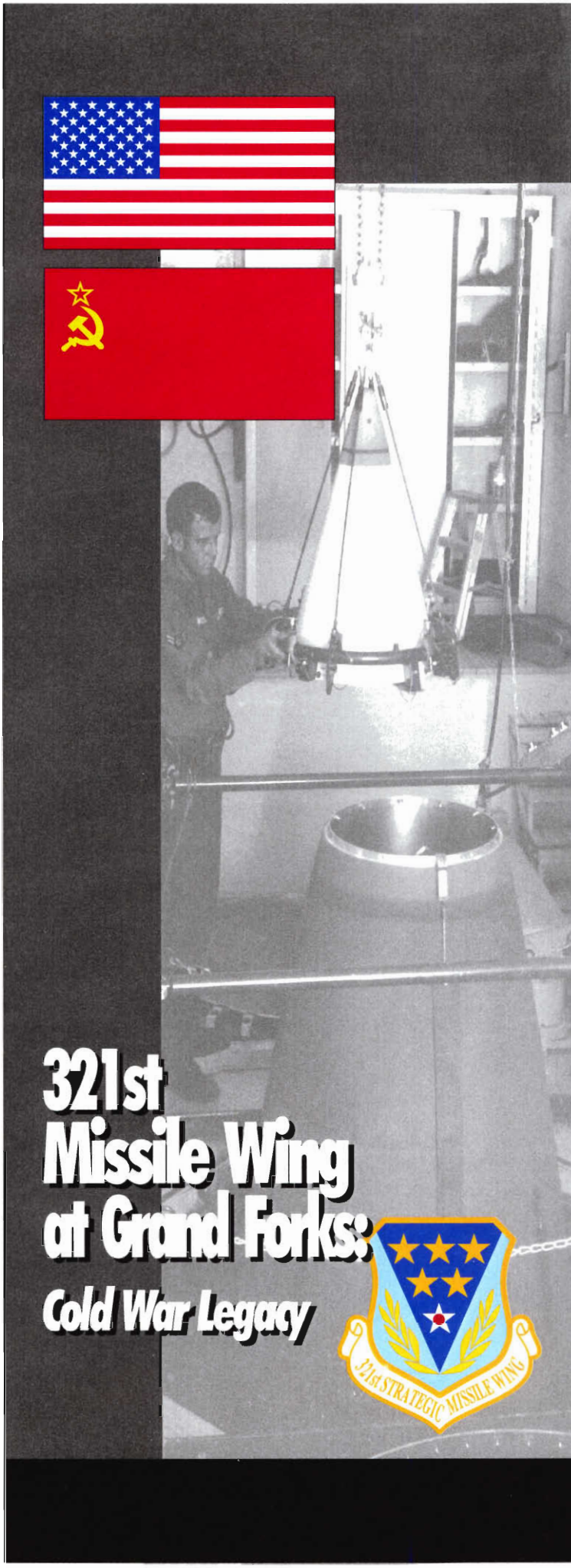


321st Missile Wing at Grand Forks:

Cold War Legacy

321st STRATEGIC MISSILE WING

INTRODUCTION

The 321st Strategic Missile Wing was activated in 1965 in response to events and developments of the Cold War. The 321st operated Wing VI near Grand Forks Air Force Base (AFB), the last cluster of Minuteman missile sites built by the Air Force. These sites represented the conclusive element in the United States' strategy of land-based nuclear deterrence. This pamphlet is designed not only to recount the history of the 321st Missile Wing, but also to provide background information on the sequence of events leading up to the activation of the Wing. The following sections trace the history of the Cold War, the Arms Race, the development of the intercontinental ballistic missile (ICBM), and the history of the 321st Wing at Grand Forks.

THE COLD WAR (1945-1989)

The Cold War was an undeclared war that did not involve actual armed confrontation between the major powers, the United States, and the Soviet Union.

> *An iron curtain is drawn upon the [Russian] Front. There seems little doubt that the whole of the region will soon be completely in their hands.*
> *- Winston Churchill, May 1946*

Although the Allied and Soviet blocs were never involved in a full-scale shooting war, they squared off against each other in a variety of other ways. President Harry S. Truman established the U.S. policy of "containment" against Soviet expansion in the late 1940s, which would endure through the end of the Cold War. Rather than maintain extensive ground forces in Europe in an effort to contain the Soviets, the United States would pursue a new foreign policy—one of nuclear deterrence against direct Soviet attack. Under the strategy of deterrence, the United States would be able to strike back in the wake of a massive Soviet missile attack.

THE ARMS RACE

America enjoyed a nuclear monopoly from the end of World War II until 1949, when the Soviets shattered it by detonating their own atomic weapon. The United States had relied on America's sole possession of the atomic bomb to keep the Union of Soviet Socialist Republics (USSR) at bay, and this event, along with the tensions created by the Korean War, led to an arms race. By mid-1950, the United States had stockpiled hundreds of atomic bombs at newly constructed alert facilities (called "Q Areas") situated around the country and in Canada, Morocco, and Spain. The Strategic Air Command (SAC) was established in 1946 as the Air Force's long-range reconnaissance and attack force, with both bomber and fighter aircraft. To defend against a possible Soviet air attack, the Air Force had begun building a permanent radar network around the country and had started the development of an automated, computerized control system that would ultimately become the semiautomatic ground environment (SAGE).

