1. NAME AND LOCATION OF PROPERTY

Historic Name: Quebec 01 Launch Control Facility

Other Name/Site Number: Quebec 01 Missile Alert Facility

Street and Number (if applicable)**:** 2025 Road 238 (southwest of Exit 39, Interstate 25)

City/Town: Chugwater vicinity **County:** Laramie **State:** WY

2. SIGNIFICANCE DATA

NHL Criteria: 1

NHL Criteria Exceptions: 8

NHL Theme(s): Criterion 1, National Pattern of History
IV, Shaping the Political Landscape
3, Military Institutions and Activities

Period(s) of Significance: 1965-1991

Significant Person(s) (only Criterion 2)**:** N/A

Cultural Affiliation (only Criterion 6)**:** N/A

Designer/Creator/Architect/Builder: Ralph M. Parsons Company, Los Angeles, California
J.T. Banner & Associates, Laramie, Wyoming
Morrison-Knudsen Company (M-K), Boise, Idaho

Historic Contexts: Protecting America: Cold War Defensive Sites

3. WITHHOLDING SENSITIVE INFORMATION

Does this nomination contain sensitive information that should be withheld under Section 304 of the National Historic Preservation Act?

___ Yes

_X_ No

4. GEOGRAPHICAL DATA

1. Acreage of Property: 5.9

2. Use either Latitude/Longitude Coordinates or the UTM system:

Latitude/Longitude Coordinates (enter coordinates to 6 decimal places)**:**
Datum if other than WGS84:

	Latitude:	**Longitude:**
1	41.543165	-104.902730

OR

UTM References:

Zone	**Easting**	**Northing**

The boundary of the nominated property includes all of Laramie County, Wyoming, assessor parcel number 18670310000500, as shown on the included Sketch Map. A shapefile of the nominated area was provided to NPS created by Construction and Engineering, Wyoming Outdoor Recreation Office and Division of State Parks based on the 2017 surveyed metes and bounds legal description.

4. Boundary Justification:

The nominated area includes approximately 5.9 acres, encompassing all of the extant resources possessing historic integrity that were associated with the operation of the Quebec 01 Launch Control Facility during the period of national significance.

5. SIGNIFICANCE STATEMENT AND DISCUSSION

INTRODUCTION: SUMMARY STATEMENT OF SIGNIFICANCE

The Quebec 01 Launch Control Facility, twenty-five miles north of Cheyenne and fifteen and a half miles south of Chugwater, in Laramie County, Wyoming, possesses extraordinary national significance under National Historic Landmark Criterion 1 in the area of Military History, for its association with the deployment and operation of the Minuteman IB, Minuteman III, and Peacekeeper intercontinental ballistic missile (ICBM) systems during the Cold War[1] (see Location Map and Figure 1). Strategic land-based missile delivery systems, submarine-launched missiles, and manned bombers comprised the US nuclear triad during the Cold War, the 1946-91 military and political standoff between the US and the Soviet Union and their respective allies. From 1965 to 2005, Quebec 01 comprised the launch control facility (later termed a missile alert facility) for a flight of ten nuclear missiles placed in dispersed, hardened, underground concrete launch facilities miles away. As part of the nation's defense, the missile systems controlled by Quebec 01 preserved the peace by comprising a credible means of retaliation in response to an attack by the Soviet Union. Originally constructed 1963-64 as a launch control facility for the Minuteman I missile, Quebec 01 controlled a flight of ten missiles as part of the 400th Strategic Missile Squadron of the 90th Strategic Missile Wing at F.E. Warren Air Force Base, Cheyenne.[2] The facility became operational in 1965 and, over ensuing decades, embodied the operation and evolution of a launch control/missile alert facility that directed increasingly sophisticated weapons systems.

From 1965 to 1986 Quebec 01 served as a launch control facility for the Minuteman missile, the backbone of the US nuclear arsenal. The Minuteman, the nation's first solid-fueled missile, was equipped with a single warhead equivalent to eighty times the force of the 1945 bomb that devastated Hiroshima, Japan, during World War II. Quebec 01, constructed as part of the missile's deployment, began controlling Minuteman IB missiles in 1965. Located in individual, hardened, underground launch facilities, the Minuteman represented a significant improvement over its Atlas and Titan liquid-fuel predecessors in the US nuclear arsenal.[3] The new missile was smaller, more accurate, less expensive to manufacture, capable of being mass produced, and less expensive to maintain and keep on alert. President John F. Kennedy described the Minuteman as the nation's "ace in the hole" in its global confrontation with the Soviets.[4]

Historian Gretchen Heefner described the deployment of the Minuteman in a rural landscape of ongoing agricultural operations as "a story of how Americans came to live with the Cold War, how they came to accept

[1] Alexander Shane, National Park Service, email to Thomas H. Simmons and R. Laurie Simmons, June 14, 2021 (forwarding F.E. Warren AFB comments on an earlier draft of this nomination); Eric L. Leonard, National Park Service, former superintendent, Minuteman Missile National Historic Site, email to Thomas H. Simmons, December 20, 2021. This nomination uses "Quebec 01" (without a dash) as the preferred name for the facility. For its current use as a state historic site, Wyoming State Parks, Historic Sites and Trails Division consulted with former missileers and selected the format without a dash. Over the four decades of its operation, the Air Force was not consistent in formatting the name of the resource. The 2001 draft HAER documentation and the 2013 *Historic Structure Report* for the facility both use Quebec-1, while a source at F.E. Warren AFB reported that Air Force documents usually employed "Quebec-01" or "Q-01." Leonard reported that the South Dakota missile field was "super consistent with a dash between letters and numbers; they were less consistent with number of numerals (9 versus 09)."

[2] The original term "launch control facility" was replaced during the Peacekeeper era with "missile alert facility." This terminological change is discussed later in the nomination.

[3] Peer Reviewer 1, comments on Quebec 01 LCF National Historic Landmark nomination, revised draft, July 2021. A peer reviewer of this nomination indicated that "launch facility," or LF, was the preferred term for Minuteman facilities versus "silo" for Atlas and Titan sites. However, in the literature launch facilities are frequently referred to as silos.

[4] "The Minuteman System," National Museum of the United States Air Force, published May 27, 2015.

the tenets of nuclear deterrence and to live, in some cases, literally next door to nuclear weapons."[5] The Minuteman, placed in missile fields covering tens of thousands of square miles from Montana to Missouri and Colorado to North Dakota, brought the Cold War conflict between the United States and the Soviet Union to the nation's heartland, manifested in the vast network of launch control facilities and missile launch facilities. One thousand Minuteman missiles were deployed in six states between 1962 and 1967, but the unassuming surface buildings were not conspicuous in the vast plains landscape.

Quebec 01 is an extraordinarily well preserved example of the precise type of resource the 2011 *Protecting America: Cold War Defensive Sites* National Historic Landmark Theme Study identified as having potential for designation: "places and resources associated with controlling and executing the national defense," including command and control centers and missile sites.[6] The nuclear forces of the US and the Soviet Union, including the personnel stationed at Quebec 01, exemplified the international tension, mass destructive power, and round-the-clock vigilance of that era. Quebec 01 housed a control center from which nuclear missiles could be launched at the command of the president.

Continuing to stand on alert as progressively more sophisticated and powerful missiles came under its control, in 1973 Quebec 01's ten launch facilities received the Minuteman III missile, a weapons system with an improved guidance system that carried three multiple independently targetable reentry vehicles (MIRVs) with nuclear warheads. The last missile controlled by Quebec 01 was the Peacekeeper, deployed in 1986 and planned as a successor to the Minuteman. Debate over the need, basing mode, authorization, and funding for the Peacekeeper, initially known as the MX, continued for more than a decade, spanning four presidential administrations and involving officials at the highest levels of government. The missile became operational in the final years of the Cold War and played a significant role in the nation's nuclear arsenal and defense systems as its most lethal deterrent, carrying ten MIRV nuclear warheads with great accuracy. The deployment of the Peacekeeper influenced arms control negotiations with the Soviet Union until the end of the Cold War in 1991 and later with the Russian Federation from 1991 to 2005.

Quebec 01 is the only extant facility in the nation retaining historic integrity that possesses historical associations with three of the nation's frontline nuclear missiles during the Cold War. The facility served as the launch control /missile alert facility for successive generations of US nuclear weapons systems, controlling flights of ten Minuteman IB, Minuteman III, and Peacekeeper missiles. Retired Air Force Col. Tucker Fagan, former commander of the 90th Space Wing at nearby F.E. Warren Air Force Base (AFB), provided perspective on these changes: "Atlas to Minuteman to Peacekeeper. You can see incremental steps with more accuracy, more reliability, more safety, more capability. I think the Russians figured they can't compete."[7] Quebec 01 therefore illustrates both the continuity and adaptation of facilities and practices throughout the period, as the weapons systems it handled evolved, becoming larger, more accurate, and carrying larger payloads capable of inflicting significantly greater damage on a potential foe. While other launch control/missile alert facilities at F.E. Warren AFB and elsewhere controlled versions of the Minuteman missile, Quebec 01 uniquely possesses further association with the Peacekeeper missile.

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[5] Gretchen Heefner, *The Missile Next Door: The Minuteman in the American Heartland* (Cambridge, Massachusetts: Harvard University Press, 2012), 4.

[6] John S. Salmon, *Protecting America: Cold War Defensive Sites*, A National Historic Landmark Theme Study (Washington: National Historic Landmarks Program, National Park Service, October 2011 (draft)), 58. An updated and final version of this theme study was completed in April 2020. The page numbers cited in this nomination refer to the 2011 version.

