REDSTONE—THE MISSILE AND ITS EQUIPMENT

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The Redstone is the largest and longest range operational field artillery missile. The missile has a rocket propulsion system and an inertial guidance system. Guidance is set before firing. The system automatically guides the missile to the target, making the necessary corrections in the trajectory to insure accuracy.

The Redstone is 21.1 meters long, 1.8 meters in diameter, and weighs 31 tons when it is prepared for firing. Its range is 200 miles.

The Redstone group (ARTILLERY TRENDS, February 1959) has 2 firing batteries, each containing the equipment and personnel required to prepare and fire one missile at a time; a headquarters and headquarters battery; an Ordnance company; and an Engineer company. The headquarters and headquarters battery provides the normal command, administrative, maintenance, and supply functions. The Ordnance company is responsible for missile supply and maintenance, in addition to supplying the fuel and hydrogen peroxide. The Engineer company manufactures liquid oxygen (LOX) and supplies it directly to the firing battery. The entire Redstone group is 100 percent mobile. Normally one Redstone group is assigned to each field army.

Three Units

The missile consists of a thrust unit, an aft unit, and a warhead unit (fig 22). The aft and warhead units are known as the body unit when they are assembled. The thrust unit includes the tail section which has fixed stabilizers, movable rudders, and jet vanes. The jet vanes extend into the rocket exhaust and provide control of the missile until its speed is sufficient to make the rudders effective. The rocket engine and a propellant pumping system are located inside the tail section. The pumping system is operated by hydrogen peroxide, a chemical which readily decomposes into steam. Above the tail section is the oxidizer tank which is loaded with 25,000 pounds of liquid oxygen (LOX). Above the oxidizer tank is the fuel tank loaded with 19,000 pounds of an alcohol and water solution.

Various valves of the propulsion system are operated by high-pressure air in fiberglass spheres near the engine. High-pressure air also is used to maintain a slight pressure on the fuel tank; the oxidizer tank is self-pressurized by the evaporation of liquid oxygen.

The aft unit houses the guidance system. At the base of the aft unit are four vanes which control the body unit after separation. The guidance system has a gyro-stabilized platform as a reference, accelerometers to measure the performance, computers to determine corrective commands,

a relay box to apply battery power to the motor actuators which position the rudders as required, and a program device to provide pitch programming and timing signals.

Shortly after thrust termination, the thrust and body units are separated by igniting six explosive bolts which connect the units and by pushing the units apart using two compressed-air-loaded expulsion cylinders. Separation improves the reentry characteristics of the missile.

The rest of the story is told in pictures. The photographs show the equipment needed to get the missile in the air and insure that it hits its target.

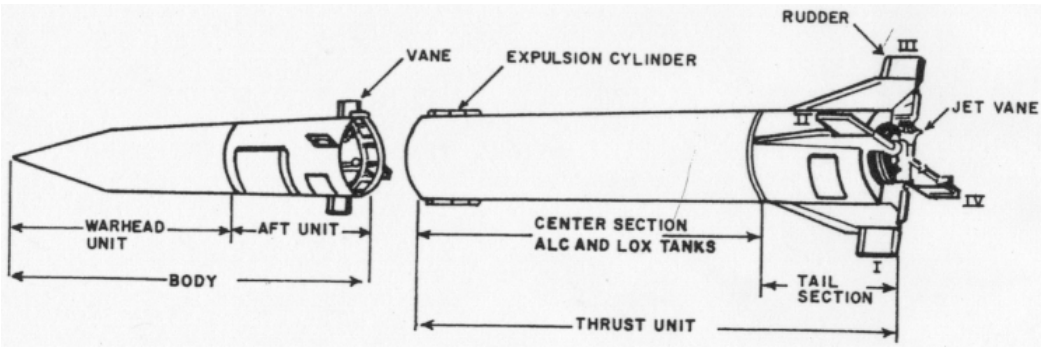

Figure 22. Components and nomenclature of the Redstone missile.

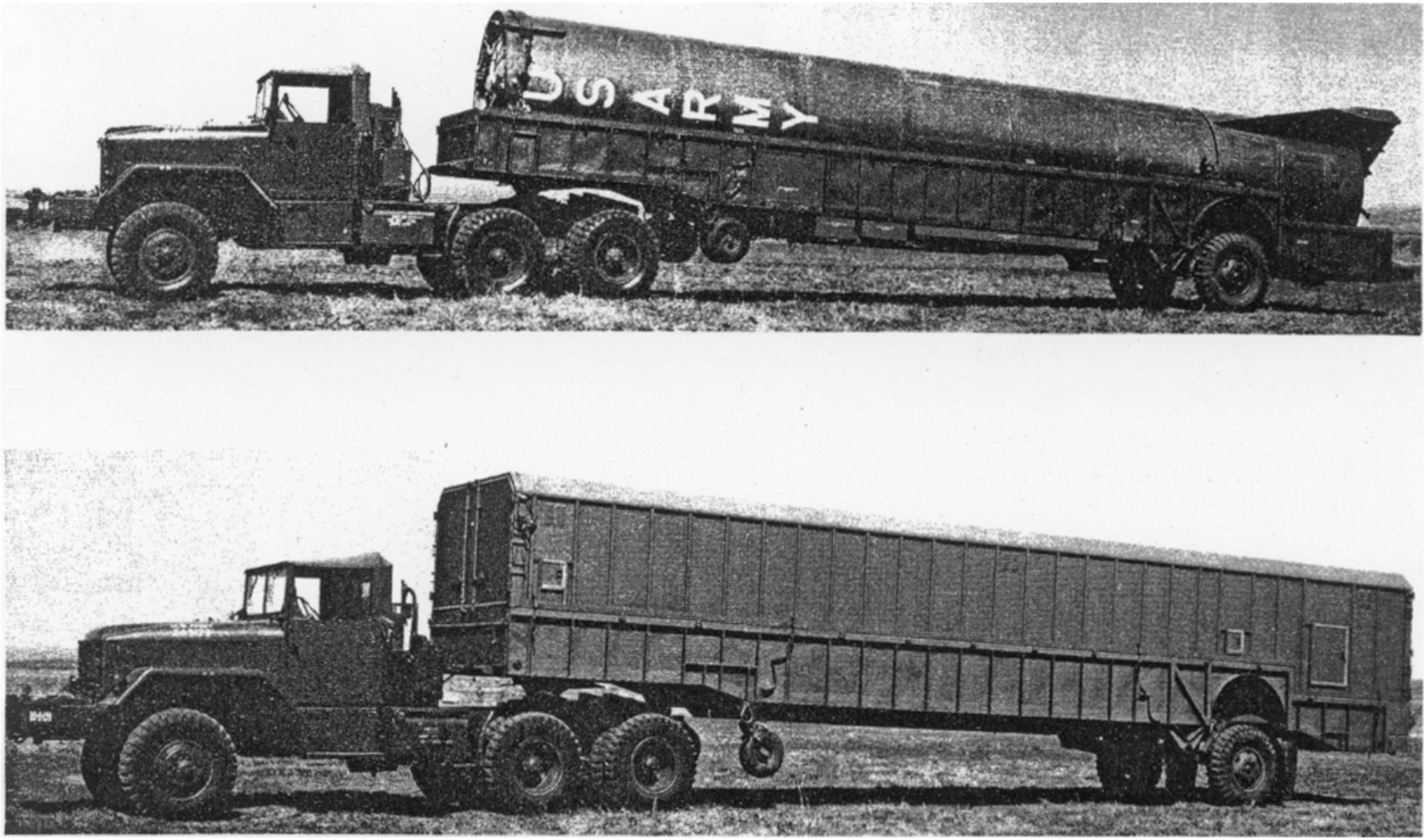

Figure 23. The missile is transported into the battery area as three separate units. The thrust unit is the largest of the three and is carried on the XM482 semitrailer. The cover (shown in bottom photo) is removed prior to