In 1950, Truman ordered development of the hydrogen bomb; this thermonuclear device dwarfed the original atomic bomb in destructive capacity. It was successfully tested by the United States in 1951 and was developed by the Soviets 2 years later. The Soviet device was more compact than the one the United States had built and was capable of being dropped from an airplane. To make matters worse, American military experts believed that the USSR had the capacity to deliver their new weapon using an ICBM. This fear would be confirmed with the launch of "Sputnik" atop a modified Soviet ICBM in 1957. Sputnik was the first artificial satellite launched into space.

The United States and the USSR would continue to develop and stockpile increasingly more sophisticated thermonuclear weapons and delivery systems (missiles and bombers) during the course of the Cold War. The vast expense of the escalating arms race with the United States was one of the main factors that contributed to the final collapse of the USSR in 1989.

ICBM DEVELOPMENT

In response to the threat of Soviet missile attack, the United States restarted its ballistic missile development program, which it had neglected in the late 1940s and early 1950s due to doubts about the reliability of new missile technology. The first-generation U.S. ICBMs, the "Atlas" and "Titan" missiles, were developed and deployed by the early 1960s. Both were exceedingly complex and powered by liquid fuel, which was so volatile and corrosive that the missiles could only be loaded immediately before launch. This meant that the missiles could not have a truly rapid response time, which was critical to successful retaliation against a missile attack. Both the Atlas and the Titan programs also required large forces of highly trained personnel acting without error for successful maintenance and operation. In addition, the early Atlas missiles had launching facilities that were vulnerable to attack. Nevertheless, they were all that the United States had at the time to counter the Soviets.

MINUTEMAN

Titan missiles in underground silos represented a significant step toward the military's ideal launch system. The ultimate solution for slow launch times, however, lay in using solid fuel for the rockets. As a result, the Air Force developed a solid-fueled, second-generation ICBM known as "Minuteman." Unlike Atlas and Titan, which required constant maintenance, the Minuteman missiles would require minimal upkeep and ground support facilities, and they could be launched remotely by two-man crews from centralized facilities that each controlled ten missiles. The solid fuel could be kept aboard for long periods; consequently, the missiles were ready for immediate launching from their silos. Thousands of these relatively small, solid-fuel missiles could be deployed in widely dispersed, unmanned silos linked electronically to central launch control facilities.

Cutaway of Launch Facility missile silo showing Minuteman II missile.

Because of the success of the Minuteman, it remained in service until the end of the Cold War and underwent extensive development. Military planners were continually upgrading America's nuclear arsenal, developing warheads that were more

destructive and delivery systems that were more powerful and more accurate. Even as Minuteman I missiles were being installed in their silos, the Air Force Ballistic Missile Division was experimenting with an improved version of its mainstay weapon. Although only slightly longer than its predecessor, Minuteman II embodied several significant technological advances. With an improved guidance system powered by a microelectric computer, it was far more accurate. It also had greater range and could carry a larger warhead. The ultimate version was Minuteman III, which had a multiple independently targeted reentry vehicle (MIRV). This new warhead could deliver three nuclear bombs to widely scattered targets.

MINUTEMAN DEPLOYMENT

As eventually deployed, the missiles were organized into administrative units called "wings," each wing comprising three or four 50-missile squadrons. Each squadron was in turn subdivided into five smaller units called "flights." Each flight comprised ten unmanned, underground Launch Facilities (LFs) containing one ICBM each. These LFs were configured as reinforced concrete silos with massive blast doors hardened to withstand a direct hit from an enemy warhead. They were dispersed over large areas to prevent destruction of multiple LFs by single warheads. The LFs were linked by means of underground cables and an airwaves communication network to a Missile Alert Facility (MAF) centralized within each flight. The MAF consisted of an above-ground launch control support building, which provided access to the underground Launch Control Center and launch control equipment building.

