Dugway Proving Ground

—a unique test facility

By Jerry Steelman

Dugway Proving Ground (DPG), the primary DOD Chemical Retaliatory Materiel Test Facility, lies in the West Desert Area of Utah near the historical Pony Express and Overland Stage routes. Located 67 air miles southwest of Salt Lake City, Dugway is in an isolated area of rugged mountains and level salt flats. The installation, including support and test complexes, covers an area of approximately 840,000 acres or 1,315 square miles, which makes it the ideal location for retaliatory testing.

Over the last several years three major DOD chemical retaliatory systems have been tested at Dugway: the near-strike weapon system, the M687, 155mm, GB2 projectile; the mid-range weapon system, the XM135, Multiple Launch Rocket System (MLRS) binary chemical warhead; and the deep strike weapon system, the Bomb, Binary Chemical, BLU-80/B (BIGEYE).

All three retaliatory systems tested are binary systems. Binary chemical weapons are weapons that use two non-toxic chemicals that can be stored, transported, and handled separately as opposed to unitary chemical weapons where the active agents are stored in the weapons themselves. The two non-toxic components of a binary weapon, assembled just before employment, "mix" during flight to become a toxic chemical agent at delivery on target.

The M687 155mm binary projectile has been developed to provide a chemical retaliatory capability compatible with the Army's most common fire support system, the 155mm howitzer cannon artillery piece.

DPG has been involved in the development and adoption of the M687 projectile since its concept and has been the test site for all simulant and agent round firings. DPG tested the dissemination characteristics of the original adopted M687 and has tested the product improvement models. Currently DPG is conduct-

Soldier loading canisters into the M687 binary round.

An MLRS launch propels skyward at Dugway Proving Ground.

ing three M687 tests (IPT) –

- Article testing to ensure the IPT projectile is safe to fire and meets requirements.
- Testing of a larger number of projectiles to ensure safety/ transportability, flight stability, reliability, compatibility, precision, performance, manprint/human factors engineering, and NBC survivability.
- Dissemination testing to determine the dissemination performance of the projectile has recently been completed.

The binary chemical warhead (BCW) will produce a semi-persistent agent that, when dispersed, will cause immediate casualties on enemy troops and will force them to mask, don protective gear, or restrict themselves to protective structure. The agent will remain effective in the target area for several hours.

DPG has completed several phases (using simulants) of dissemination testing to demonstrate the dissemination characteristics of the warhead. The dissemination tests include setting up a test grid layout with up to 4,000 samplers, filter papers and jars. They are placed on the grid and then analyzed for the contamination density of the simulant after the rocket is fired. Cards placed on the grid determine drop size distribution. Maps are then created showing the different concentration and drop size dispersions. The test results have provided data necessary for development of the military effectiveness and application tables. This data is being incorporated into the weapons effects models.

Before the rocket can be released to troops, DPG conducts a series of tests to determine the safety and vulnerability issues of the MLRS/BCW munition. These tests will demonstrate that the BCW can be handled safely and that it will not present an undue hazard to personnel in the battlefield if damaged. The tests include subjecting the rockets to bullet impact using up to a 50-caliber round, sympathetic detonation (if one round explodes with the others), enveloping flame (exposure to open burning) and both 40-foot and 5-meter drop tests. These tests have just begun and will be completed by 4th quarter FY 90.

The BIGEYE bomb is an aircraft-delivered binary chemical munition in the 500-pound bomb class. The bomb is compatible with several Air Force, Navy, and Marine Corps fixed-wing aircraft. The bomb generates and disperses a persistent nerve agent, VX, the end product of two non-lethal chemical precursors that are mixed after release. The bomb consists of an airframe (or outer skin), a reactor containing one chemical and Ballonet containing the second chemical, and a dissemination system. The BIGEYE bomb is actually a misnomer. The BIGEYE does not explode as we usually think of a bomb doing. It's actually a spray

system. The BIGEYE is a tri-service effort with the Navy (the developer and user) and the Air Force (the prime user). Testing of the system includes weapon stability in flight, simulant/reactant mixing during flight, proper simulant dispersal at event, and acceptable accuracy (photo below).

In the late 1950s, DPG was the site used to prove the binary VX concept with conduct of the prototype test. During the period 1963-1964, the concept-designed, full-scale prototype was tested on DPG's V-grid and proved that the binary system was valid for VX synthesis.

In 1969, five safety tests were conducted at DPG. The tests consisted of three 40-foot drop tests, a .50 caliber outlet impact test, and a slow cook-off test. The BIGEYE is normally stored and handled without the two binary components assembled but for these trials the weapon was tested in an all-up condition.

BIGEYE development program was restarted in October 1976 as a joint program with the US Navy as the lead service. DPG conducted simulant dissemination trials and flame envelopment trials using hardware fabricated during the initial development following the program restart in April through September 1980. This program evaluated function of the weapon mix system and whether the weapon met the criteria of the military standard for shipboard fires.