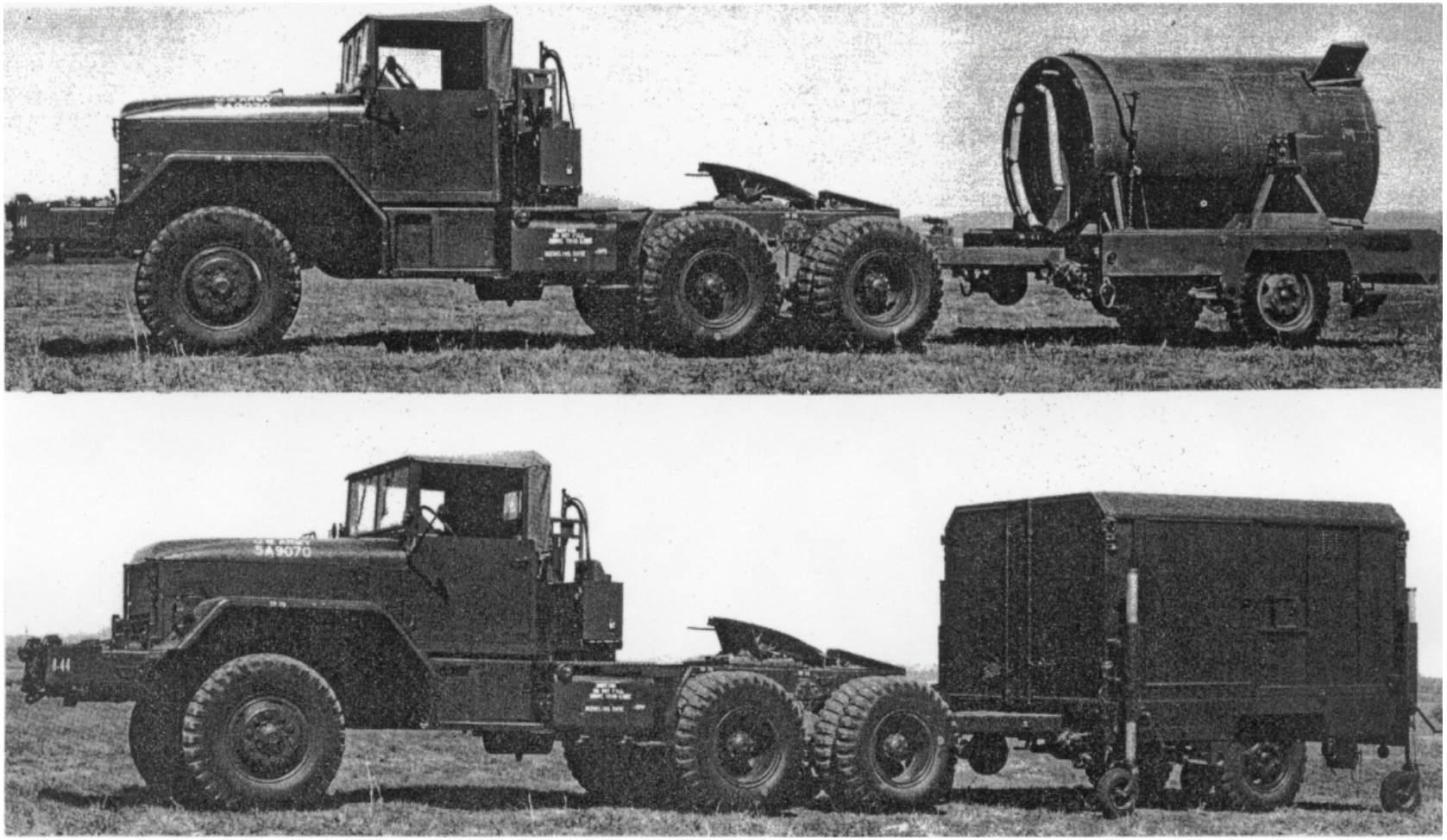

Figure 24. The aft unit is transported on the XM480 trailer. Like the other two trailers, the upper portion or cover of the trailer is removed by lowering a set of four extendable legs (shown in bottom photo). The cover is then elevated by a series of jacks and the entire assembly is pushed to the rear by battery personnel thereby uncovering the aft unit.