[7] "Ground Zero, Wyoming," Main Street Wyoming Series, video documentary (Riverton, Wyoming: KCWC Wyoming Public Television, 2007).

Located on a level, treeless tract on the prairie of southeast Wyoming, the 5.9-acre nominated area of Quebec 01 includes an underground launch control center, where a two-person combat crew stood duty for twenty-four hour or longer alerts, and an underground launch control equipment building. Surface elements within a security fence include a building providing access to the underground components and housing support and security personnel, a vehicle storage building, communications antennas, and recreational resources, with most resources dating between 1963-64 and 1966. Also within the nominated area are two sewage lagoons to the west and a helipad (1969) to the east.[8]

The national period of significance for Quebec 01 extends from 1965 (when the facility became operational) to 1991 (the end of the Cold War). The ending date of the period of significance is less than fifty years from the present in order to capture its years of service with the Minuteman III and its first years with the Peacekeeper. The facility meets the exceptional significance requirement of NHL Exception 8, given the vital role Quebec 01 played during the Cold War, in particular its association with successively more powerful missile systems and its unique association with the Peacekeeper missile. An analogous resource is the Minuteman Missile National Historic Site (Ellsworth Air Force Base Minuteman ICBM Launch Control Facility Delta-01) in South Dakota, a Minuteman II facility now under the stewardship of the National Park Service. Rather than designated through the NHL process, Delta-01 was recognized by Congress as a National Historic Site. The resource's launch control facility (LCF) played the same role for the Minuteman IB and II missiles that Quebec 01 did for the Minuteman IB and III and Peacekeeper missiles.[9] Quebec 01 retains historic integrity. Currently Quebec 01 is not listed in the National Register of Historic Places although it has been determined eligible.[10]

THE COLD WAR AND EARLY POST-WORLD WAR II US MISSILE PROGRAMS

In November 1945 Gen. Carl Spaatz, commander of American strategic bombing during World War II, warned a Senate Committee: "Attacks can now come across the Arctic regions, as well as across oceans, and strike deep through the air into the heart of the country. No section will be immune. The Pearl Harbor of a future war might well be Chicago, or Detroit, or Pittsburgh, or even Washington."[11] The threat then envisioned by Gen. Spaatz came from manned bombers rather than missiles. Scientific defense planners such as Dr. Vannevar Bush discounted the practical, near-term development of intercontinental ballistic missiles. Testifying before the Special Senate Committee on Atomic Energy in December 1945, Dr. Bush described his annoyance with people raising the specter of "a 3,000-mile high-angle rocket shot from one continent to another carrying an atomic bomb, and so directed as to be a precise weapon which would land on a certain target such as this city. I say technically I don't think anybody in the world knows how to do such a thing and I feel confident it will not be done for a very long period of time to come."[12]

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[8] None of the launch facilities (LFs) associated with Quebec 01 are included in this nomination. Located miles away, none retains historic integrity, as they were filled in and rendered permanently inoperable when the Peacekeeper missile was decommissioned in 2005.

[9] Christina Slattery, Emily Schill, and Amy R. Squitieri, Minuteman ICBM Launch Control Facility Delta 01 and Launch Facility Delta-09, Ellsworth Air Force Base, Cottonwood, South Dakota, National Register of Historic Places nomination, October 2003, (Madison, Wisconsin: Mead and Hunt, October 2003 (accepted May 5, 2005). The 2003 National Register nomination for Delta-01 provided a 1963-1993 period of significance (POS) from construction to deactivation following the end of the Cold War. Similarly, the beginning of the Quebec 01 POS starts in 1965 (fifty-seven years ago), but the latter part of the POS falls into the less-than-fifty-year period.

[10] Department of the Air Force, Headquarters/Air Force Civil Engineer Center, *Historic Structure Report, Missile Alert Facility Quebec-1, F.E. Warren Air Force Base, Cheyenne, Wyoming* (Lackland Air Force Base, Texas: Department of the Air Force, Headquarters/Air Force Civil Engineer Center, August 2013), ES-1 (hereafter cited as *Historic Structure Report*); Salmon, *Protecting America: Cold War Defensive Sites*, 61.

[11] US Senate, *Hearings before the Committee on Military Affairs*, Statement of Gen. Carl Spaatz, Army Air Forces, November 15, 1945 (Washington: US Government Printing Office, 1945), 344.

[12] Quoted in E. Cargill Hall, "Early U.S. Satellite Proposals," *Technology and Culture* 4 (Autumn, 1963): 411.

Nazi Germany employed unmanned V-1 and V-2 missiles in attacks on Great Britain in the final months of World War II. The German missiles terrified the civilian population but exhibited short range, carried small payloads, and lacked sophisticated guidance systems that permitted them to strike intended targets with precision. The US military recognized the potential of unmanned missiles and pursued research into their potential during and after the war. In 1945 the US launched Operation Overcast (later Operation Paperclip), a secret program to identify and recruit German scientists and technicians who worked on the development of Nazi rocketry and other military technology. Wernher von Braun, who directed Nazi V-2 efforts at Peenemünde, was among the thousands of German scientists and family members brought to the US. Their knowledge and expertise was deemed essential in the postwar competition with the Soviet Union despite their wartime support of the Third Reich.[13]

The Cold War

The issue of weapon systems grew in importance as relations between the US and the Union of Soviet Socialist Republics (USSR or Soviet Union) deteriorated in the years following World War II. The two countries were allies against a common foe during the war, but after the conflict each side competed to gain an advantage over its adversary without engaging in direct warfare. Former British Prime Minister Winston Churchill, in an address at Fulton, Missouri, in March 1946 in the immediate aftermath of World War II, warned that "from Stettin in the Baltic to Trieste in the Adriatic, an iron curtain has descended across the Continent. Behind that line lie all the capitals of the ancient states of Central and Eastern Europe. Warsaw, Berlin, Prague, Vienna, Budapest, Belgrade, Bucharest and Sofia, all these famous cities and the populations around them lie in what I must call the Soviet sphere, and all are subject in one form or another, not only to Soviet influence but to a very high and, in many cases, increasing measure of control from Moscow."[14] The era embodied a hostile ideological rivalry between the Soviet bloc and western countries lasting from 1946 to 1991.

Writer George Orwell first employed the term Cold War in this context in October 1945 to describe the standoff between nuclear superpowers: "Unable to conquer one another, they are likely to continue ruling the world between them, and it is difficult to see how the balance can be upset except by slow and unpredictable demographic changes. … We may be heading not for general breakdown but for an epoch as horribly stable as the slave empires of antiquity. … that is, the kind of world-view, the kind of beliefs, and the social structure that would probably prevail in a state which was at once unconquerable and in a permanent state of 'cold war' with its neighbours."[15] In 1947 financier, statesman, and advisor to President Harry S. Truman Bernard Baruch used the term "Cold War" to portray the growing division between the Soviet Union and the US and their respective allies, and journalist Walter Lippmann popularized the description in his 1947 book *The Cold War: A Study in US Foreign Policy*.[16]

In an article published in *Foreign Affairs* in July 1947, George F. Kennan, director of the State Department's policy planning staff, identified what he saw as motivating Soviet foreign policy. Kennan concluded "the main element of any United States policy toward the Soviet Union must be that of a long-term, patient but firm and

[13] Laura Schumm, "What Was Operation Paperclip?" https://www.history.com/news/what-was-operation-paperclip, June 2, 2012 (updated March 4, 2020); Annie Jacobsen, *Operation Paperclip: The Secret Intelligence Program that Brought Nazi Scientists to America* (New York: Little Brown and Company, 2015). Jacobsen reported some of the recruited Germans had been tried for war crimes.

[14] Winston Churchill, "Sinews of Peace," speech at Westminster College, Fulton, Missouri, March 5, 1946, International Churchill Society website, winstonchurchill.org. This became known as the British statesman's "Iron Curtain" speech.

[15] George Orwell, "You and the Atom Bomb," *London Tribune*, October 19, 1945, Orwell Foundation, orwellfoundation.com.

[16] Walter Lippman, *The Cold War: A Study in US Foreign Policy* (New York: Harper, 1947).

vigilant containment of Russian expansive tendencies."[17] The concept of containment drew widespread support within the US foreign policy establishment. To further the policy, the US entered into a number of collective security and mutual defense treaties in the early post-World War II era. The most important was the 1949 North Atlantic Treaty Organization (NATO) to counter possible Soviet aggression in Western Europe. Other similar organizations included: the Organization of American States (OAS, 1948); the Australia, New Zealand, and United States Security Treaty (ANZUS, 1951); and the Southeast Asia Treaty Organization (SEATO, 1954). In response the Soviets established the Warsaw Pact in 1954, encompassing the USSR and seven Central and Eastern European allies.

A hallmark of the Cold War era for both the US and the Soviet Union was uncertainty and misunderstanding over the motivations, intentions, and capabilities of one another. The result was an arms race typified by the development of more powerful weapons and their production in greater numbers. Nuclear weapons technology progressed rapidly in the early 1950s, increasing the possibility that any clash between the superpowers might escalate beyond conventional warfare. The Soviet Union gained nuclear capability in 1949 when it exploded an atomic bomb. The US tested a more powerful thermonuclear device in 1952, leading to development of a workable hydrogen bomb in 1954. The Soviets followed suit, testing a hydrogen device in 1953 and a hydrogen bomb in 1955.[18]

What made the Soviet developments in nuclear weapons particularly troubling to the US was their growing capability in missile delivery systems. The Soviet Union had made strides in rocketry following World War II, focusing on ballistic missiles and not dividing its efforts between military and civilian space programs as the US had. Until advances in hydrogen bomb technology in the 1950s and 1960s resulted in much smaller weapons, nuclear warheads comprised heavy payloads for a missile to carry. Journalist Bruce D. Callander observed that the Soviets did not worry "that nuclear warheads were so large and heavy for the existing rocket engines. They just built larger missiles to accommodate them."[19] The USSR's progress in guided missiles was manifested in two developments that shocked the West: the launch of the Sputnik satellite in 1957 and the first manned earth orbital flight by cosmonaut Yuri Gagarin in 1961.