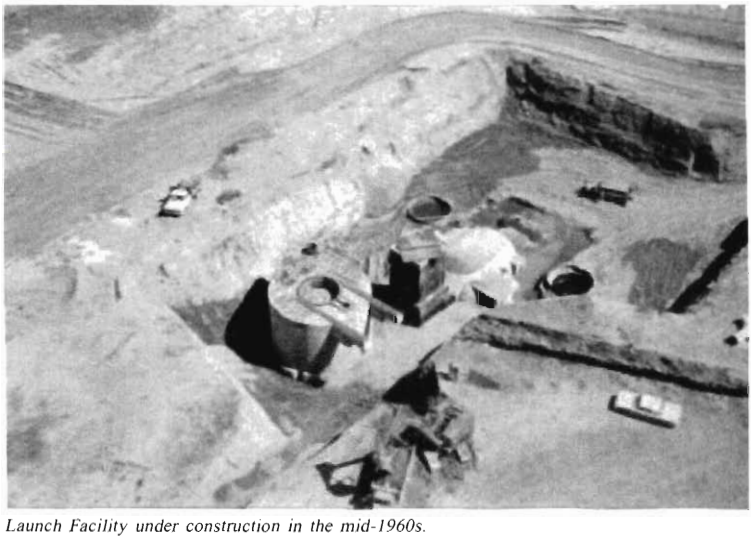
Once they had decided to scatter the missiles over several sites, Air Force tactical planners considered deploying Minuteman launch facilities as far south as Georgia and Texas. When the effective range of the first Minuteman missiles was determined to be only 4,300 miles, however, they instead decided to place the missiles across the sparsely populated areas in the northern United States, which were relatively close to the Soviet Union. The Air Force's policy of using public lands and existing support facilities when possible for its missile sites dictated that the Minuteman sites be situated near existing SAC bases in Montana, Wyoming, and the Dakotas.
The first deployment area— designated as Wing I—was outside Malmstrom AFB at Great Falls, Montana. Construction at Malmstrom began in March 1961 and proceeded rapidly over the next 18 months. The program took on a new urgency as Malmstrom's first 10-missile flight was declared active in October 1962, when U.S. spy planes observed Russian intermediate-range missile emplacements under construction in Cuba. The Cuban Missile Crisis, as the episode came to be known, represented the most serious threat to U.S. security to date in the Cold War.

The Malmstrom wing comprised four 50-missile squadrons. It was followed by Wing II, a 3-squadron cluster that sprawled over 15,000 square miles outside of Ellsworth Air Force Base in South Dakota. Wing III consisted of three 50-missile squadrons covering 12,000 square miles around Minot AFB in North Dakota; Wing IV had three 50-missile squadrons around Whiteman AFB in Missouri; and Wing V was made up of four 50-missile squadrons around F.E. Warren AFB in Wyoming.

In January 1961, the Air Force began investigating locations for its sixth and final cluster of Minuteman launch sites. Two years later, in February 1963, the government announced that Wing VI would be situated in a 6,500-square-mile area around the existing Grand Forks AFB in eastern North Dakota. The area covered by this complex would include the Red River Valley and areas to the west.
Grand Forks AFB had been fully operational for less than 3 years

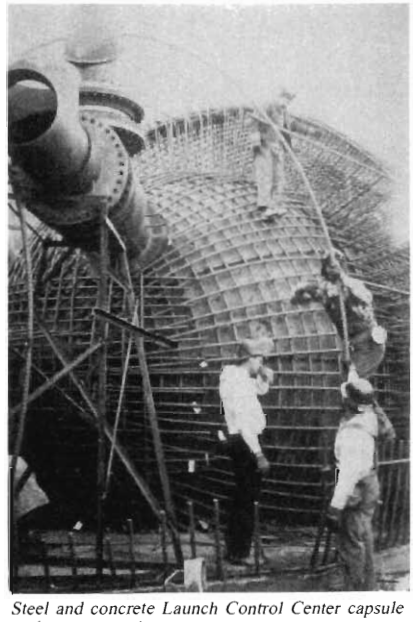
when the announcement was made. First authorized in 1954, the facility was one of several Air Defense Command (ADC) installations situated across the northern United States to form the nation's air defense network. The base's principal mission would be as a facility for the SAGE network. Construction was underway on the runway and associated buildings in August when the Air Force announced that the base's mission was being expanded to include a fighter squadron. In September 1958, the 4133rd Strategic Wing was activated. In December 1959, the Grand Forks sector of SAGE began operations, and in May, the 18th Fighter Interceptor Squadron was transferred to Grand Forks. That month the base received its first complement of KC-135 Stratotankers. In February 1963, the 4133rd was redesignated the 319th Bombardment Wing (Heavy), with the arrival of B-52 Stratofortress bombers. In July 1963, SAC assumed command of Grand Forks AFB.

The announcement in 1963 that Grand Forks AFB would house Wing VI was greeted enthusiastically by the city. Established in 1874 as a trading post on the Red River, Grand Forks had grown steadily



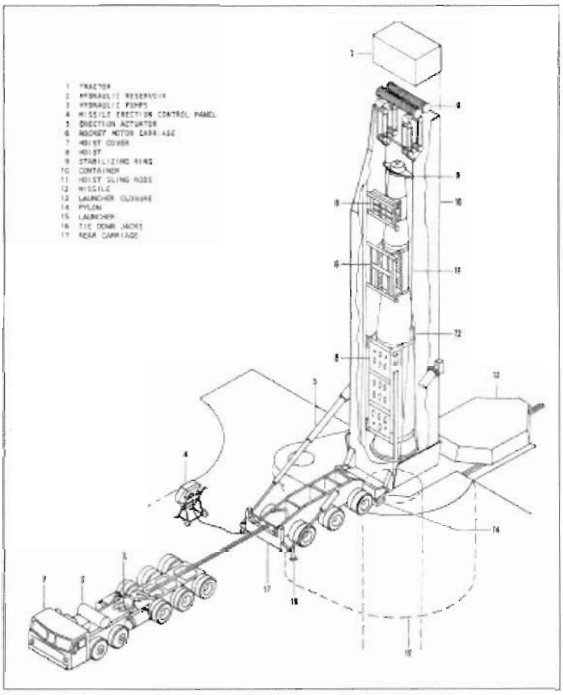
Launch Facility under construction in the mid-1960s.

