Western Europe in support of NATO.

Major John E. Bonner received an ROTC commission at Boston College in June 1959. He has served in a variety of field artillery assignments in CONUS, Europe, Korea, and Vietnam. Only recently he finished a tour of duty as chief of the R&A Branch, Artillery Weapons Department (formerly, Guided Missile Department), U. S. Army Field Artillery School. Presently, he is assigned to the 56th Artillery Brigade, USAREUR.