The US sought to contain potential USSR aggression with the threat of immediate and devastating nuclear retaliation. In January 1954 President Dwight D. Eisenhower pledged that America would not be an aggressor but "have and will maintain a massive capability to strike back."[20] Both countries eventually developed parallel nuclear forces composed of land- and submarine-based missiles and manned bombers. Historian John Salmon describes the psychological toll the era took on the American public: "Children gasped whenever television screens went black in the middle of an evening sitcom, the word BULLETIN dropped into view, and a grim voice intoned, 'We interrupt this program for a special announcement.' Were the missiles on their way? To most Americans, the Cold War was an era of constant low-grade fear and worry punctuated by unforgettable moments of sheer terror."[21] The potential for nuclear war loomed as a tangible possibility. The USSR committed substantial resources to develop a civil defense infrastructure. In the US school children took part in "duck and cover" drills and substantially constructed buildings were designated as fallout shelters and stocked with survival supplies. Some families also built personal fallout shelters on their own properties.

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[17] Quoted in Louis J. Halle, *The Cold War as History* (New York: Harper Colophon Books, 1967), 107.

[18] "The Cold War: A Brief History, The Beginnings of the Cold War," atomic archive.com.

[19] Bruce D. Callander, "Minuteman Turns 40: The Nation's ICBM Force Is Still Going Strong," *Air Force Magazine* (March 2001): 71.

[20] National Park Service and US Air Force, Legacy Resource Management Program, *Minuteman Missile Sites: Management Alternatives Environmental Assessment*, Special Resource Study (Washington, DC: Dept. of the Interior, National Park Service and Department of Defense, US Air Force, Legacy Resource Management Program, 1995), 22 (hereafter *Minuteman Missile Sites*).

[21] Salmon, *Protecting America: Cold War Defensive Sites*, 5.

While the US and USSR did not directly engage each other in armed combat, part of the competition between the two superpowers included a number of proxy wars fought in the post-World War II period, including those in Korea (1950), Vietnam (1964), Angola (1975), and Afghanistan (1979). US and USSR participation extended from backing opposing sides with arms and advisors to commitment of combat troops. The two countries came to the brink of a nuclear exchange in October 1962, following the discovery of the Soviet Union's secret placement of medium-range nuclear missiles in Cuba. After a US naval quarantine of the island, tensions eased as the Soviets removed missiles from Cuba and the US withdrew Jupiter missiles from Turkey. In November 1983 a realistic North American Treaty Organization (NATO) military exercise (Able Archer 83) included the participation of senior US and allied political leaders, leading Soviet intelligence analysts to believe that a Western nuclear first strike might be imminent. The Soviet Union raised its level of military preparedness. Historian and journalist Richard Rhodes reported the two nations "inadvertently blundered close to nuclear war," concluding that "an American renewal of high Cold War rhetoric, aggressive and perilous threat displays, and naïve incredulity were combined with Soviet arms-race and surprise attack insecurities and heavy-handed war-scare propaganda in a nearly lethal mix."[22]

Nuclear Deterrence

Nuclear deterrence emerged as the cornerstone of US Cold War strategy against the Soviet Union. This required the country to possess a level of nuclear forces necessary to discourage the Soviet Union from even contemplating a nuclear attack, knowing that such a strike would be met with massive retaliation and destruction of the Russian homeland. To ensure that such retaliation was credible, enough US nuclear forces were required to survive an attack in order to deliver a counterblow. The approach adopted, differentiated redundancy through the creation and maintenance of a nuclear triad, was composed of three methods of delivering warheads: from the air by strategic bombers carrying gravity bombs, from the sea by submarines armed with ballistic missiles (SLBMs), and from the land by hardened underground launch facilities holding intercontinental ballistic missiles (ICBMs).

The theory held that an enemy might damage or cripple portions of the triad, but sufficient forces would remain to devastate the enemy's homeland. A 2020 Congressional Research Service report succinctly explains the rationale for the triad: "ICBMs were believed to have the accuracy and prompt responsiveness needed to attack hardened targets such as Soviet command posts and ICBM silos, SLBMs had the survivability needed to complicate Soviet efforts to launch a disarming first strike and to retaliate if such an attack were attempted, and heavy bombers could be dispersed quickly and launched to enhance their survivability, and they could be recalled to their bases if a crisis did not escalate into conflict."[23]

In the late 1950s, as the Soviets developed missiles with massive thrust and successfully orbited the Sputnik satellite, a belief developed that the US suffered from a "missile gap" with the Soviet Union. The military-industrial complex encouraged this misconception as a means of justifying increased defense appropriations, but contemporary intelligence revealed a different picture. Historian Richard Rhodes reported that "the United States had discovered the vast discrepancy between U.S. and Soviet strategic forces when its first generation of Corona photographic reconnaissance satellites began returning film in August 1960."[24] Historian Jeffrey A. Engel elaborates: "Not only did Western forces field larger bomber forces, but though exact numbers of Soviet capabilities remain impossible to state with accuracy, a problem compounded by their varied range and

[22] Richard Rhodes, *Arsenals of Folly: The Making of the Nuclear Arms Race* (New York: Alfred A. Knopf, 2007), 166.

[23] Congressional Research Service, "Defense Primer: Strategic Nuclear Forces," https://crsreports.congress.gov, last updated January 10, 2020.

[24] Rhodes, *Arsenals of Folly*, 93.

destructive capabilities, so too was the West ahead in missiles.… As historian Peter Roman has concluded, 'ironically, the [Eisenhower] administration had finally initiated the buildup that the missile gap critics had clamored for–and did it just as intelligence estimates of Soviet missiles were being revised downward.'"[25]

The 1962 Cuban missile crisis had a sobering effect on both President Kennedy and Soviet Premier Nikita Khrushchev. During the Cuban standoff, Kennedy had looked for options short of massive nuclear retaliation. In August 1963 the US and USSR established the Washington–Moscow Direct Communications Link (or "hotline") that enabled leaders to directly communicate by teletype. In October 1963 the US, USSR, and United Kingdom ratified a treaty banning all test detonations of nuclear weapons except for those conducted underground.

Early US Missile Systems

Established in 1946 as part of the Army Air Forces, the Strategic Air Command (SAC) was tasked with responsibility for the wartime use of nuclear weapons. SAC became part of the US Air Force after its creation as a separate service in 1947 but initially focused on manned bombers as a means of delivering nuclear weapons against a potential adversary. Serious US commitment to ICBM research lagged in contrast to that of the Soviet Union. Early rocketry efforts took place at White Sands Proving Ground near Las Cruces, New Mexico, where laboratories, test facilities, launch complexes, and support resources were established. The facility's Hermes Project (1944-54) utilized captured German V-2 rockets and missile components as a basis for developing new ballistic missiles. Rocket scientists who had worked on the Nazi missile program during the war, including Dr. Werner Von Braun, aided the White Sands effort.[26]

The manned bomber leg of the nation's nuclear triad was strongly supported by Gen. Curtis E. LeMay, who headed SAC from 1948 to 1957. In 1955 LeMay conceded that an ICBM might merit deployment by SAC if it possessed "a capability of instantaneous launch and with acceptable reliability, accuracy, and yield."[27] In classified remarks to the US Air Force Scientific Advisory Board in May 1957, however, LeMay pointed to the forty years of experience with manned bombers demonstrating their reliability and opined: "I agree that *eventually* missile systems will reach a satisfactory state of reliability, but I am certain that this will come only after long and bitter experience in the field."[28] Manned bombers had delivered the first two atomic weapons against Japan during the war, thus comprising a proven option, but World War II-era aircraft lacked the necessary intercontinental range. This capability soon was achieved through the introduction of longer-range jet bombers (such as the B-47 in 1951 and B-52 in 1955), the development of KC-135 fuel tankers and in-flight refueling, and the establishment of overseas SAC airbases.[29]

The submarine-based element of the triad was filled by Polaris missiles (UGM-27) carried aboard nuclear-powered submarines. The Navy's effort in this regard contributed to technological advances necessary for the

[25] Jeffrey A. Engel, *The Missile Plains: Frontline of America's Cold War*, Historic Resource Study, Minuteman Missile National Historic Site, South Dakota, prepared for National Park Service, Midwest Regional Office, by Mead and Hunt (Omaha, Nebraska: National Park Service, Midwest Regional Office, 2003), 25.

[26] "A Brief History of White Sands Proving Ground, 1941-1965," White Sands Missile Range Museum, wsmrmuseum.com (accessed June 28, 2021). The White Sands V-2 Launching Site was designated a National Historic Landmark in 1985.

[27] Neil Sheehan, *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon* (New York, Random House, 2009), 413 and 415. When LeMay was told that the maximum size warhead an Atlas missile could carry was one megaton, he responded: "When you can put something on that missile bigger than a [expletive deleted] firecracker, come and see me."

[28] Gen. Curtis E. LeMay, "The Operational side of Air Defense," Remarks to the USAF Scientific Advisory Board, B-60725, Patrick Air Force Base, Florida, May 21, 1957, 11, in Manuscript Division, Library of Congress, Washington, DC.