through the nineteenth and twentieth centuries as a trading center for the surrounding farming community. The city had welcomed the initial construction of the air base in the late 1950s, donating $65,000 toward the purchase of a 5,400-acre tract of land on which to build the facility. It proved an investment well made. Since its inception, the air base has infused tens of millions of dollars into the local economy, both through construction projects and through the payroll of the thousands of military personnel stationed here. The base brought continued prosperity to Grand Forks, as new residential neighborhoods were platted, six new schools were built, and numerous new businesses were formed to accommodate the massive influx of residents. Additionally, Base Administration worked to foster good relations with the



Steel and concrete Launch Control Center capsule under construction.

city. The proposed missile facilities would boost the base's population by some 1,200 residents, mostly military, with their dependents. As reported by the *Grand Forks Herald* in February 1963, "A boon to the economy of the greater Grand Forks area, as well as other towns and cities in the missile building area, was seen by business, civic, and educational leaders here."



Transporter-erector loading missile into silo.

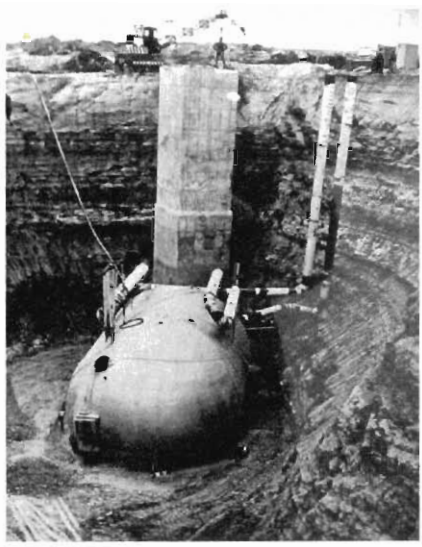
Construction on the Grand Forks missile field began in spring 1964. On March 12—a day after the 500th Minuteman rolled off the assembly line in Ogden, Utah—giant earthmovers began scraping the surface soil to create the enormous pit required for Launch Facility Golf-12 near Park River. Construction continued apace through summer and fall 1964. With an average of about 5,500 people working at various sites in eastern Dakota, steady progress was made during the warm-weather months. Work on the LFs and MAFs was exacting and often dangerous, but with hundreds of silos already completed elsewhere, the construction technique of the massive steel and concrete structures had been well tested by the time the contractors began building the LFs at Grand Forks. Slowed during the bitter winter, full-scale construction resumed the following spring and continued into the summer. By August 1965, more than 100 of the LFs were essentially completed, and in 40 of these, Boeing was installing the weapons systems. On August 5, the first Minuteman II missile arrived at Grand Forks aboard a specially designed railroad flatcar, accompanied by two Air Force "bird watchers." By the end of August, 130 of the 150 LFs and 12 of the 15 MAFs were completed. Five missiles had been delivered by rail and transporter-erector and installed, and antennas were being installed at the 165 sites. By late 1966, all of the Minuteman facilities at Grand Forks had been completed.

LAUNCH CONTROL AND MISSILE FACILITIES

Bedroom of missileers in Launch Control Support Building.

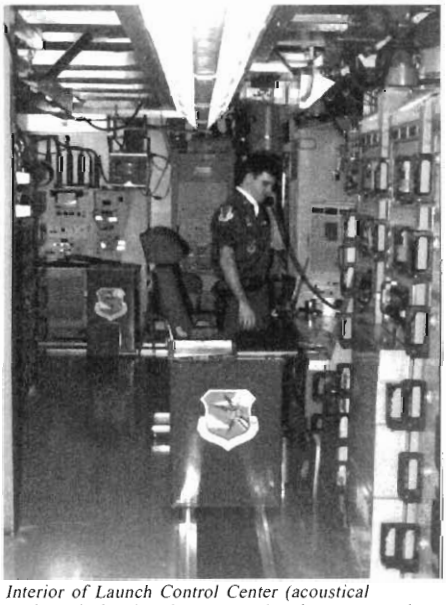
The most prominent feature at the Launch Control Facility is the Launch Control Support Building. The building is the aboveground extension of a blast-hardened, subterranean complex consisting of the Launch Control Center and the Launch Control

Equipment Building (see descriptions in following sections). The Launch Control Support Building served as a security center for the entire missile flight and provided living accommodations for the eight-person contingent assigned to the premises in three-day shifts. The staff consisted of two flight security controllers, two 2-person armed security teams, a cook, and a facility manager.