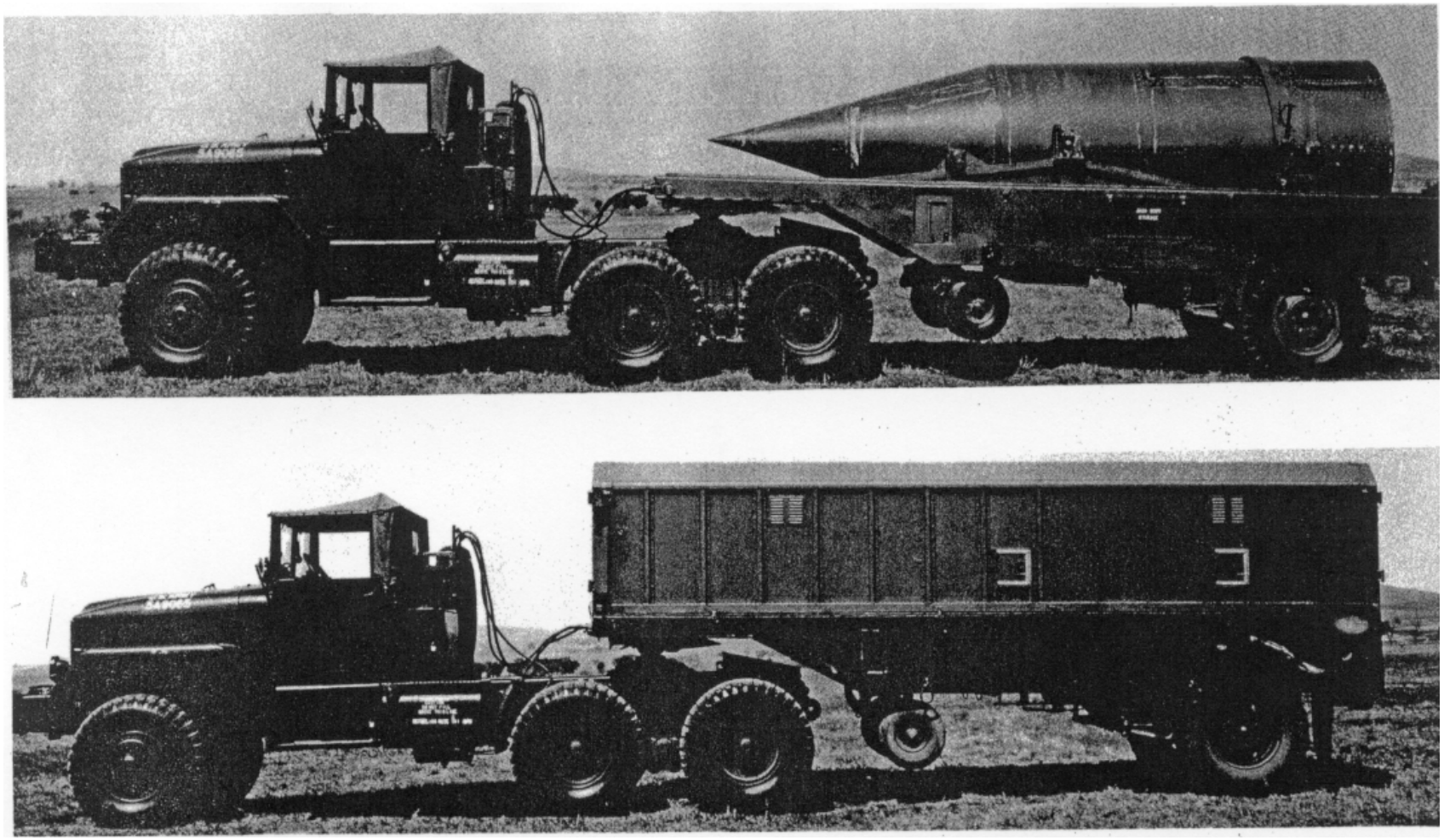

Figure 25. The warhead arrives in the battery area on the XM481 semitrailer. After the warhead and the aft unit have been uncovered, the aft unit is removed from its trailer by a standard 5-ton wrecker and is mated to the warhead. Once mated this portion of the missile is termed the "body." The bottom photo shows the trailer with the cover mounted.

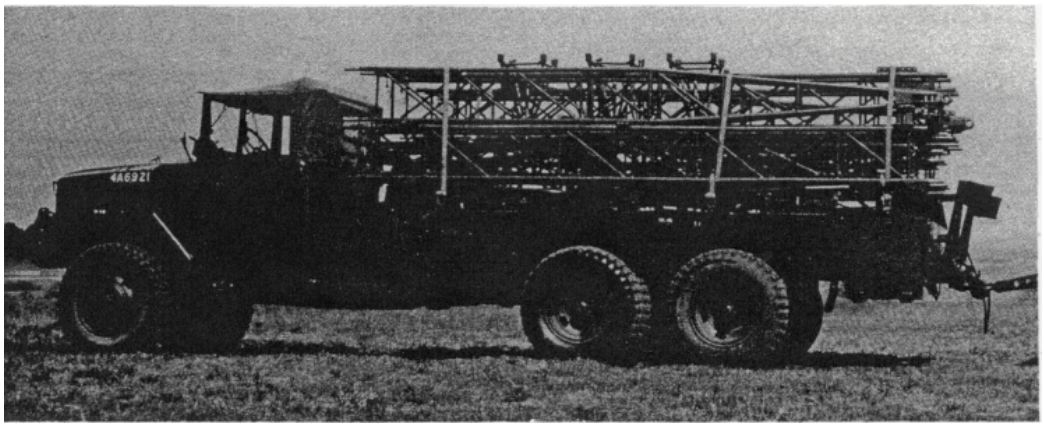

Figure 26. The erector-servicer XM478 consists of a modified 2½-ton truck on which lightweight erection equipment is transported. When a firing position has been selected, the truss sections are unloaded and bolted together to form large "A" and "H" frames, which will be shown in subsequent photographs. This truck normally tows the launcher shown in figure 27.

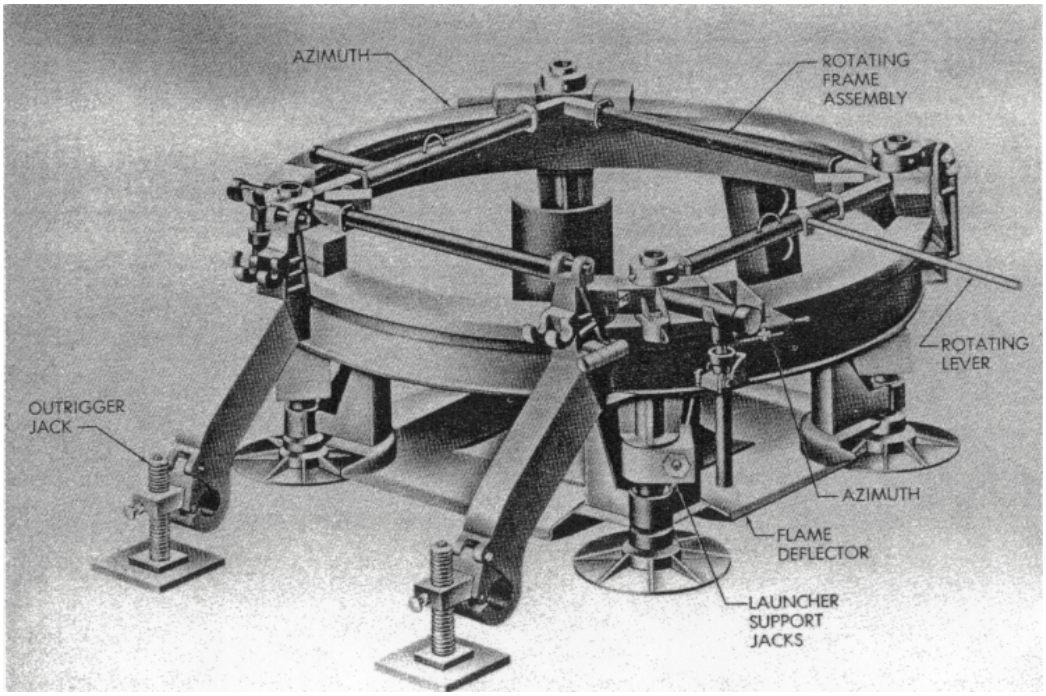

Figure 27. The XM74 launcher is used to orient the missile vertically and to aline the selected reference fin toward the target. The wheel and axle assembly is removed when the launcher is emplaced.