[29] Alfred Goldberg, "Strategic Air Command—The Deterrent Force," *Air Force Magazine* 40 (August 1, 1957).

later development of the solid-fuel Minuteman missile.[30] The two-stage, solid-fuel Polaris, launched underwater from a mobile platform, was first deployed in 1960. With an initial range of only 1,380 miles, Polaris required launch positions close to an enemy's coastline. The Polaris constituted a more survivable weapon delivery system, given the submarines' constantly changing locations and difficulty of detection by an enemy.[31]

The development of a reliable ICBM as the third component of the triad proved more difficult to perfect and deploy. The US Air Force created the Air Research and Development Command (ARDC) in 1951, with a mission to investigate and create new weapons systems. In 1954 ARDC established the highly-classified Western Development Division (WDD), under the command of Air Force Gen. Bernard Schriever, to develop an ICBM weapon system. WDD began work in a repurposed Catholic school in Inglewood, California, a suburb of Los Angeles, and became the Air Force Ballistic Missile Division (BMD) in July 1957. The initial work concentrated on improving liquid fueled missiles to a point where they could be deployed, initially the Atlas and then the Titan I and II missiles.

The Atlas had its first test flight in December 1957 and was deployed beginning in 1959 at Vandenberg AFB, California. Three successive versions of the missile were produced, the Atlas D (1959), E (1961), and F (1962). Engel reported that "technological advances would be seen in each new generation of Atlas produced, most notably through improvements in thrust, launch, and guidance system."[32] The initial one-and-half-stage Atlas D possessed 360,000 pounds of thrust, a range of 5,500 nautical miles, a radio guidance system, and a one-megaton thermonuclear warhead. Atlas F carried the same payload but featured 390,000 pounds of thrust, a range of more than 7,000 nautical miles, an inertial guidance system, and an accuracy of 1.5 miles. The missile was built by Convair near San Diego, California. By 1962, one hundred twenty-six Atlas missiles were deployed at Air Force bases in nine states, from California to New York and from Washington state to New Mexico and Texas.[33]

Development of the Titan ICBM took place concurrently with that of the Atlas. According to Engel, the Titan possessed advantages in range, speed, and warhead size over the Atlas. Built by the Martin Company in the suburbs of Denver, Colorado, the two-stage missile was stored in underground silos, with a range of 6,300 miles and a payload of one four-megaton warhead. Fifty-four Titan I missiles were deployed in 1962 at five operational Air Force installations: Lowry AFB, Denver, Colorado; Beale AFB, California; Ellsworth AFB, South Dakota; Mountain Home AFB, Idaho; and Larson AFB, Washington.[34]

The Titan I only remained on alert between 1962 and 1965. Its replacement, the Titan II, which was 103' tall, 10' in diameter, and weighed 330,000 pounds at lift off, was "the largest ICBM the United States ever built."[35] Easier to deploy and maintain than the Titan I, the two-stage Titan II was silo-launched and featured a maximum range of 6,000 nautical miles, use of storable propellants, a nine-megaton nuclear warhead, ability to launch within two minutes, and an improved guidance system. A total of fifty-four Titan II's were deployed at

[30] David K. Stumpf, *Minuteman: A Technical History of the Missile that Defined American Nuclear Warfare* (Fayetteville, Arkansas: University of Arkansas Press, 2021), chapter 5.

[31] Polaris A1, A2, and A3 Missiles, US Navy Strategic Systems Programs, ssp.navy.mil.

[32] Engel, *The Missile Plains*, 17.

[33] Engel, *The Missile Plains*, 18-19; John C. Lonnquest and David F. Winkler, *To Defend and Deter: The Legacy of the United States Cold War Missile Program* (Champaign, Illinois: US Army Construction Engineering Research Laboratories, November 1996), 91.

[34] Lonnquest and Winkler, *To Defend and Deter*, 91. The missiles at Vandenberg AFB were not considered operational.

[35] Lonnquest and Winkler, *To Defend and Deter*, 120-121; Titan II Specs, Titan Missile Museum, https://titanmissilemuseum.org/about/titan-ii-history/ (accessed January 4, 2022).

three Air Force bases: Davis-Monthan AFB, Arizona; Little Rock AFB, Arkansas; and McConnell AFB, Kansas. Deactivation of the Titan system started in 1982 and the last missile was removed in 1987.[36]

The early Atlas and Titan ICBM systems had serious drawbacks. Historian Jacob Neufeld pointed out that "the Atlas comprised some 40,000 parts, including many delicate electronics components that overburdened maintenance and operational crews."[37] Lonnquest and Winkler concluded: "Owing to the hazards inherent in their caustic, volatile liquid-fuel systems and vulnerability of their radio-inertial guidance systems, the early ICBMs were dangerous to operate, expensive to maintain, and difficult to deploy."[38] The underground facilities at the missile silos included fuel storage tanks and pumping equipment, and the fueling of the missiles lengthened the time required to launch. Accidents occurred at four Atlas silos and two Titan ones. A 1965 accident at a Titan II facility near Searcy, Arkansas, claimed the lives of fifty-three workers performing maintenance inside the silo. In 1980 the Titan II missile at a silo near Damascus, Arkansas, exploded, claiming the life of one airmen, injuring twenty-one others, and requiring the evacuation of civilians from the surrounding area.[39]

THE MINUTEMAN MISSILE SYSTEM

Development of the Missile

Military planners prioritized development of an ICBM employing solid fuel to replace the more cumbersome Atlas and Titan weapons systems. According to journalist Neil Sheehan, the Air Force envisioned the new missile as the "progenitor of all rockets to follow. … If a solid-fueled ICBM could be devised, it would have a number of advantages over its liquid-fueled predecessors. It would be much smaller and far simpler in construction, thus making it more reliable and affordable for the United States to produce in many hundreds. It could be stored in full readiness for lengthy periods of time. And most important, it could be fired off on its journey through space in a minute or less."[40]

After the Western Development Division (WDD) was created in 1954, Gen. Schriever selected Lt. Col. Edward N. Hall, from the Air Development Center at Wright-Patterson AFB, to serve as the chief of rocket propulsion.[41] In his new position, Hall pushed for research on solid fuel missiles. In 1956 WDD became the Air Force Ballistic Missile Division, with research on solid fuel propulsion undertaken by the Wright Air Development Center, at Wright-Patterson AFB, Ohio. In 1957 Schriever put Hall to work full-time on creating a missile with sufficient thrust to reach targets six thousand miles distant and developing a technique to make solid fuel burn evenly without burning through the rocket casing and causing an explosion. Hall code-named the project Weapon System Q. The solution devised by Hall produced sufficient thrust by using ammonium perchlorate to provide oxygen and aluminum additives and polybutadiene-acrylic acid as fuel. Even burning from the inside out was achieved by leaving a star-shaped cavity in the solid fuel propellant. In addition to designing the missile, Hall developed plans for basing, deploying, and staffing the system, including dispersed, hardened, underground launch facilities.

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[36] Engel, *The Missile Plains*, 20-21.

[37] Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945-1960* (Washington: Office of Air Force History, US Air Force, 1990), 213.

[38] Lonnquest and Winkler, *To Defend and Deter*, 72.

[39] See, Eric Schlosser, *Command and Control: Nuclear Weapons, the Damascus Accident, and the Illusion of Safety* (New York: Penguin Books, 2013).

[40] Sheehan, *A Fiery Peace in a Cold War*, 409.

[41] The discussion of Minuteman development is drawn from Sheehan, *A Fiery Peace in a Cold War*; Callander, "Minuteman Turns 40;" Lonnquest and Winkler, *To Defend and Deter*; Roy Neal, *Ace in the Hole* (Garden City, New York: Doubleday and Company, 1962; and Engel, *Missile Plains*.

In January 1958 Hall presented the results of his work to Schriever. Before sharing the proposal with his superiors, Schriever sought a catchier name than Weapon System Q. While earlier US missiles employed names from Greek or Roman mythology, such as Agena, Atlas, and Nike, Schriever considered Sentinel, Sentry, and Minuteman for the new weapon system, before deciding that Minuteman best "caught the essence of the new rocket."[42] One peer reviewer of this nomination opined that "Minuteman spoke to American mythology. The image of the rugged individual rising in defense of the nation was useful in the Cold War context."[43] The term alluded to the citizen-soldiers of the American Revolutionary War, who pledged to be ready for military action at a minute's notice. In January 1959 the Department of Defense approved $184 million for development of the weapon system with initial deployment projected for 1962. The Minuteman missile program ultimately involved hundreds of thousands of defense workers, more than one thousand companies, and billions of federal budget dollars. To speed the project, the Minuteman's first flight on February 1, 1961 was an "all up" test launch from Cape Canaveral, Florida. Rather than test-firing the three stages and other components separately, all stages, the payload, and the guidance system were assembled in one launch.[44] The flight was flawless, and the payload successfully splashed down on target 4,600 miles away near Ascension Island in the South Atlantic Ocean.

The single-nuclear warhead Minuteman missile represented a significant advance over earlier missiles through enhanced targeting accuracy and solid-fuel propulsion, resulting in safer and more efficient basing and a quicker launch sequence. Minuteman basing was also less expensive than its predecessors, as Lonnquest and Winkler explain: "On average, a Minuteman silo, including an allowance for its associated launch control facility, required only 15 percent of the earth moving, 20 percent of the steel, and 15 percent of the concrete necessary to build an Atlas F silo. Whereas the construction of 12 Atlas sites near Plattsburgh, New York, cost $44 million, building 150 Minuteman silos at Ellsworth AFB, South Dakota cost $75 million."[45] Minuteman missiles also required less maintenance and smaller numbers of personnel to operate.