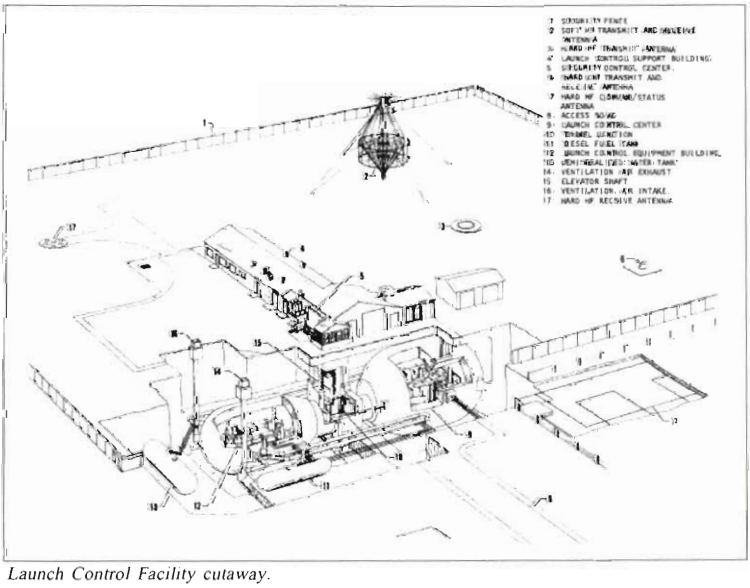
Launch Control Center capsule.

The Launch Control Center is the heart of the MAF, and is a blast-proof, steel-reinforced concrete capsule within which is suspended a rectangular room called the "acoustical enclosure." The acoustical enclosure contains the desk-like command and status consoles, and associated equipment required for the monitoring and launching of the ten Minuteman missiles. It also contains life support equipment and minimal accommodations for two duty officers: the Commander and the Deputy Commander.



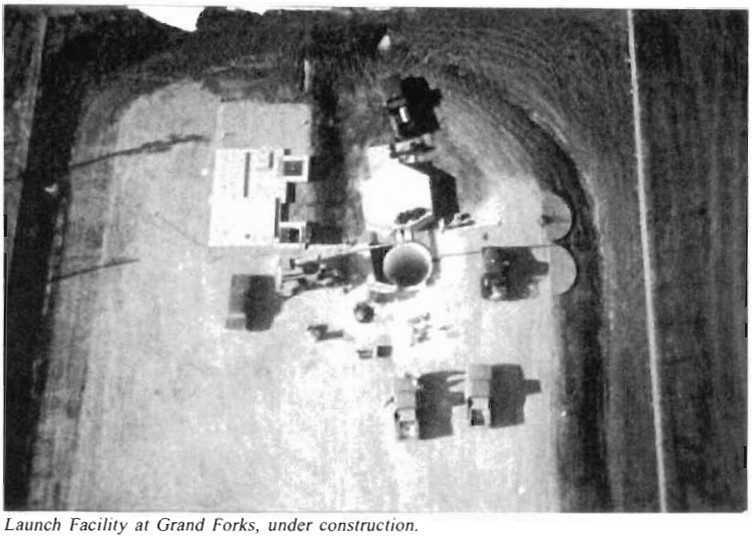
Interior of Launch Control Center (acoustical enclosure) showing the command and status consoles.

Access to and from the Launch Control Center is provided via a tunnel opening at one end of the



Launch Control Facility cutaway.

capsule. The opening is protected by an 8-ton blast door, which was designed primarily to withstand the effects of nuclear blast and to provide an environmental seal. The Launch Control Center of the



Launch Facility at Grand Forks, under construction.

MAF is aligned and connected with the Equipment Building on a common axis in a "dumbbell" configuration. Equipment in the underground Launch Control Equipment Building provides environmental control and power required to make the Launch Control Center self-sufficient during the prolonged periods of isolation that could occur after a nuclear attack. The Equipment Building, like the Launch Control Center, is a blast-hardened, capsule-shaped structure of steel and reinforced concrete. The equipment it contains is supported by a floor suspended on shock isolators. Like the Launch Control Center, the Equipment Building is fitted with a massive steel-concrete blast door to isolate it from the tunnel junction.

The other main component of the MAF is the remotely located Launch Facility. This is a self-contained underground concrete-lined steel missile silo with blast doors, associated launch equipment room, and a capsule-shaped launch facility equipment room.

321st MISSILE WING AND GRAND FORKS AFB

To operate the missiles of Wing VI (the last wing formed by the Air Force), the Air Force had activated the 321st Strategic Missile Wing the previous November. On base, the Wing occupied Building 306, a massive structure that had formerly functioned as the SAGE Direction Center for ADC. In 1965, the Wing's three Strategic Missile Squadrons (SMSs)—the 446th, 447th, and 448th—were activated and crews had begun training at Vandenberg AFB in California. On April 25, 1966, the 50 missiles under the aegis of the 447th Strategic Missile Squadron (Foxtrot, Golf, Hotel, India, and Juliet Flights) were turned over by Boeing to the SAC and declared operational. These formed the first Minuteman II squadron in the country. One additional flight had been placed online by June, and the remainder were activated incrementally over the following months. On December 7, 1966, the 321st Wing, with its 150 Minuteman II missiles, was declared fully operational.