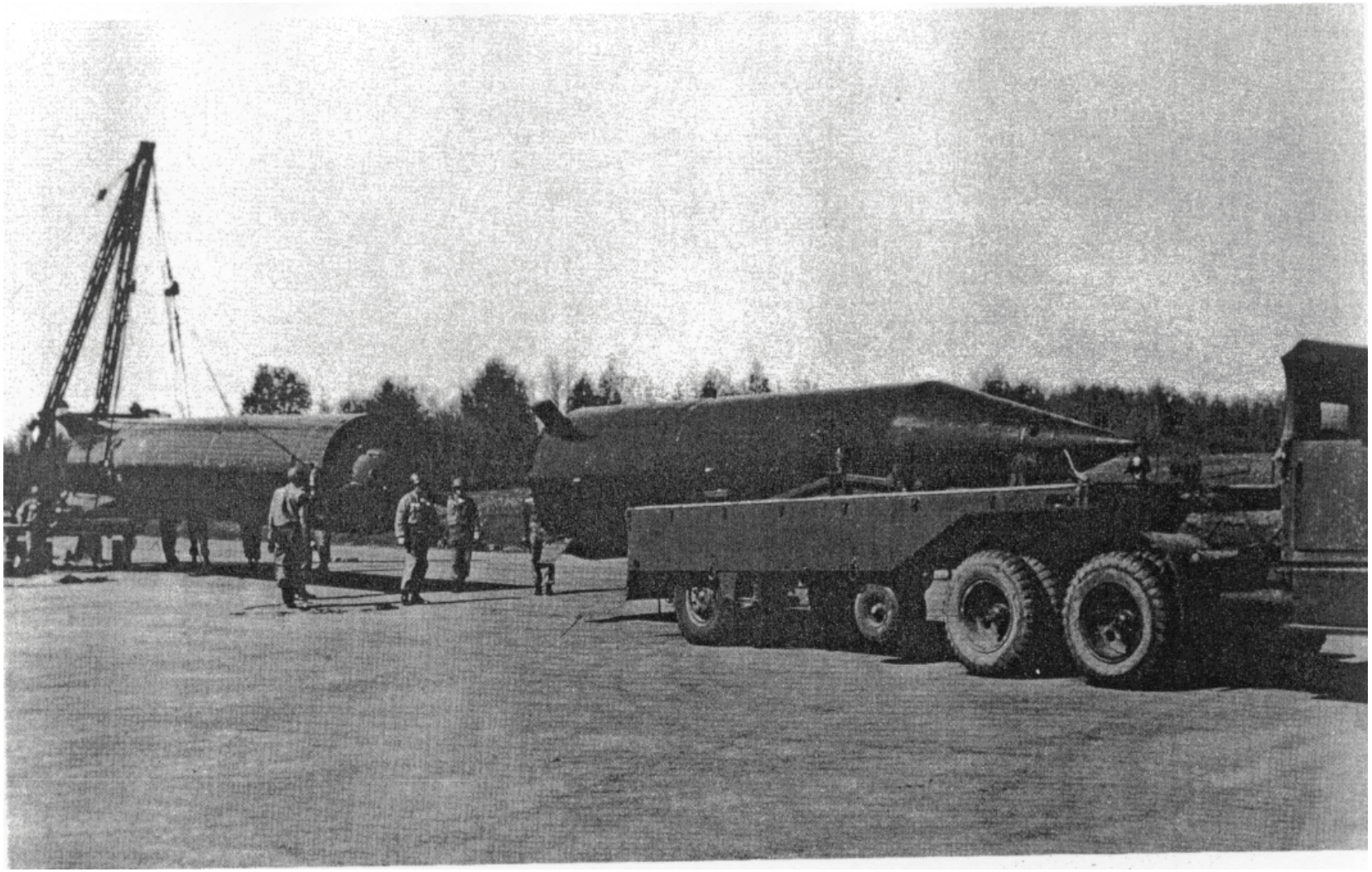

Figure 28. During missile assembly, the erector-servicer holds the missile thrust unit while the body unit is properly positioned by maneuvering the body unit (warhead and aft unit) trailer.

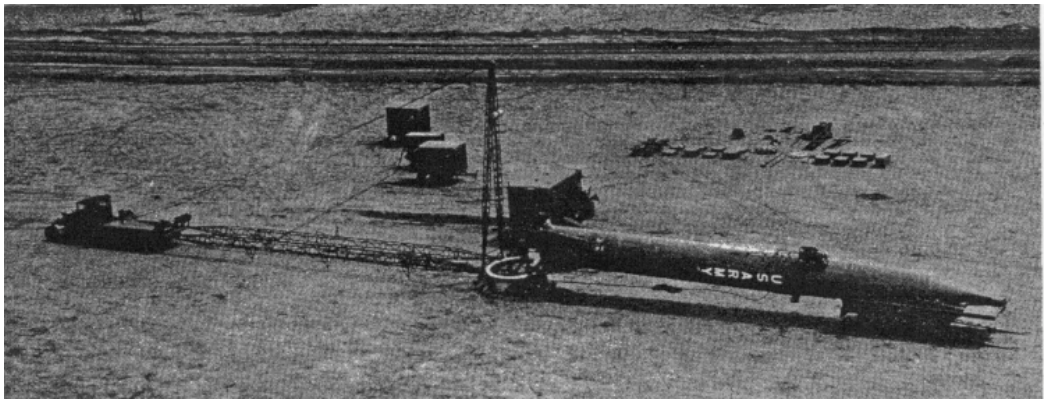

Figure 29. The missile is assembled at the firing position and is first tested in the horizontal position by the firing battery personnel. At this stage the missile also is rigged for erection.

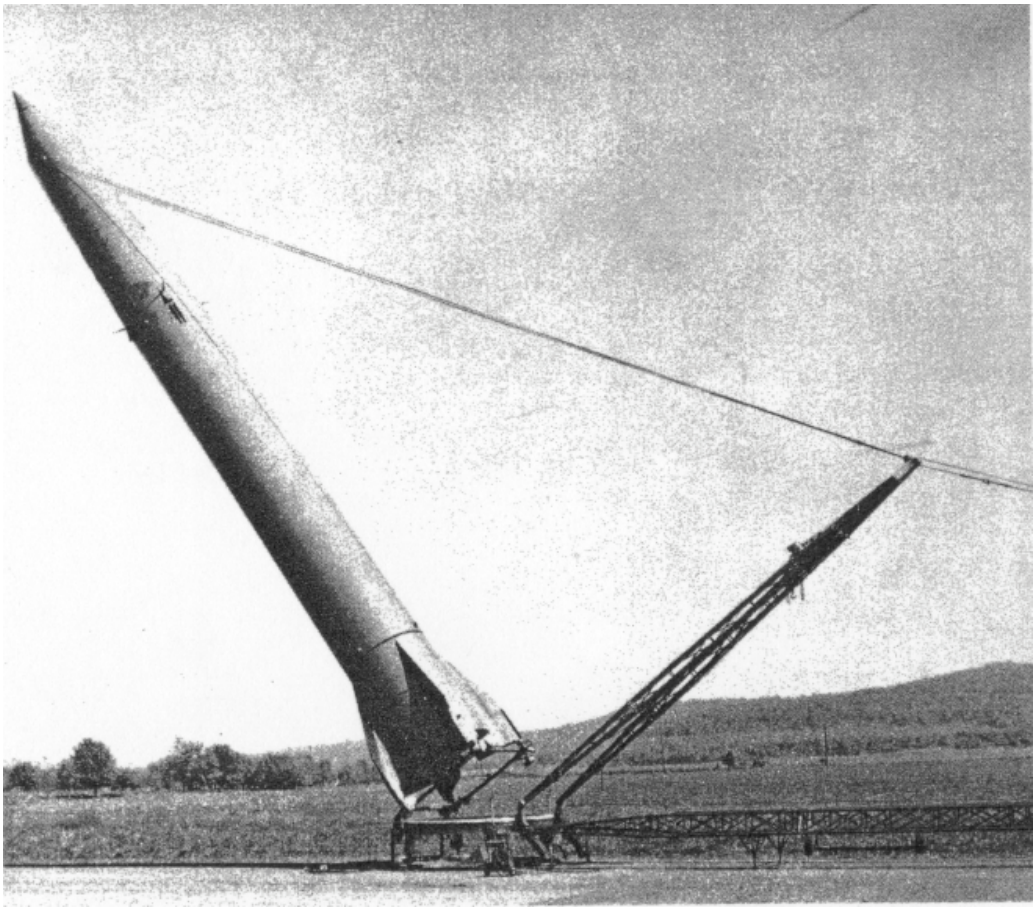

Figure 30. The missile is raised to the vertical position by the erector-servicer. The base of the missile is hinged to the launcher and the nose is raised to the vertical position by steel cables which are attached to the "A" frame.