The *Minuteman Missile Sites* Special Resource Study provided this assessment of the new missile: "Powerful, accurate, reliable and capable of being economically mass produced, the Minuteman missile was the Nation's first truly effective deterrent weapon."[46] Journalist Neil Sheehan commented: "The creation of Minuteman now put the United States so far ahead in the strategic missile competition that the Soviet Union was confronted not with a gap but with a chasm. Not until five years later, in 1966, did the Soviets acquire their first solid-fueled ICBM, designated SS-11 by NATO."[47] By that time the US had deployed most of the planned one thousand Minuteman missiles.

Characteristics of the Minuteman Missile

The Minuteman I missile (also known as LGM-30A/B) was a three-stage, single-warhead, solid-fuel missile, featuring an all-inertial guidance and control system. This type of guidance system was advantageous, as it did not require the missile to receive radio commands, which might be subject to jamming or other interference.[48] The Boeing Corporation oversaw the effort, assembling and testing the missile in a project described by the company as "one of the most complex, largest and longest running programs in Boeing history. At its peak, it

[42] Sheehan, *A Fiery Peace in a Cold War*, 412. The Minute Man National Historical Park was established by Congress on September 21, 1959 and included sites around Lexington and Concord, Massachusetts, locations of the opening battles of the Revolutionary War.

[43] Peer Reviewer 2, comments on Quebec 01 LCF National Historic Landmark nomination, revised draft, July 2021.

[44] Neal, *Ace in the Hole*, 22.

[45] Lonnquest and Winkler, *To Defend and Deter*, 84-85.

[46] *Minuteman Missile Sites*, 14.

[47] Sheehan, *A Fiery Peace in a Cold War*, 419.

[48] The "LGM" is a military acronym identifying a ground-based, surface attack missile.

would employ 39,700 people located at Boeing sites in Seattle and at the missile final assembly site at Plant 77 in Ogden, Utah."[49] Thiokol manufactured the first and third stages, and Aerojet-General produced the second stage.

The first stage of the Minuteman ignited in the underground launch facility, and, after rising vertically above the surface, the missile pitched to follow its assigned trajectory to a target. It could deliver its nuclear payload to a target in the Soviet Union in approximately half an hour. NBC News aerospace correspondent Roy Neal likened the Minuteman to a rifle bullet. The warhead carried by the Minuteman IB was equivalent to eighty times the force of the bomb that devastated Hiroshima, Japan, in 1945. The hardened underground placement of the missile, coupled with its accuracy and nuclear throw-weight, led to its description as America's "ace in the hole."[50]

Considerably smaller than the earlier Titan missile, the first version known as the Minuteman IA, was just 54.8' tall and 5.5' in diameter and carried a one-megaton W-59 warhead.[51] The missile had a planned range of 4,780 to 4,910 nautical miles and an accuracy of one mile circular error probable (CEP).[52] This calculation meant that half of the missile's projectiles were expected to fall within a circle with a radius of one mile. However, a problem with the missile's swivel nozzles that controlled the rocket's propulsion significantly reduced its planned range to about 4,300 nautical miles.[53] Due to this, it was only deployed in 1962 at Malmstrom AFB, Montana, because of its more northerly, higher elevation location.[54] Those 150 Minuteman IAs were replaced with Minuteman IIs by 1969.[55]

The Minuteman IB corrected the swivel nozzle problem and exhibited greatly improved range. The missile was somewhat larger (55.8' tall and 5.5' in diameter), with a range of 5,500 nautical miles and a bigger payload: a 1.2-megaton W-56 warhead.[56] The Minuteman IB's circular error probable was 0.41 to 0.65 miles. The deployment of the Minuteman IB began in April 1962 at Whiteman AFB, Missouri, and eventually included 650 missiles deployed between 1962 and 1965.[57]

The Minuteman Force and Its Basing

In addition to developing a viable missile, the Air Force was faced with decisions over the total size of the Minuteman missile force and where missiles should be deployed. Recommendations on the number of missiles varied widely and quickly grew in the late 1950s. President Dwight D. Eisenhower opined in 1956 that "150 well-targeted missiles might be enough."[58] The Security Resources Panel of the Science Advisory Committee (known as the Gaither Committee, for its chairman) proposed six hundred missiles in November 1957. The Air

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[49] Michael Lombardi, "Ace in the Hole," *Boeing Frontiers*, November 2008, 9.

[50] This phrase is borrowed from the stud poker card game, where an ace dealt as a face-down "hole" card is an advantage to a player. It can then be unveiled and played when needed to win a hand.

[51] One megaton is the equivalent of one million tons of TNT; a kiloton is equal to a thousand tons of TNT.

[52] Stumpf, *Minuteman*, 37 and 180. Different sources provide somewhat different dimensions and other characteristics for the Minuteman models. Stumpf deems his numbers the "best dimensions available."

[53] Minuteman Missile Historic Site, Minuteman IA and IB Missiles, https://www.nps.gov/articles/minuteman-ia-ib.htm. A circular error probable is a measure of a weapon system's precision at delivering a payload to a target.

[54] Stumpf, *Minuteman*, 90. Stumpf notes Malmstrom's 3,972' elevation as a factor in its selection, as well as its northerly location.

[55] US Air Force, *Peacekeeper in Minuteman Silos Program, Final Supplemental Environmental Impact Statement* (N.p.: US Air Force, December 1991), 16.

[56] Stumpf, *Minuteman*, 37 and 180.

[57] US Air Force, *Peacekeeper in Minuteman Silos Program*, 16.

[58] David Allen Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1969," *International Security* 7 (Spring 1983): 46, citing memorandum by Gen. Andrew Goodpaster, December 16, 1956.

Force suggested 1,600 in 1958 and 2,300 in 1960.[59] President John F. Kennedy, who assumed office in 1961, had campaigned on the existence of a "missile gap" vis-à-vis the Soviet Union, and his administration supported the Minuteman program. Carl Kaysen, Kennedy's Deputy National Security Advisor, reported "informal discussions" contemplating the deployment of as many as 8,000 to 10,000 missiles.[60] Ultimately, Secretary of Defense Robert McNamara set the number of Minuteman missiles at one thousand in 1964.[61]

Deployment plans called for the bulk of the Minuteman force to be placed in fixed, hardened launch facilities, but SAC initially advocated for deploying fifty to one-hundred-fifty of the missiles on railroad cars. The mobile missiles would not be located in fixed locations, rather "deceptive mobility" would improve their chances of survival from Soviet attack. Inter-service funding rivalry with the Navy may have also stimulated Air Force interest in the mobility concept, as a means of a developing a capacity similar to the Polaris submarine missile system. The Air Force expended $108 million on research and development on the mobile program from 1958 to 1961. In 1960 Operation Big Star out of Hill AFB, Ogden, Utah, assessed the feasibility of mobile deployment. The concept envisioned dozens of special trains with three to six nuclear armed missiles per train. Each missile would be transported on a missile launcher car, with additional cars for support, security, and a launch control center staffed by a combat crew. In December 1961 Secretary of Defense Robert McNamara cancelled the railroad-basing approach, apparently due to its substantially higher costs compared with fixed basing.[62]

In determining where to base the Minuteman, the Air Force balanced the need to act quickly to construct facilities to meet a perceived imminent threat versus planning for the long term. Its decisions "would determine the size and shape of the nation's ICBM force for decades to come."[63] Launch facilities and missile fields represented an expensive, fixed investment that would be difficult to relocate and rebuild elsewhere. A number of factors influenced the basing decisions for the Minuteman missile force. Installations had to be within the continental United States to prevent a host nation from determining if and how the missiles would be used. Locations needed to be far enough inland to be out of range of possible attack by Soviet submarines. Basing solutions had to enhance the operational capability of the missiles by providing the best coverage of the Soviet landmass following trajectories over the North Pole, the shortest, fastest path to the adversary (see Figure 2). Launch facilities should be widely spaced to comprise separate targets in the event of a Soviet attack. Missile fields also should be situated in less populous areas, thus minimizing US and Canadian civilian casualties from any Soviet attack to neutralize the US missile force.[64] Soil conditions, water tables, the presence of housing and support communities, and existing infrastructure, such as the capacity of roads and bridges needed to move construction equipment and missiles, also were factors in site selection decisions.