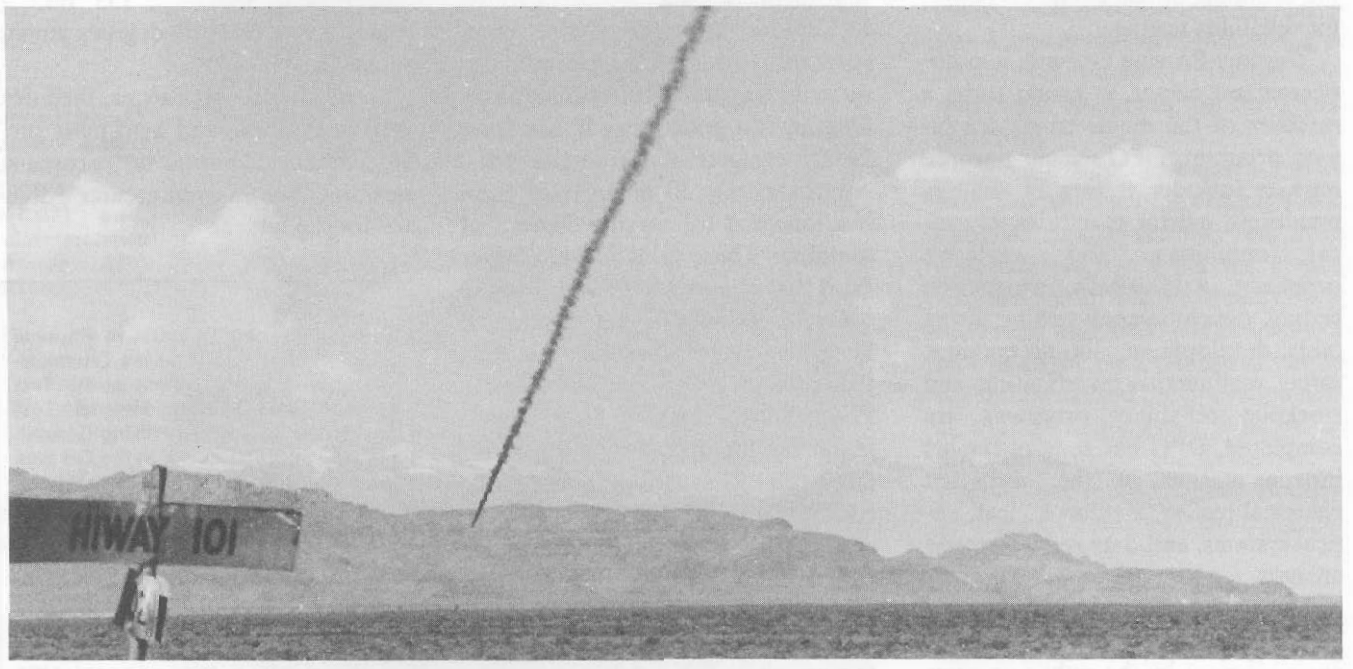
In 1983 the design of the BIGEYE was changed from the on-board mix design to the off-station-mixing (OSM) BIGEYE and integrated into the weapon with little delay in the program schedule. This bold change in the weapon was needed to delay the mixing of the binary agents until after BIGEYE is released from the delivery aircraft.

Dugway conducted several simulant dissemination trials in June-November 1984 under the technical evaluation phase demonstrating that the OSM design functioned reliably and produced droplet spectra comparable with previous testing.