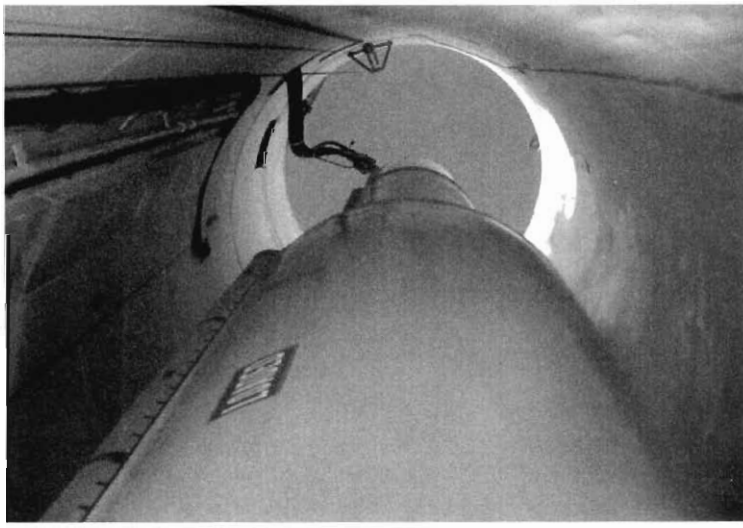
The 15 missile flights administered by the three squadrons (the 446th, 447th, and 448th) are designated in alphanumeric order. Within each flight, the MAF is designated with the numeral 0 (e.g., Oscar-Zero), and the 10 Launch Facilities with numerals arranged sequentially through the Wing (e.g., November-32). A flight's numbering system corresponds roughly to its geographical layout. The MAF typically occupies a central position, with the LFs arrayed around it within the flight area. Comprising the 446th Squadron, Flights Alpha through Echo are dispersed through northern North Dakota immediately south of the border with Canada. The 447th SMS comprises Flights Foxtrot through Juliet south of the 446th, and the 448th comprises Flights Kilo through Oscar south of the 447th and

southwest of Grand Forks AFB. These missiles are strategically separated by several miles to minimize damage from enemy attack. In the perimeter arrangement at Grand Forks AFB, the first-numbered site within a flight is always in the northeast, with subsequent sites positioned clockwise in numerically ascending order. Oscar Flight is southwest of Grand Forks AFB, with its MAF situated at the flight's southern end about 4-1/2 miles north of the small town of Coopers-town. Oscar Flight forms an irregular polygon covering roughly 23 miles on its north-south axis by 19 miles on its east-west axis, which extends over the rolling, arid plains of northeastern Griggs County. Approached from an asphalt-surfaced state highway, its MAF is among the most readily accessible of the Grand Forks facilities.

Administered by Grand Forks Air Force Base in North Dakota, Wing VI is the last cluster of Minuteman missile sites built by the Air Force, and as such it represents the conclusive step in design and construction of this unique architectural and technological form. As one of 15 MAFs associated with the 150-missile wing, MAF Oscar-Zero has formed an integral part of the Minuteman system. Originally built in the 1960s to control 10 unmanned Minuteman II launch facilities, it was modified in the 1970s to accommodate Minuteman III missiles. In March 1995, the Base Realignment and Closure (BRAC) Commission selected the 321st Strategic Missile Wing for closure, and all of the MAFs at Grand Forks AFB were deactivated by the mid-1990s.

MISSILE CREWS: THE LIFE OF A MISSILEER

With construction completed and the 150 missiles armed and ready, emphasis for the base turned to maintenance and training. The launch crews trained and drilled constantly to maintain a high level of readiness. The training program typically began with technical courses offered by Air Training Command at Chanute AFB in Illinois, followed by Operational Readiness Training at Vandenberg AFB and on-site drilling and coursework at the Wing VI facilities. Missile combat crews at Grand Forks AFB, as at the other Minuteman facilities, consisted of two officers in the grade of captain or lieutenant. Called "missileers," these officers worked 24-hour shifts on alert duty. Missileers pulled an alert duty every 3 days, averaging between 6 and 10 days per month. They were required to take turns sleeping during the shift, so that at least one officer would remain awake at any time. During an alert, with little else to do, missile combat crews performed routine fault monitoring, watching the computer consoles for operational irregularities or other signs of trouble. The status of each of ten missiles, along with their support