To satisfy these criteria, the Air Force selected rural locations with low population densities and wide swaths of land in less intensive uses, such as grazing or cropland. To provide a source for personnel support, the missile fields were placed adjacent to existing Strategic Air Command bases, mostly in the north central region of the nation, in Montana, North and South Dakota, Nebraska, Wyoming, Colorado, and Missouri. Whiteman AFB, Missouri, just sixty miles east-southeast of Kansas City, was the closest deployment to a major urban center, as

[59] Stumpf, *Minuteman*, 19.
[60] Stumpf, *Minuteman*, 19.
[61] Lonnquest and Winkler, *To Defend and Deter*, 77.
[62] Steven A. Pomeroy, "Highball! Missiles and Trains," *Air Power History* 57 (Fall 2010): 24-26 and 31; *New York Times*, December 14, 1961, 20. One option examined launching the missiles while the train was moving. Toy manufacturer Lionel Trains produced a "Minuteman" model train with a hidden missile in a launching car, but the missile did not resemble an actual Minuteman missile.
[63] Lonnquest and Winkler, *To Defend and Deter*, 77.
[64] Lonnquest and Winkler, *To Defend and Deter*, 77; Engel, *The Missile Plains*, 30.

well as being the farthest south of the six wings. The specific locations for the missile fields, launch facilities, and launch control centers were determined by the Army Corps of Engineers, the Air Force Ballistic Missile Division, and SAC headquarters. The six missile wings were under the control of the six Air Force bases (AFB) below (see Figure 3):

- Malmstrom AFB, Great Falls, Montana (Wing I, 200 missiles): originally 150 missiles, fifteen flights of missiles east and west of Great Falls; 341st Strategic Missile Wing. The wing increased to 200 missiles with the deployment of the 564th Strategic Missile Squadron (50 Minuteman II missiles in 1966-67)
- Ellsworth AFB, Rapid City, South Dakota (Wing II, 150 missiles): fifteen flights of missiles in west-central South Dakota; 44th Strategic Missile Wing
- Minot AFB, Minot, North Dakota (Wing III, 150 missiles): fifteen flights of missiles in the north central portion of the state, northwest and south of Minot; 91st Strategic Missile Wing
- Whiteman AFB, Knob Noster, Missouri (Wing IV, 150 missiles): fifteen flights of missiles in west-central Missouri between Kansas City and Jefferson City; 351st Strategic Missile Wing
- F.E. Warren AFB, Cheyenne, Wyoming (Wing V, 200 missiles): twenty flights of missiles in southeast Wyoming, northeast Colorado, and southwest Nebraska; 90th Strategic Missile Wing
- Grand Forks AFB, Grand Forks, North Dakota (Wing VI, 150 missiles): fifteen flights of missiles northwest, west, and southwest of Grand Forks; 321st Strategic Missile Wing[65]

Historian Gretchen Heefner observes the missiles "were hidden in plain sight—implanted in out-of-the-way places whose vast desolation seemed to swallow up the meaning of the weaponry."[66] Deployed in agricultural regions with small, widely spaced populations, the missiles occupied small amounts of land and permitted existing livestock grazing or other agricultural uses to continue on the surrounding land.[67] Groups campaigning for nuclear disarmament characterized the Minuteman missile fields as "a national sacrifice area" that would serve as a "sponge" to absorb the impact of a possible Soviet nuclear attack.[68]

Construction of Minuteman Facilities

The Air Force missile force employed the hierarchical structure used by military manned aviation, organized into wings, squadrons, and flights. Each missile deployment area associated with an air force base comprised a missile wing, composed of three or four missile squadrons. A Minuteman missile squadron consisted of five flights of ten missiles each. Within each flight, five dispersed launch control facilities were responsible for a group of ten missiles housed in individual unmanned underground launch facilities located miles away.

Construction of the Minuteman facilities was underway by 1961. The Army Corps of Engineers created the Corps of Engineers Ballistic Missile Construction Office to administer the overall project, with actual construction delegated to private contractors. Peter Kiewit Company of Omaha served as prime contractor at many of the missile fields, and the firm's efforts at Minot AFB, involving construction of one-hundred-fifty launch facilities (LFs) and fifteen LCFs, illustrated the scale of the task: "During peak construction, Kiewit and its subcontractors employed six thousand workers, 1,100 vehicles, and 115 cranes to keep construction on pace

[65] Stumpf, *Minuteman*, 89-91 and 131; Lonnquist and Winkler, *To Defend and Deter*, 77. SAC had reportedly considered Vandenberg AFB on the California coast for the first Minuteman wing, but the shortened range of the Minuteman IA ruled out that location and Malmstrom AFB in Montana received the first wing. Vandenberg became an important test and training location for the missile.

[66] Heefner, *The Missile Next Door*, 3.

[67] The F.E. Warren AFB missile field extended over 12,600 square miles, for example, but the land actually used for launch control facilities (about 6 acres each) and launch facilities (about 2 acres each) aggregated to slightly less than one square mile.

[68] Samuel H. Day, Jr., ed., *Nuclear Heartland: A Guide to the 1,000 Missile Silos of the United States* (Madison, Wisconsin: Progressive Foundation, 1988), 10.

to meet the aggressive project schedule."[69] One thousand launch facilities were completed by 1966.[70] Other major contractors were Morrison-Knudson and Fuller-Webb.

Designs continued to evolve as construction progressed, resulting in hundreds of contract modifications and increases of millions of dollars above the original contractor bids.[71] The Air Force had anticipated overruns given what it termed the "concurrency" of the design and construction process. Testifying before a Congressional committee in February 1961, Joseph V. Charyk, Undersecretary of the Air Force, noted that since the program was "producing missiles in quantity and constructing facilities before prototypes are carefully tested and proven," a concurrency approach was adopted due to "the extreme urgency of this program and the fact that we are trying to develop a very large operational force in a minimum of time and in a scientific field where major breakthroughs are frequent."[72]

Construction Staging and Operational Status

The deployment of one thousand missiles occurred in stages in wing number order with the wings becoming fully operational between July 1963 and November 1966. The first wing at Malmstrom AFB received 150 Minuteman IA model missiles, while the remainder of the wings received Minuteman IB and/or II missiles. Table 1 below provides the deployment by wing, year deployed, and missile type.

The first flight of missiles at Malmstrom AFB, Montana, was placed on modified operational status in October 1962, during the Cuban missile crisis. The Malmstrom wing became fully operation in July 1963, followed by Ellsworth AFB (Minuteman IBs) in October of that year. The Minuteman IB missiles at Minot and Whiteman AFBs went on alert in March and June 1964, respectively. Francis E. Warren AFB's Minuteman IBs were ready for launch in June 1965. At Grand Forks AFB, the launch facilities received Minuteman II missiles, which became operational in November 1966. In April 1967 an additional fifty Minuteman IIs were placed at Malmstrom as the 564th Strategic Missile Squadron. The wings at Malmstrom and F.E. Warren AFBs included two hundred missiles each (four squadrons), while the remaining four wings each fielded one-hundred-fifty missiles (three squadrons).

Principal Components of the Minuteman System

The key components of the Minuteman deployment were the launch control facilities and launch facilities, which followed standard designs. As construction of the six missile wings proceeded, some features were changed or reconfigured, but they generally conformed to the description below.

Launch Control Facility (LCF). Each missile flight included a launch control facility, consisting of aboveground support buildings and communication equipment and an underground launch control center and a launch control equipment building for the two-person combat crew, who were responsible for monitoring and launching the ten missiles[73] (see Figures 4 and 5). Typically, an LCF covered five to six acres, with the standing buildings and communication antennas enclosed within an 8'-high chain link security fence topped with barbed wire. The underground components comprised the sophisticated heart of the LCF, including the launch control center (LCC or "capsule"), where the two-person combat crew served on twenty-four-hour or longer alerts, and the launch control center equipment building (LCEB), containing mechanical back-up power and life support

[69] Engel, *The Missile Plains*, 30.
[70] Lonnquest and Winkler, *To Defend and Deter*, 86.
[71] Stumpf, *Minuteman*, 150.
[72] Stumpf, *Minuteman*, 127.
[73] The launch control facility (LCF) was later renamed the missile alert facility (MAF).

equipment needed by the LCC.[74]

Table 1. Changes in the Deployment of Minuteman and Peacekeeper Missiles by Wing , Missile Type, and Year

Wing	Air Force Base	Number and Type of Missiles	Installation/Removal Start/Finish/Removal
I	Malmstrom AFB, Great Falls, MT	150 MM IA	Oct. 1962/July 1963/Jan. 1967
I	Malmstrom	50 MM II	Apr. 1966/Apr. 1967/Jan. 1975
I	Malmstrom	150 MM II	Jan. 1967/May 1969/1995
I	Malmstrom	50 MM III	Jan. 1975/July 1975/2008
I	Malmstrom	150 MM III	1992-94
II	Ellsworth AFB, Rapid City, SD	150 MM IB	Apr. 1963/Oct. 1963/Mar. 1972
II	Ellsworth	150 MM II	Mar. 1972/Mar. 1973/1994
III	Minot AFB, Minot, ND	150 MM IB	Sep. 1963/Mar. 1964/Apr. 1970
III	Minot	150 MM III	Apr. 1970/Dec. 1971
IV	Whiteman AFB, Knob Noster, MO	150 MM IB	Apr. 1962/June 1964/May 1966
IV	Whiteman	150 MM II	May 1966/Oct. 1967/1995
V	F.E. Warren AFB, Cheyenne, WY	200 MM IB	Nov. 1962/June 1965/Nov. 1973
V	F.E. Warren	200 MM III	Nov. 1973/Jan. 1975
V	F.E. Warren	50 PK	Sep. 1986/Dec. 1988/2005
VI	Grand Forks AFB, Grand Forks, ND	150 MM II	Apr. 1965/Nov. 1966/July 1971
VI	Grand Forks	150 MM III	July 1971/Mar. 1973/2001

SOURCE: Based on Table 4.1 in US Air Force, *Peacekeeper in Minuteman Silos Program, Final Supplemental Environmental Impact Statement* (N.p.: US Air Force, December 1991). Clarifications and details added and removals updated to reflect decommissioning of MM II and Peacekeeper. MM indicates Minuteman and PK indicates Peacekeeper. At F.E. Warren AFB, 50 of the MM IIIs were replaced by PKs. At Malmstrom AFB, 100 MM IIs were converted to MM IIIs.