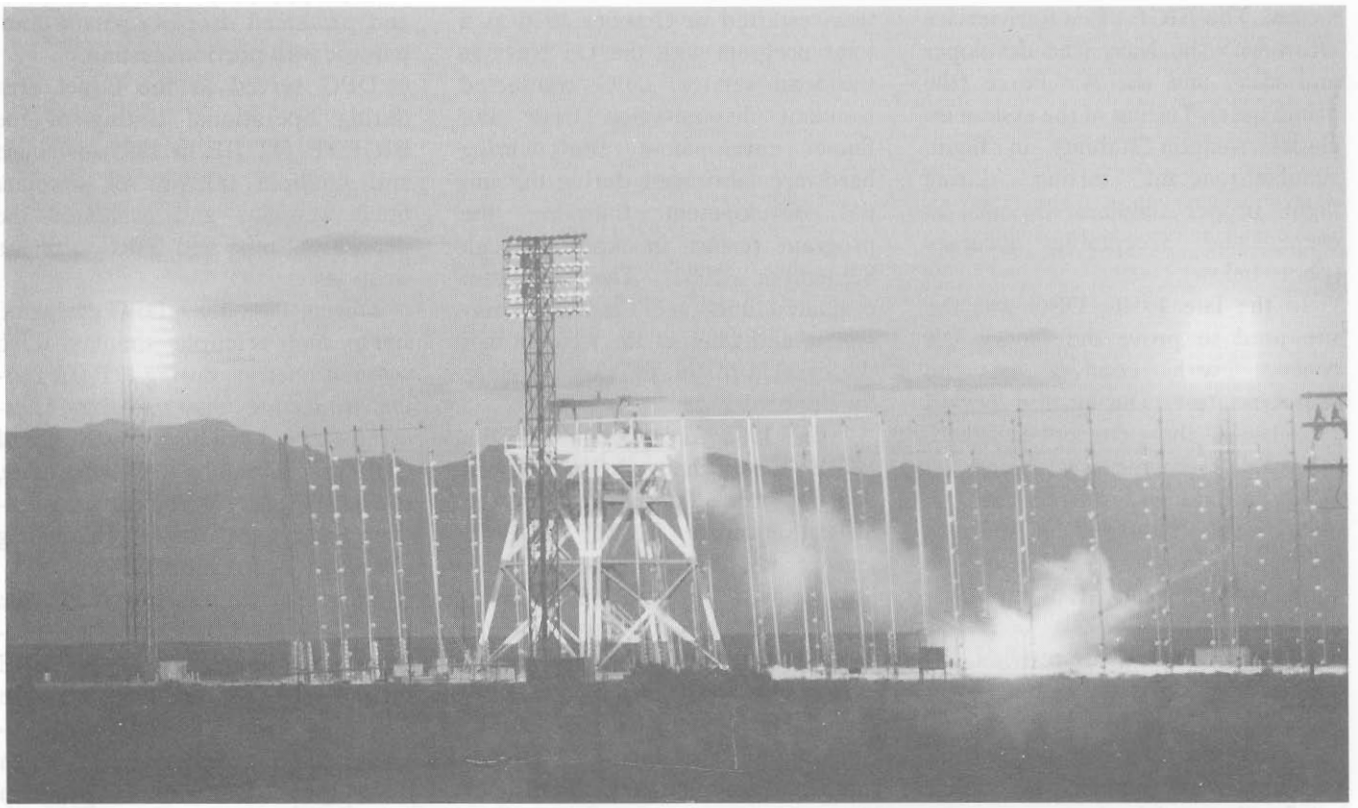
DPG served as the target area during operational testing of the BIGEYE OT IIE in 1985 for single and multiple releases of simulant filled weapons and evaluated the deposition, mix, and function of the weapons.

During 1988-1989, DPG evaluated single and multiple simulant-filled weapon releases during OT IIB testing, reporting dissemination characteristics of each bomb by the use of chemical sampling, photographic, radio, and meteorological measurement techniques. The OT IIC testing was also scheduled for DPG.

Programs at DPG include the M687 IPT ($1.3M), the MLRS program ($2.6M), the BIGEYE program ($4.2M), the 155mm Smoke Projectile ($.7M), the Mortar program ($4.5M), and the Open Burn/Open Detonation program ($6.3M). Testing at DPG since 1983 has included over 50 MLRS rockets and approximately 80 BIGEYE



A simulant with red dye disseminates on Target S Grid at Dugway Proving Ground. Simulant was disseminated from a BIGEYE bomb.



An M687 binary round fired from the tower on Tower Grid at Dugway. Note vertical sampling stations.

bombs. Current testing of the M687 binary rounds includes the firing of 1,144 rounds and future tests include the dropping of 200 BIGEYE bombs for reliability testing.

Dugway Proving Ground, a multi-person test center, is proud to be a member of the major tri-service binary program. DPG's multi-purpose mission includes testing of artillery munitions, mortar munitions, chemical munitions, and explosive ordnance. Additionally, production testing, developmental testing, firing table development, lot acceptance, safety, malfunction investigation, and stockpile reliability programs are completed. DPG has state-of-the-art instrumentation in the areas of chemical testing, meteorological, optical systems, and data reduction and analysis.

Dugway's large, remotely located land mass is free of ingress or encroachment by the public or commercial activities. The location provides a virtually interference-free electromagnetic and physical environment. A manned airfield with a 13,125-foot improved runway supports all types of aircraft of any size up to and including the space shuttle. Dugway test grids range in size from 1,800 feet square to 150 square miles. Approximately 30 areas have been instrumented for varying degrees of sampling. These grids include Tover Grid that includes a 75-foot artillery tower, a 300-foot rocket tower, and linear and vertical sampling station that contains 3,200 sampling stations. Photo above shows a M687 round impacting the grid. Target S grid includes a 10-square-mile area for rocket and bomb testing.

Dugway's scientist and technical staff engage in chemical and biological research and development, munitions testing, smoke/obscuration testing, characterization of aerosols, meteorology, and general test/engineering. The work force of 686 includes approximately 200 professional people, having 135 BS, 50 masters, and 23 PhD degrees among them.

Dugway people, ranges, facilities, instrumentation, and land mass provide unique munition test programs now and has an even greater potential for the future.

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