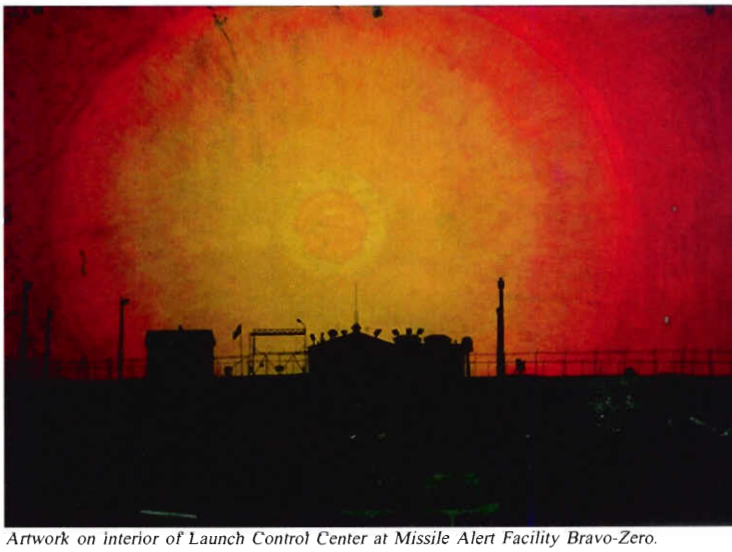


Minuteman III missile in silo.

equipment and launcher sites, was continuously relayed to the MAF and monitored by the missileers.

Until the mid-1980s, these crews were all male. Women slowly worked their way into the Minuteman program, working as cooks or maintenance workers in the Launch Control Support Buildings where the bedrooms and toilets had been modified to accommodate them. In 1986, 2-women launch crews began serving alert duty, and 2 years later, SAC began allowing mixed-sex crews in the MAFs. To foster excellence among its combat and maintenance crews, the Air Force staged competitions among the various missile squadrons that were similar to the bombing competitions that SAC had been sponsoring since the 1950s. Planning for the first missile competition began as the Grand Forks wing was becoming operational in mid-1966, and it was held in April 1967 at Vandenberg AFB. Although the same six Minuteman and three Titan II wings contended for the honor each year, the competition remained intense.

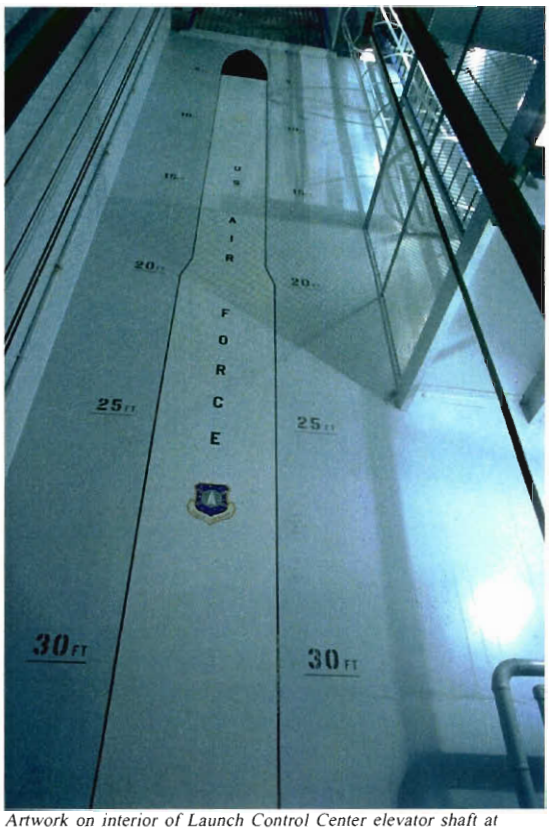
The launch crews worked to keep their reflexes sharp by performing frequent practice runs. In the event that they would actually be called to launch the missiles under their command, the two missileers would take their launch keys and preset authenticators out of steel lockboxes above their consoles. After verifying the authenticity of the orders, they would insert the codes they had received into the enable panels, insert the keys into the switches, and turn them in unison. A predetermined number of missiles would then burst from their silos and arc toward preprogrammed targets a continent away. Competitions and training provided occasional diversions, but in



Artwork on interior of Launch Control Center at Missile Alert Facility Bravo-Zero.

Artwork over doorway of Launch Control Center at Missile Alert Facility Golf-Zero.

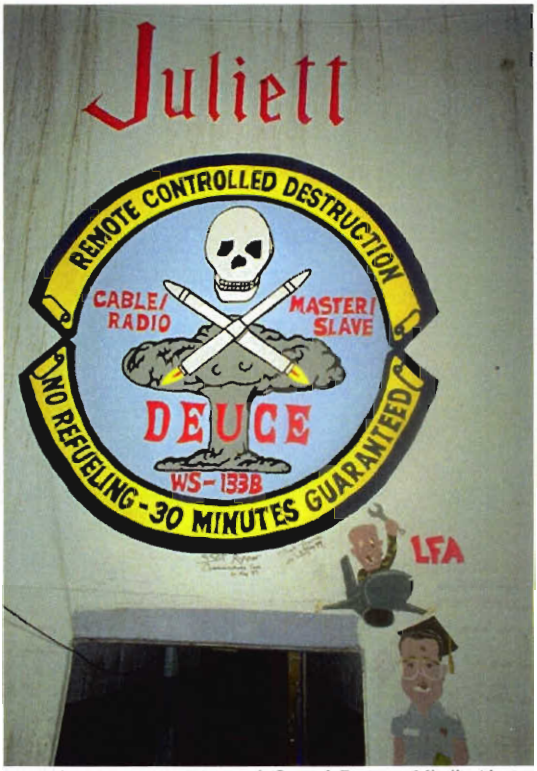
truth, work in the launch facilities was boring, with countless 24-hour shifts spent waiting underground for a war that would never come. To compensate its launch crews and maintain morale, the Air Force initiated an undergraduate college education program, which was later expanded to include masters of science degrees in business administration.