The surface or "topside" components included the launch control support building (LCSB), a utilitarian building with prefabricated wood frame and roof trusses shipped to the sites. The LCSB included the wing's flight security control center, sleeping quarters, a kitchen, restrooms, a dining/recreation area, and garage. When a detached vehicle storage building was added to the LCF later in the 1960s, the LCSB garage space was repurposed. The LCSB provided access to the LCC and LCEB by means of a reinforced concrete shaft holding a freight elevator. A large-capacity elevator was needed to transport repair and replacement parts for the underground facilities. A metal ladder within the shaft provided a second means of access.[75]

Communication was critical to the mission of the missile wings, and the LCFs displayed a variety of antennas,

[74] The first two missile wings included the LCEB components on the surface inside the LCSB. Realizing that this vulnerable location impacted how long the combat crew could survive in a wartime scenario, the design used for the remaining four wings placed the LCEB underground.

[75] Stumpf, *Minuteman*, 143; "Life in the LCSB," *Minuteman Service News*, September-October 1968, 6-7.

including pole types and those sheltered by radomes. Twin intake and exhaust vents for the LCEB also stood within the security fence.[76] Over time LCFs gained outdoor recreational amenities, such as horseshoe pits, volleyball courts, and basketball poles with backboards. Located adjacent to the LCF, but outside the security fence, were elevated tanks for the storage of diesel fuel, a concrete helipad, and sewage lagoons for treating effluent wastewater.

Launch Facilities (LF). Wood posts beginning at the LCF identified hardened intersite cable system (HICS) routes across the prairie to the flight's LFs. Each unmanned launch facility (LF) was located at least three miles from its LCF and at least three miles from other LFs. Each launch facility covered about 1.8 to 2 acres enclosed by a chain link security fence. Constructed of reinforced concrete and steel, the LFs were hardened to withstand the effects of nuclear explosions, with most components underground and little visible on the surface. An LF complex included the launcher, launcher equipment room, launcher support building, communications and intrusion monitoring antennas, and pole-mounted lighting. The launcher included the launcher closure mounted on a track on the surface and the underground launch tube in which the missile was placed. The cylindrical, two-level, underground launcher equipment room surrounded the top of the launch tube. The underground launcher support building included such equipment as a diesel generator to provide emergency electrical power and a compressor to pressurize the cable communication system linking the LF to its LCF. Secure hatches provided access to the underground components of the LF. Near the LF but outside the fence were two concrete alignment monuments that were used in the optical alignment of the early Minuteman I guidance system.[77] To facilitate missile installation, removal, and maintenance, gravel roads were constructed to the LFs from existing county roads.

To meet the program's goal of constructing a thousand launch facilities in a short period of time, a standardized approach was developed to speed launch facility completion:

> Construction crews excavated a circular cut down to a depth of 34 feet. From there, using either a clamshell bucket or a huge auger, the builders excavated a 15-foot diameter shaft down to 94 feet. After the shaft was dug, a 62-foot prefabricated steel silo liner, built of quarter-inch steel plate and ringed with concentric rings of reinforcing bar, was lowered into place. After the liner was aligned, concrete was pumped around it to form the external silo wall. When the silo was complete the underground launch equipment and support buildings were constructed, and the excavation was backfilled.[78]

Once LFs were completed, Minuteman missiles were transported to the air force base tasked with their deployment and moved by a purpose-built, enclosed, tractor-trailer transporter-erector vehicle to a waiting LF. The erector would raise the missile to vertical over the launcher opening and then lower it into the launch facility.

The ten unmanned launch facilities associated with each LCF were connected to it by a buried hardened intersite cable system (HICS) for communication. Cable routes across the prairie were delineated by wood posts with metal bands. The miles of cables were pressurized with air for detection of damage or tampering. The many splices required in the network resulted in leaks in the pressurization system that proved troublesome to

[76] The intake and exhaust ducts are present in LCFs in the last four missile wings constructed, which placed the LCEB underground.

[77] Bob Kelchmer, "Alignment Monuments at ICBM Sites—What Are Those Things Anyway?" *Association of Air Force Missileers Newsletter* 14 (December 2006): 4. The monuments "were constructed of reinforced concrete, averaged 4 feet to 10 feet above ground, and were buried at least 10 feet in the ground."

[78] Lonnquest and Winkler, *To Defend and Deter*, 84. The auger was similar to a giant, mechanized post-hole digger.

correct. The buried HICS system also connected LCFs and LFs to others within its squadron, ensuring "that communications connecting the greatest number of launchers and launch control centers (LCC's) will survive an attack."[79] This network enabled the combat crew in another LCF to perform the confirmation key-turn ("second vote") required to launch missiles.

Writer Ian Frazier in his book on the American plains observed: "Driving on the prairie near Great Falls, Montana, or Minot, North Dakota, or Cheyenne, Wyoming, you might not realize right away that you are in a weapons system. A nuclear-missile silo is one of the quintessential Great Plains objects: to the eye, it is almost nothing, just one or two acres of ground with a concrete slab in the middle and some posts and poles sticking up behind an eight-foot-high Cyclone fence; but to the imagination, it is the end of the world."[80]

Support Facilities. The six Air Force bases associated with the missile wings played an important role in the functioning of the Minuteman system. Personnel working in the missile fields were stationed and supported by the bases. Hill AFB, Ogden, Utah, served as a vital part of the Minuteman program from 1960 through 1978 as the location of the Missile Assembly and Maintenance Shop, where the Boeing Company assembled the final missile, using components manufactured by independent contractors throughout the country.[81] Vandenberg AFB on the California coast north of Los Angeles played an important role in the Minuteman and later Peacekeeper programs in training missile crews and conducting missile test launches. The complex included launch facilities and a launch control facility like those in the missile fields for crew training.

Staffing of the Minuteman System

One benefit of the solid fuel design of the Minuteman was that fewer numbers of personnel were required than for liquid fuel missiles. The launch facilities were unmanned, and the missiles could stand for long periods of time without significant maintenance intervention. The total number of personnel on duty at one time at an LCF was about nine. Nonetheless, the total numbers of persons engaged in staffing the missile force was substantial. A publication produced by the National Park Service observed that it took "a cast of thousands" to operate and maintain the Minuteman missile force, including underground combat crews, topside support and security personnel, and missile maintainers, who kept the missiles at operational readiness.

Combat Crew. The most critical players in the missile force were the two-person combat crews who staffed the underground launch control capsule (LCC). Originally only men, typically lieutenants or captains, were assigned to this task. In 1978 women were included on Titan II missile teams. All-female combat crews were authorized for Minuteman LCCs in 1986, with co-ed teams permitted in January 1988.[82] Many missileers were officers who sought an operational career in the Air Force but whose eyesight disqualified them from flying missions.

Celebrated documentary filmmaker Frederick Wiseman explored the training of Minuteman combat crews at Vandenburg AFB in the 1987 documentary "Missile." In addition to covering more nuts and bolts aspects of the system, the fourteen-week training class began with a discussion of the command and control system for the use of nuclear weapons, stressed the moral responsibility of a missileer's role, and emphasized the importance of having no reservations about inserting and turning launch keys on receipt of a lawful order from the president.[83] Journalist David Quammen, who interviewed Minuteman combat crews in Montana in 1998, opined: "What the

[79] "Cable System," *Minuteman Service News*, January-February 1963, 7.
[80] Ian Frazier, *Great Plains* (New York: Farrar, Straus, Giroux, 1989), 200.
[81] Jonathan Bingham, "1960s: Minuteman ICBM Mission Arrives at Hill AFB," last updated April 6, 2020, hill.af.mil.
[82] "Female Missileers," Minuteman Missile National Historic Site, https://www.nps.gov/articles/femalemissileers.htm.
[83] Frederick Wiseman, director, "Missile," documentary film (San Francisco, California: Zipporah Films, 1987).

Air Force wants in those capsules are stable, methodical, uncomplicated officers who have been trained to follow checklist procedures and can be relied upon, come hell or high winds, to perform exactly as trained. In essence the job is quite simple: to turn a key when—and only when—so ordered. In practice the launch officers stay busy underground with an elaborate regimen of monitoring and security chores. Boredom is bad enough, doubt is anathema, so the Air Force must select these people cannily."[84]

Former missileer Linda Aldrich noted she was aware of the vital importance of her job and emphasized the "absolute adherence to procedural checklists" for its successful execution.[85] André Shappell, a former missileer at F.E. Warren AFB, noted that he had reflected on the decision to launch during alerts: "The way that I viewed it was that our system works to the point that if the president decided that the only resort that he had to preserve the liberty and the integrity and the democracy that we enjoy, then I would have been convinced that he's exhausted all available means, then only thing left was to launch a nuclear weapon."[86] Former missileer Tony Gatlin explained: "You're doing a job that you hope you never have to do."[87]

While on alert, the combat crew's time was spent monitoring the status of the missiles under their control, including dealing with intrusion alerts and maintenance at the LFs. Tours typically lasted twenty-four hours, but the Air Force experimented with longer tours and some tours were protracted due to weather or other unforeseen conditions. During quiet times, missileers could study for an advanced degree (the Air Force supported officers working on master's degrees), read books or magazines, play cards, or work on hobbies. There was access to a limited number of over-the-air local television stations, and the crew could bring a VCR tape that could be played for them from the LCSB. Missileer Jay E. Orgeron noted that LCC duty "could be the most extremely boring job in the world."[88]

Topside Support Staff. Facility Managers (FM) were noncommissioned officers (such as Master Sergeant, Staff Sergeant, or Technical Sergeant) responsible for running the LCF and overseeing topside personnel. FMs served three-day tours and inspected and maintained the facility. A National Park Service website discussing duties of LCF personnel reported FMs had "a host of additional duties, including everything from acting weatherman, mechanic, innkeeper, and groundskeeper, or essentially, anything needed to keep the LCF running smoothly."[89]

The LCSBs included a large kitchen staffed by a chef/cook. The cook prepared the meals for the personnel and took them to the combat crew in the LCC. The cook also performed housekeeping duties within the LCSB. In the late 1960s, F.E. Warren AFB began preparing meals that were packaged in foil, frozen, and shipped to LCFs, which the cooks would then re-heat. Missileer Tucker Fagan compared these to TV dinners. Former flight security controller Joseph Fowles said they "really weren't that bad."[90] They recalled having meals of lasagna, spaghetti, chicken, and different types of potatoes. A National Park Service website article observed: "Some cooks showed remarkable creativity in completing their task, … making soups or stews out of leftover foil packets or making seasoned croutons for the salads out of bread."[91]

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[84] David Quammen, *Wild Thoughts from Wild Places* (New York: Simon and Schuster, 1998), 145.