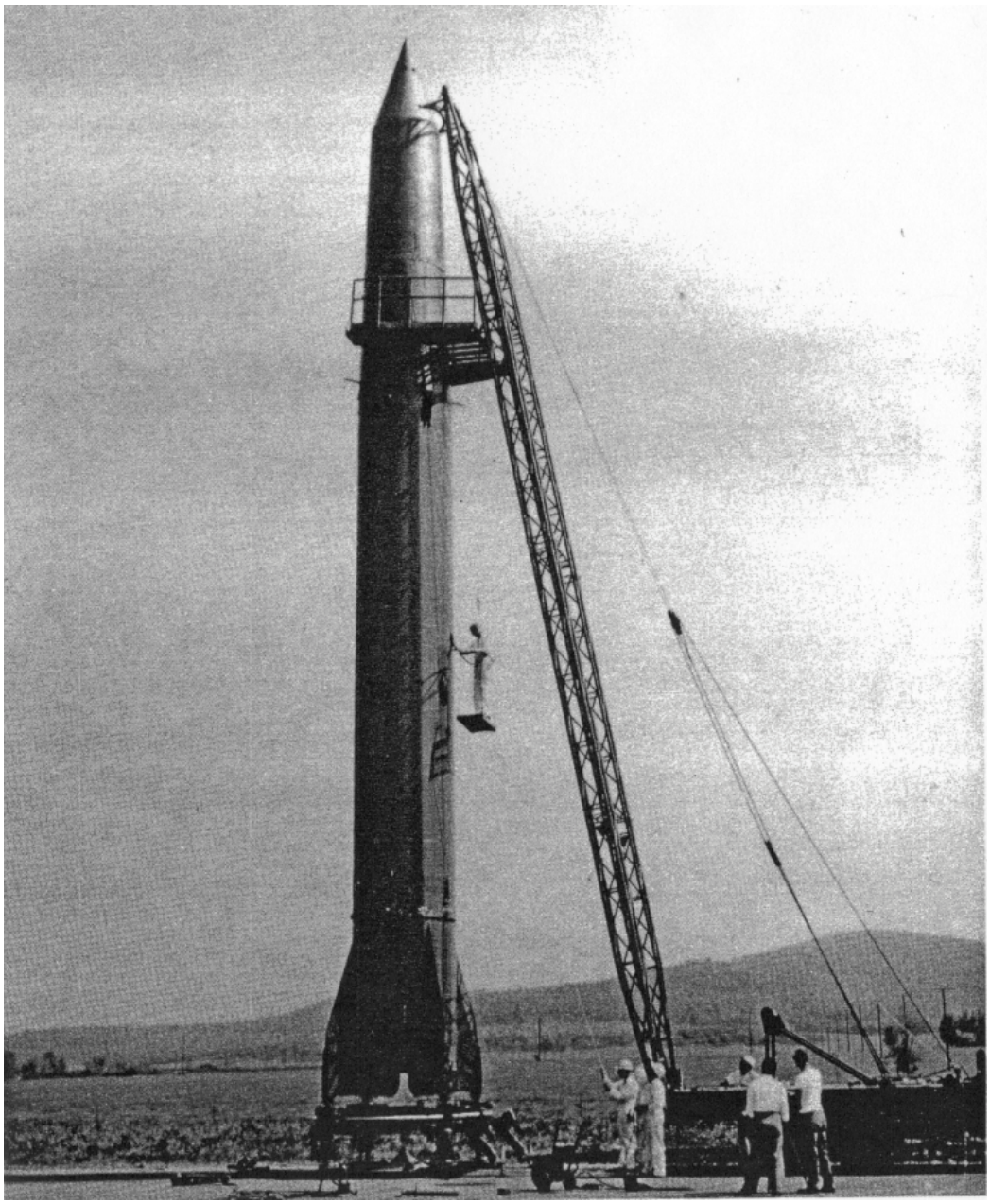

Figure 31. After the missile is raised to the vertical position, the "H" frame of the erector-servicer is used as a boom for positioning and supporting the service platform. Battery personnel perform final checks on the missile from the platform. The platform is raised by a cable assembly which is operated by an electrically powered winch located in the bed of the erector truck.

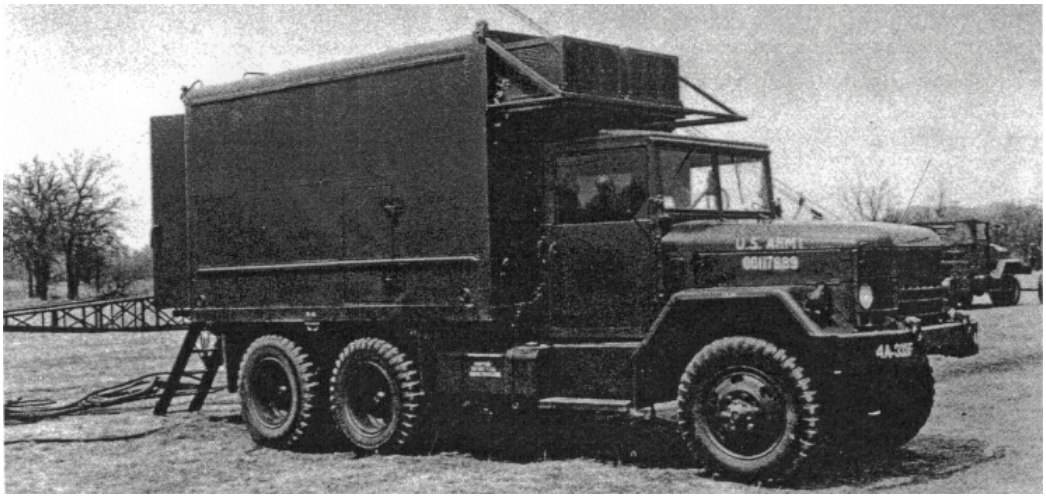

Figure 32. Battery personnel use test equipment in the fire control and test truck during the checkout phase when the missile still is in the horizontal position. This truck also contains equipment used to preset the guidance system with the trajectory data. Some trajectory data is recorded on a magnetic tape. Tapes for different trajectories are selected from a library of tapes in the battery.

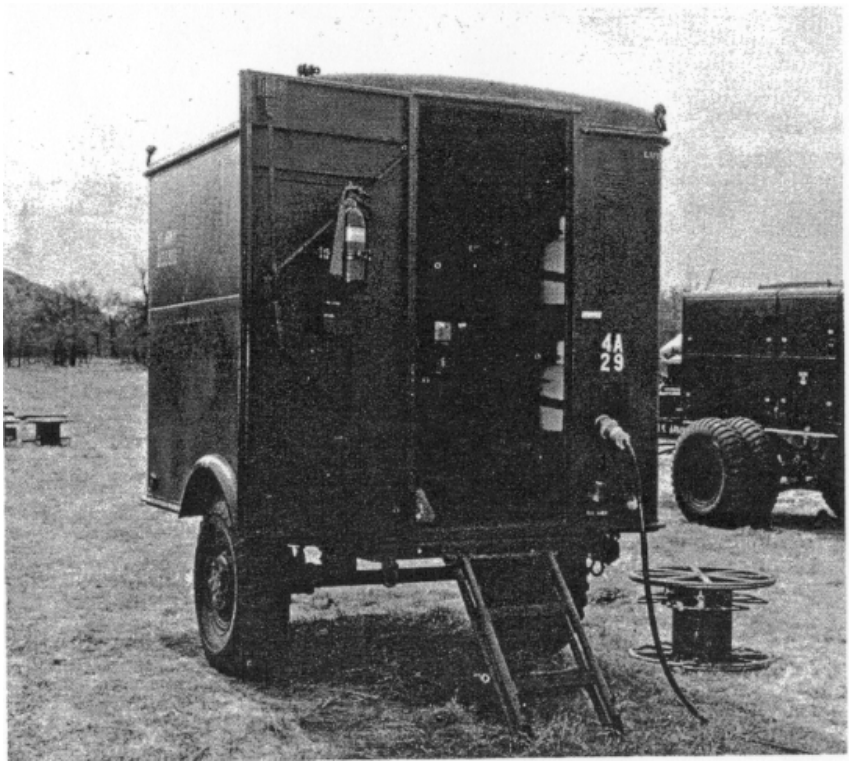

Figure 33. The XM479 battery servicing trailer activates and tests the 28- and 60-volt silver oxide batteries which provide the necessary onboard power to the missile during flight.

