A Beginning or Just a Change in Course?

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On 5 September 1947, Radar Destroyer Division 142 sortied from buoys M1 and M2 in Narragansett Bay. These two buoys were the most seaward, barely inside Bull Race Point, providing almost no shelter from the sea most days and nights. The division included USS *Everett P. Larson* (DDR 830), the flagship; USS *Goodrich* (DDR 831); USS *Hanson* (DDR 832); and USS (Dirty Herbie) *Thomas* (DDR 833). They each masted the high-powered Mk 16 stabilized parabolic dish antenna of the SP1-M three-dimensional radar, designed and built by Westinghouse Corporation. The division was to rendezvous with USS *Midway* (CV 41) in the mid-Atlantic to conduct a classified event code-named Operation Sandy. *Midway*'s construction was newly completed at Philadelphia. She put to sea with a contingent of Germans and Americans, along with a captured V-2 rocket on her flight deck. The purpose of the event was to determine the feasibility of launching a large, liquid-fueled ballistic rocket from a ship. The four radar pickets were oriented along the expected trajectory toward the south and east for a range of about 200 miles, and the rocket was to be detected by the SP-1M radars. *Goodrich* was the terminal ship in which I, then an ensign in the U.S. Naval Reserve, was embarked as radio, radar, sonar, and combat information officer. LTJG Robert Lundy, also in the Naval Reserve, was embarked in *Midway* as project officer for the operation. 'Twas a momentous occasion indeed.

Unfortunately, the V-2 prematurely exploded about six miles from *Midway*. Several outcomes resulted from this:

- It greatly affected my life and the life of LTJG Lundy. We came together two decades later, Robert Lundy as commanding officer of USS *Dale* (DLG 19), and I as the project officer and M. E. Oliver as the deputy for the conduct of the first operation of destroying Army ballistic missiles launched from St. Nicholas Island in the Pacific with Terriers from *Dale*'s batteries. (Unlike the previous event, this one was hugely successful!)
- The Navy retreated for over a decade from attempts to launch ballistic missiles from aboard ship. It further determined that, if given a choice, the Navy would prefer solid-fueled engines over liquid-fueled engines.
- The Navy vigorously pursued development and pressed into service cruise missiles, the most notable being Regulus, which was fired from submarines, cruisers, and aircraft carriers.
- It caused the Navy's new cruisers (*Long Beach*, *Chicago*, *Albany*, and *Columbus*) to be holed for attack ballistic missiles, even though none were yet ready for service.

- Probably the more significant outcome was that it reinforced and brought new energy to the Navy's belief (originally fueled by Japanese Kamikaze attacks) that defense against these missiles was absolutely vital to any effective future naval and amphibious operations. Thus, an unprecedented alliance was created that is in existence to this day.

To further examine this half-century, let me step back to look at history from a different tack.

"Fire control" is our expression for the compelling need and scheme to destroy the target. It is an expression as old as naval guns. Fire control is characterized by the need to achieve closed-loop operation. Causing the target vector and the interceptor vector, be it projectile or missile, to coincide spatially and temporally achieves the required loop closure. It is axiomatic that this is difficult.

Over time, many implementations of fire control loop closure have evolved. The earliest, of course, was man. He caused closure by aiming at the target or leading the target if it was in motion. When high rate of fire semi-automatic guns were first fielded to counter air targets, the man literally sat in or on the gun mount to direct the fire. Tracer shells were subsequently added to aid in closing the loop.

Later still, a radar director assisted the man, and an advanced mechanical analog computer supplemented the man's brain to compute lead angle and ballistics. A time-set fuze improved the shells. During World War II, a group from the Department of Terrestrial Magnetism of the Carnegie Institute of Washington undertook to design and build a highly classified radar frequency proximity fuze, the VT fuze, one of the significant instruments in turning the tide of the war. From this effort emerged APL.

By 1945, after tremendous losses to the Navy due to the Japanese Kamikaze attacks, the Navy opined that guided missiles afforded better capability than projectiles to kill them, and the "Bumble Bee" program was established. From this sprung the Navy's Bureau of Ordnance alliance, with a cadre of scientists, engineers, and technicians, executed through an instrument referred to as the "Section T" contract with The Johns Hopkins University. This program, led by the budding APL, included industry, other universities, and government laboratories in pursuit of developing the Talos, Tartar, Terrier, and Typhon systems. To better close the loop, a receiver was put in the missile to "ride" the fire control director radar beam to the target. This worked, but the longer the range to the target, the greater the miss distance, thus prompting the use of warheads with fuzes, called target detection devices, to enhance the "loop closure."

The long-range Talos system employed "beam riding" to the vicinity of the target, then switched to semi-active homing for the terminal phase. This was accomplished by adding another receiver to the missile to "home" on the reflected radio-frequency energy of the fire control director tracking radar. Terrier, and its smaller version Tartar, went to semi-active homing all the way to better cope with low-altitude difficulties associated with beam riding.

It has been suggested that this half century could be characterized into overlapping epochs:

- In the forties and fifties, Kamikaze attacks
- In the sixties, *Elath* sinking
- In the seventies, Backfire bombers
- In the eighties, Sunburn supersonic cruise missiles
- In the nineties, Theater Missile Defense (No Dong, Scud)

Even as this issue of the *Technical Digest* is being prepared, the 11 September 2001 attacks on the United States may have defined an entirely new epoch, surely characterized by the defense of our immediate homeland. I have lived through these epochs, all of which possess a common denominator—the determination, technical and leadership prowess, patriotism, professionalism, and downright brilliance of the people involved. So this past response by our Navy is just a story of people who have enabled us to live our lives as we do. Few of my associates are alive, and even fewer of my hardy original mentors remain. Yet every one of them continues to be active today in this vocation to our country. Surely their spirit will inspire and haunt this generation to press on to the demanding future response in furtherance of their initiatives.

Stay tuned for Part II of this endeavor (related to Aegis) and the "way ahead" in the third issue of this extraordinary series.

THE AUTHOR

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