Artwork on interior of Launch Control Center elevator shaft at Missile Alert Facility Golf-Zero.

The crews also devised their own diversions to break the monotony of their long shifts. One of these was the application of signatures and artwork to the walls and interior surfaces of the Launch Control Capsules and Launch Control Centers. This included unit insignia, mascots, and slogans, and featured comic as well as ominous subjects, reflecting the varying attitudes of the crewmen/artists. The artwork ranged from crude graffiti to well-executed fantasy themes. This artwork and graffiti symbolized the *esprit de corps* of the crews, and no doubt helped maintain morale during the long hours of tedious duty.

During the 1980s, the Cold War was showing unmistakable signs of winding down. By the end of the decade, the Berlin Wall had been demolished, Germany had been reunified, many of the former Eastern Bloc countries had broken from Russia to form democratically elected governments of their own, and the Soviet Union



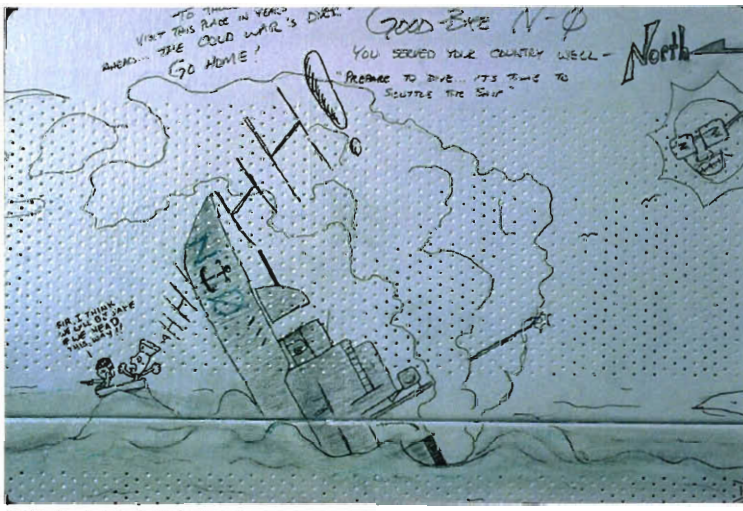
Artwork over doorway of Launch Control Center at Missile Alert Facility Juliett-Zero.

itself was disintegrating after decades of funneling massive funds into arms escalation. By the time the Warsaw Pact formally disbanded in March 1991, the Cold War was essentially over, and the era of the ICBM MAFs was coming to an end.

LEGACY

The United States has based its foreign policy of strategic deterrence on an arsenal of nuclear weapons based from submarines, airborne bombers, and on land. As the land-based leg of the U.S. "Triad," ICBMs armed with nuclear warheads represent the definitive technological refinement for weapons of mass destruction. They reflect the philosophy of a military establishment that holds high technology, rather than brute force, as the ultimate extension of military power. Since their inception in the 1950s, ICBMs have undergone a continuing evolution of form and function, as the Air Force has refined both the warheads and the delivery systems to make them more lethal and more accurate. The liquid-fueled Atlas and Titan missiles and the solid-fueled Minuteman missiles each represented technological improvements over their predecessors. The ICBM was the ultimate expression and final instrument of Cold War deterrence: a virtually unstoppable delivery system of absolute destruction that maintained a strategic balance of power with the Soviet Union.

In July 1991, President George Bush and Soviet Premier Mikhail Gorbachev executed the Strategic Arms Reduction Treaty (START), which limited the number of ICBMs held by their respective countries and mandated the destruction of launch facilities. Rather than maintain the aging Minuteman II facilities, the Air Force opted to scrap them entirely, which President Bush announced to the nation in September 1991 in a sweeping plan for peace. One of the casualties of the new agreement was Wing VI at Grand Forks AFB. Pursuant to this, in the mid-1990s, the missiles were all removed from their silos. Today, as part of an ongoing demolition program, the LFs and MAFs at Grand Forks AFB are being dynamited or filled to render them unusable. The artwork shown in this pamphlet is the result of Historic American Engineering Record (HAER) documentation of the Minuteman III Missile Alert Facility Oscar-Zero and Launch Facility November-33 at Grand Forks AFB. Fifteen MAFs at Grand Forks were similarly documented in January 2000, as mitigation for the demolition of these sites.



Artwork on interior of Launch Control Center at Missile Alert Facility November-Zero.