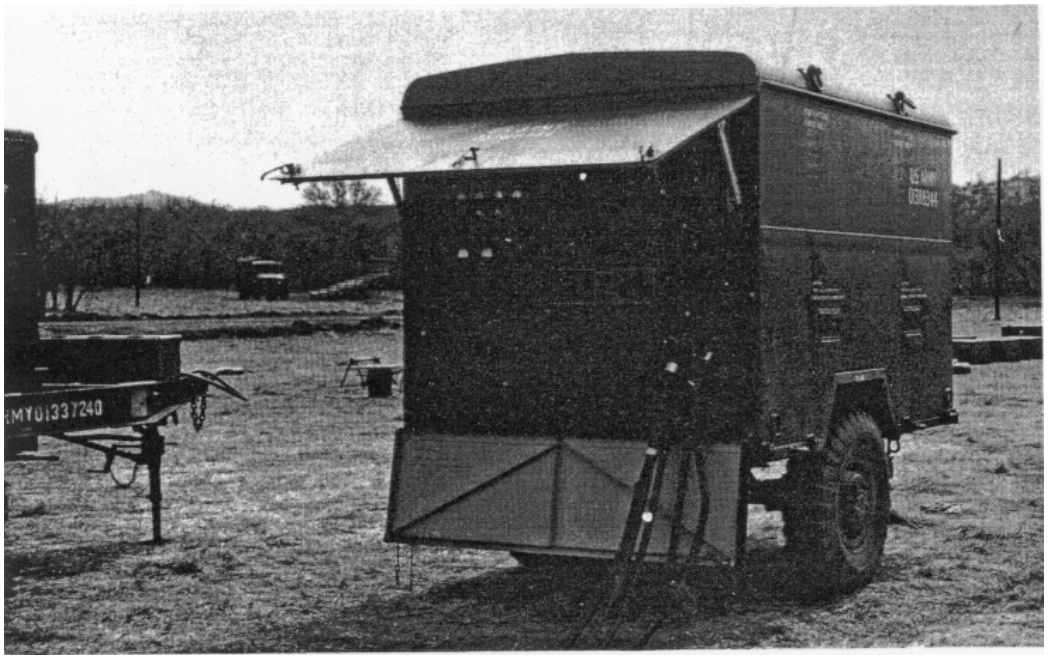

Figure 34. The power distribution station AN/MSQ-27 is used to convert 60-cycle, 208-volt power into 28- and 60-volt direct current power for missile testing and firing.

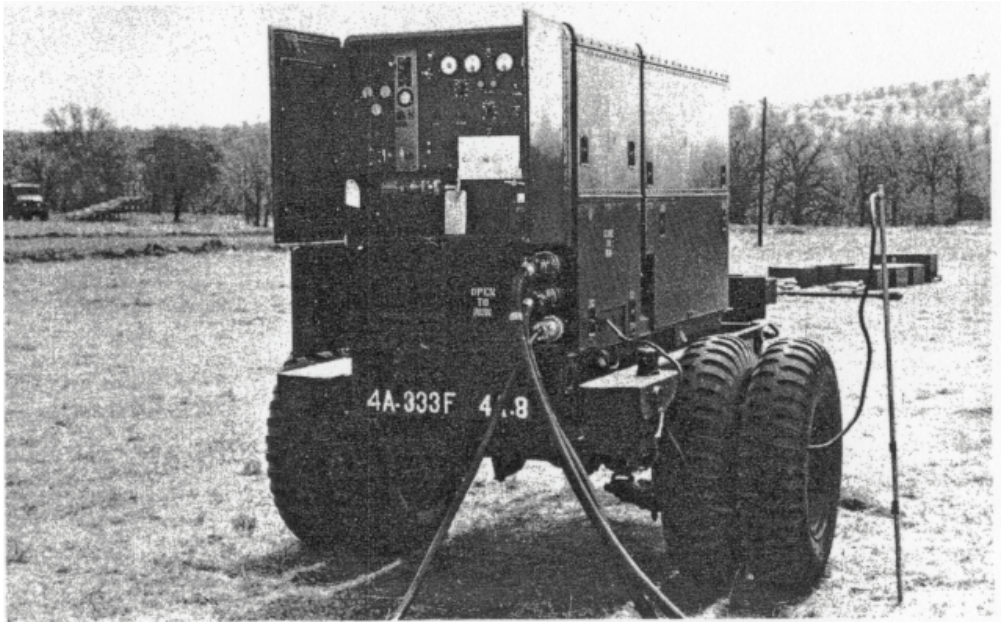

Figure 35. The generator set provides 3-phase, 60-cycle, 208-volts of power to operate the equipment that prepares and fires the missile. This diesel generator develops 60 kilowatts (KW).

Figure 36. The truck-mounted air compressor provides 5,000 pounds per square inch of air pressure. During flight the compressed air, which is stored within the missile, is used to pressurize the alcohol and hydrogen peroxide tanks and to open and close valves in the propulsion system.

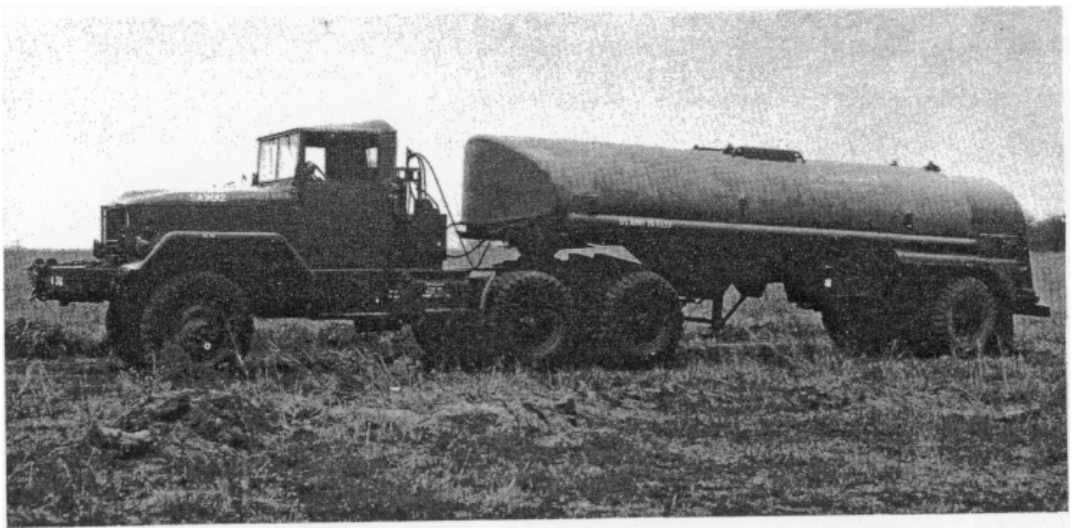

Figure 37. The XM388 alcohol semitrailer has a 3,000-gallon tank and a pumping system to transfer the alcohol-water (75 percent alcohol, 25 percent water) solution to the missile. The alcohol-water solution is the fuel for the Redstone missile. The missile is fueled only when in the vertical position.

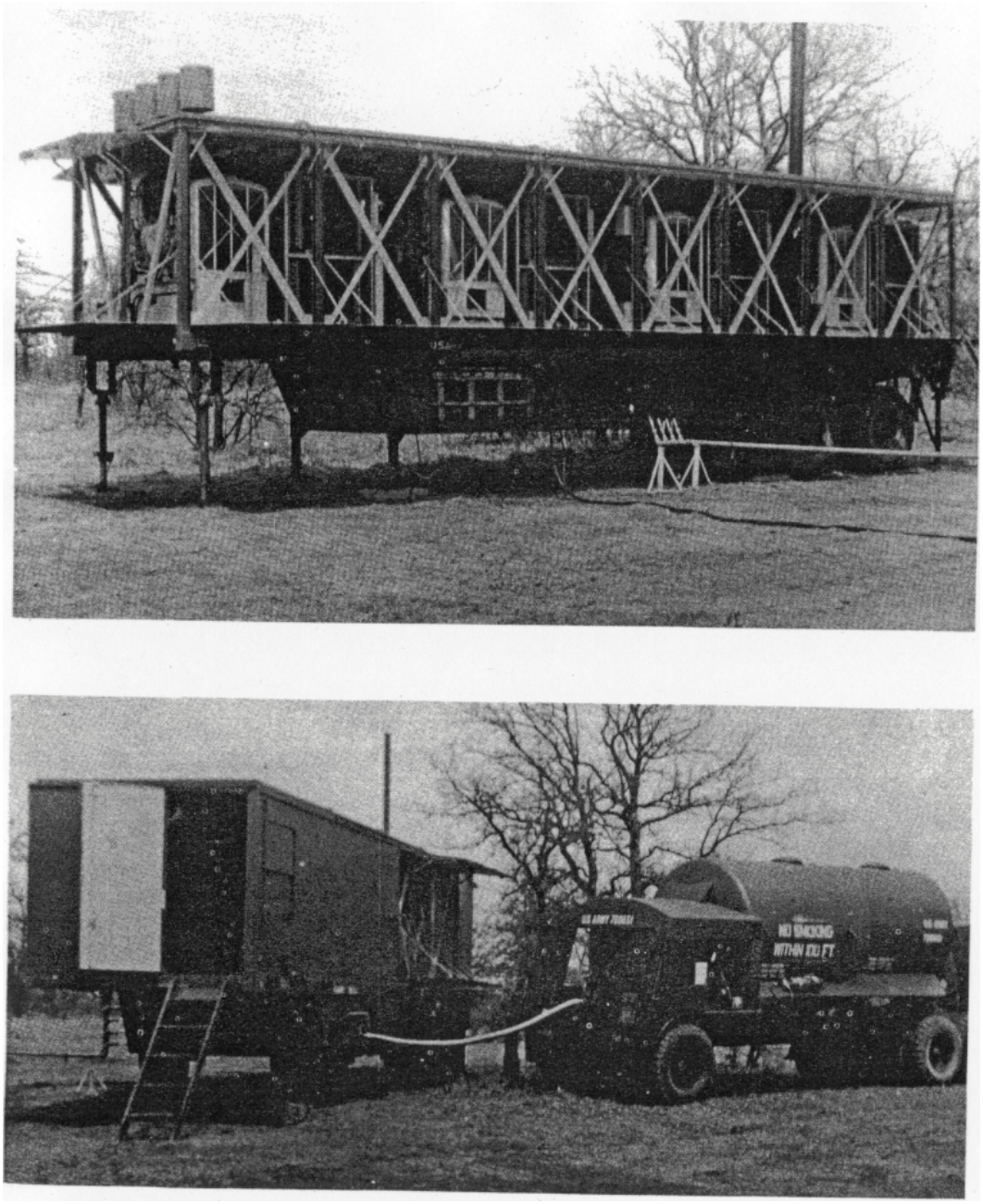

Figure 38. Liquid oxygen (LOX) is produced by the Redstone group's organic Engineer company. The generating plant consists of an air compressor unit (top photo) and an air separation unit (bottom photo) where the major components of atmospheric air, nitrogen and oxygen, are separated. The liquid oxygen is then routed to the liquid oxygen semitrailer (also shown at bottom) for delivery to the missile firing position.

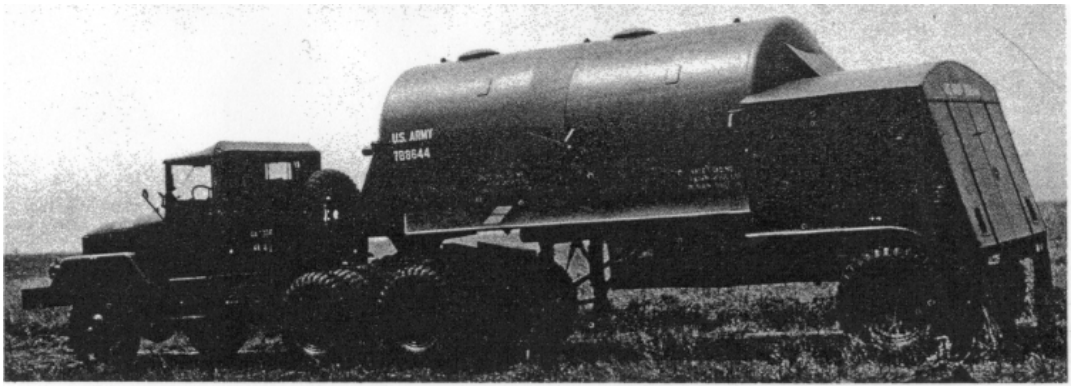

Figure 39. Each firing battery has two liquid oxygen (LOX) semitrailers that carry the oxidizer to service the missile. Each trailer can hold 9 tons of LOX. The trailer has a "thermos bottle" construction to maintain the LOX at a temperature of minus 297 degrees Fahrenheit. The LOX transfer pumps and equipment are mounted in the closed compartment at the rear of the trailer.

Figure 40. The XM387, hydrogen peroxide servicer, carries a 78-gallon drum of concentrated hydrogen peroxide which is used to generate steam to operate the missile's propulsion system. The propellent loading sequence is: alcohol, LOX and hydrogen peroxide.

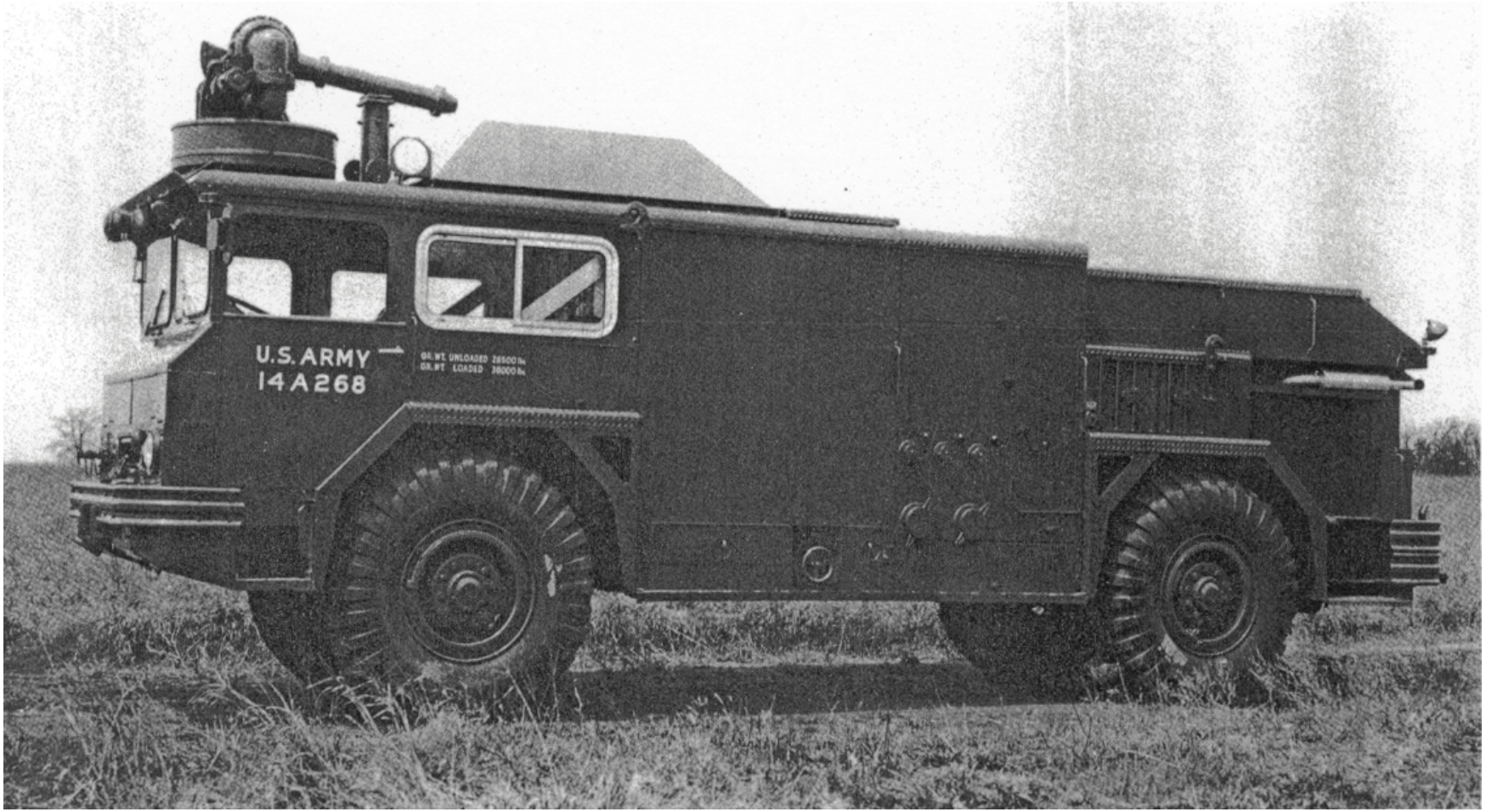

Figure 41. The fire truck carries 1,000 gallons of water and is used to neutralize spilled propellant or to extinguish small fires which may ignite when the missile is fired. The truck normally tows a four-wheeled water trailer which contains a 2,000-gallon reserve.

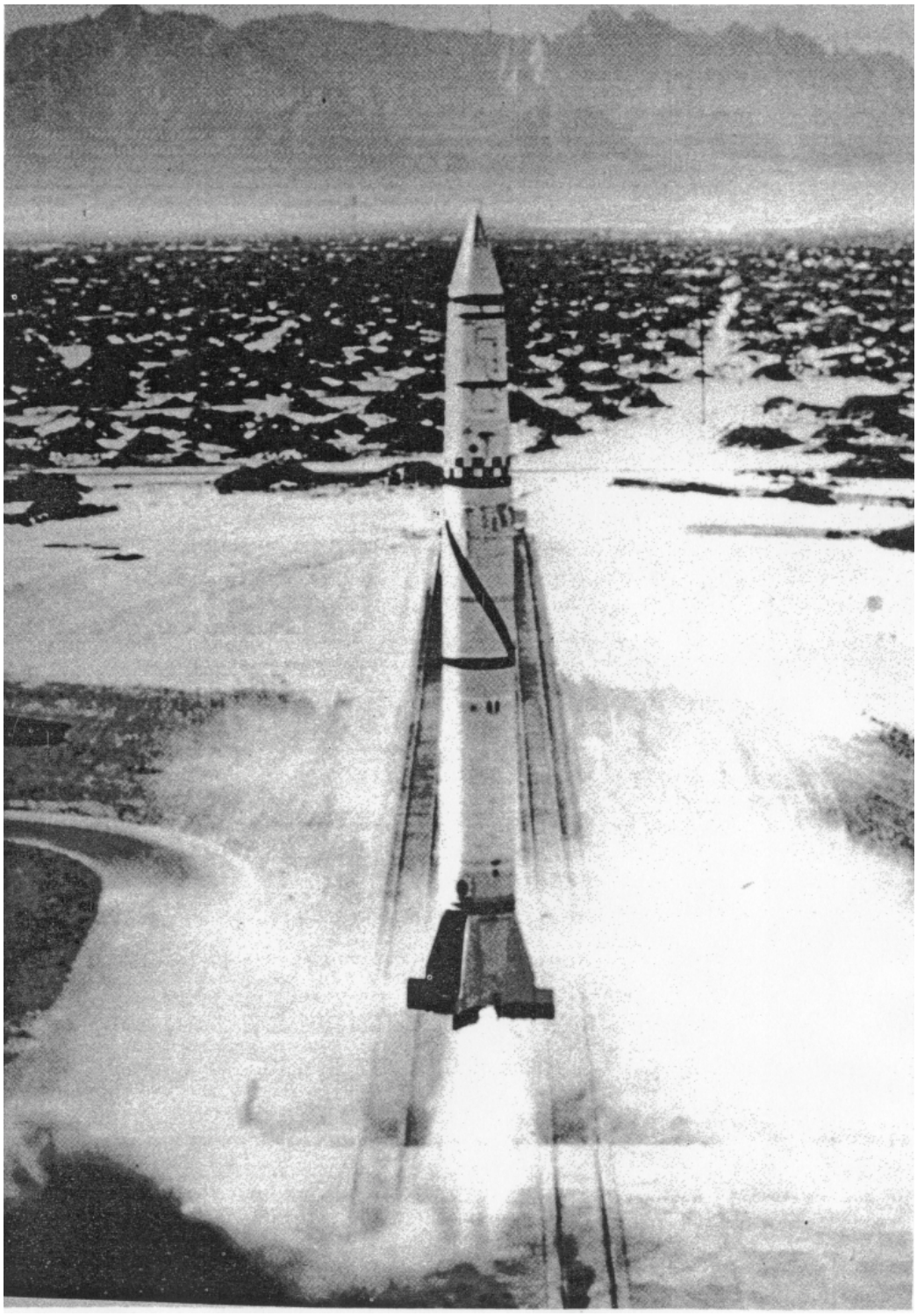

Figure 42. ON THE WAY!