[85] Harpers Ferry Center and Minuteman Missile National Historic Site, "Beneath the Plains"-Live Q&A, August 6, 2020, https://www.youtube.com/watch?v=wPCko_YwrxA (hereafter "Beneath the Plains"-Live Q&A).

[86] In Wyoming State Parks and Cultural Resources, Division of State Parks, Historic Sites and Trails, Quebec 01 Missile Alert Facility State Historic Site, Visitor Video, Cheyenne, Wyoming: Wyoming State Parks and Cultural Resources, Division of State Parks, Historic Sites and Trails, February 27, 2019.

[87] Tom Vanderbilt, "Blast-Door Art: Cave Paintings of the Nuclear Era," DesignObserver, April 3, 2008, www.designobserver.com.

[88] Orgeron, interview.

[89] "Facility Manager," Minuteman Missile National Historic site, www.nps.gov/articles/facility-manager.htm.

[90] Quebec 01 Historic Site, visitor video.

[91] "Missile Rations Cook," Minuteman Missile National Historic site, www.nps.gov/articles/missile-rations-cook.htm.

Security Teams. A flight security controller (FSC) regulated access to the LCF and provided security to the flight's ten LFs. The FSCs also were noncommissioned officers (such as Sergeant, Staff Sergeant, or Technical Sergeant) stationed adjacent to the elevator room at the end of the LCSB with windows looking out at the gate accessing the LCF. The FSC oversaw two, two-person security alert teams, who routinely inspected LFs, investigated potential security breaches triggered by alarms, and escorted missile maintainers during their work at the LFs. If work at an LF could not be completed in one day, a camper team secured the LF overnight.

A local rancher in the Ellsworth AFB missile field recalled the security teams "were usually a bunch of fresh faced kids sent to God's forsaken half acre of something."[92] Missileer André Shappell paid homage to the LCF security teams: "It's certainly not pleasant duty in many times, especially for young kids who have to walk fencelines at two o'clock in the morning when it's snowing horizontally, but they do it willingly because they know what it contributes to the national defense."[93] Joseph Fowles, a flight security controller at F.E. Warren AFB, observed the security teams were armed with grenade launchers and heavy machine guns, permitting them to "level" the surface of a LF if necessary without harming the underground elements: "You're not leaving with a nuke."[94]

Missile Maintainers. Missile maintainers were responsible for the maintenance of LCFs and LFs. Missile maintainer Alonzo Hall recalled spending hours driving many miles to access some missile launch facilities, since some wings covered more than ten thousand square miles. He noted the importance of his task: "If it's off alert, there's a target not being covered."[95] The maintainers were limited to sixteen hours a day in the field. If a task had not been completed within the available time, the maintenance team had to remain overnight (RON) at the LCF and complete the work the following day.[96] For recreation, one former maintainer recalled stamping out "rude messages in the snow at LFs for the Russian spy satellites to image."[97]

Richard Hartman, a proficiency trainer at the 90th Strategic Missile Wing, emphasized that all maintenance tasks had technical order procedures specifying how and in what order they would be performed. To illustrate this, he recalled removing a motor-generator from an LCC at F.E. Warren AFB: "After uncoupling, each [part] was unbolted from the base plate, lifted out and wheeled out on dollies to the elevator. The base plate is very long and had to be manhandled in an upright position in the elevator. That sometimes left scratches in the paint and upset many Facility Managers. Total weight of the whole thing is on the order of 3000 pounds."[98] This demonstrated why the LCFs included a freight elevator, as that was the only means of transporting everything needing repair or replacement in the LCC or LCEB.

Minuteman II Is Deployed

As the Minuteman I's were being deployed, the Air Force continued research into refining and improving the new weapon system. By 1964 the Air Force developed an upgraded version of the Minuteman missile with increased range, improved accuracy, and greater payload. Historian Jeffrey A. Engel observed: "The missile gap had become a thing of the past by the mid-1960s, as American intelligence proved beyond doubt the superiority of American missiles over their Soviet counterparts."[99] The Minuteman II missile (LGM-30F) was slightly

[92] "Security Alert Teams," Minuteman Missile National Historic site, www.nps.gov/articles/securitye-alert-teams.htm.
[93] In Quebec 01 Historic Site, visitor video.
[94] In Quebec 01 Historic Site, visitor video.
[95] "Beneath the Plains"-Live Q&A.
[96] "Missile Maintainers," Minuteman Missile National Historic site, www.nps.gov/articles/missile-maintainers.htm.
[97] Richard Hartman, Quebec 01 Historic Site, Facebook post, July 8, 2020.
[98] Richard Hartman, email to Thomas H. Simmons April 9, 2020.
[99] Engel, *The Missile Plains*, 31.

larger than the IB: 57.1' tall, 5.5' in diameter, and a range of 5,300 to 6,300 nautical miles, the missile carried one W56 1.2-megaton warhead with a circular error probable of 0.5 miles.[100] Work began on the installation of Minuteman IIs in 1965 in existing Minuteman I launch facilities in a staged manner. Grand Forks AFB, North Dakota, which had yet to receive the Minuteman I, became the first installation to receive the new missile. A total of 650 Minuteman IIs eventually were deployed, with additional missiles installed at Whiteman AFB (operational in 1967), Malmstrom AFB (1967 and 1969), and Ellsworth AFB (1973).

The Minuteman III Upgrade

In 1965 development began on a still more enhanced version of the Minuteman. The Minuteman III (LGM-30G) was larger still: 59.9' tall and 5.5 in diameter, with a range of 5,000 to 6,270 nautical miles with a circular error probable of 0.25 miles, four times better than the Minuteman 1A.[101] Missile combat crew commander Stephen Laurence shared his impression of the missile: "You can see pictures of it but it doesn't really do it justice until you're standing next to it. It's really quite astounding."[102] The Minuteman III embodied a military doctrine of "flexible response," reflected in its significantly larger multiple independently targetable reentry vehicle (MIRV) warhead: "The MIRV could deliver three hydrogen bombs to widely scattered targets, a capability that would 'render current and contemplated antimissile defense systems largely inadequate,' and 'thrust the world into a new era of weapons for mass destruction.'"[103] The new missile, "longer and more powerful than its predecessors," included "an improved guidance system that could be retargeted in minutes."[104] Rather than requiring a team to physically visit each LF, the SAC Command Data Buffer retargeting system enabled the combat crew in the LCC to remotely reprogram its missiles. SAC could communicate new targeting data to the LCC, and the combat crew could then input the new information by keyboard and transmit it to the individual missiles.

Installation of Minuteman III missiles began in January 1970, with the first wing operational at Minot AFB in December 1971. Minuteman III wings became operational at Grand Forks AFB in 1973 and F.E. Warren in 1975. Fifty Minuteman IIIs replaced Minuteman IIs in 1975 at the 564th Strategic Missile Squadron at Malmstrom AFB. From 1975 to the deactivation of the Minuteman II the US ICBM force consisted of 550 Minuteman IIIs and 450 Minuteman IIs.

Operation of the Minuteman System

Launch Procedures. Once operational, the purpose of the Minuteman system was to stand on alert twenty-four hours a day, in preparedness to launch missiles in response to an enemy attack. The LCC was a "no-lone zone," meaning that anyone entering had to be in the company of, or observed by, another person "who could detect erratic behavior or sabotage attempts. Launch control officers carried sidearms and were authorized to shoot in order to guard against sabotage or an unauthorized launch."[105] The two-person combat crew on duty for twenty-four-hour shifts in the LCC had the responsibility for firing all or part of its flight of missiles upon receipt of authenticated launch orders from the national command authority. Early warning of a missile attack would come from surveillance satellites and/or coastal radar facilities linked to the North American Aerospace Defense Command (NORAD).

NORAD would alert the President, who as the civilian Commander in Chief in charge of the military, would determine the appropriate response. If the President opted for land-based nuclear retaliation, coded orders would

[100] Stumpf, *Minuteman*, 37 and 180.
[101] Stumpf, *Minuteman*, 37 and 180.
[102] US Air Force, "Minuteman III ICBM," Military Notes, video documentary (N.p.: US Air Force, 2017).
[103] Quoting a *New York Times* article, *Minuteman Missile Sites*, 40.
[104] *Minuteman Missile Sites*, 40.
[105] *Minuteman Missile Sites*, 48.

be sent to selected LCCs. Upon authentication of an order to launch a missile, the commander and deputy commander would retrieve the launch keys from the red safe above the Deputy Missile Combat Crew Commander's console. The combat crew would buckle themselves into their seats and execute a procedure checklist culminating in the simultaneous turning of launch keys by both from their respective consoles in the LCC. A critical security feature of the system required both keys to be turned in unison, and the separation of the officers' positions in the LCC prevented one person from operating both launch keys. The final step in firing a missile required the combat crew in another LCF to turn their keys as well, providing a "second vote" for a launch.[106] The time from receipt of the orders to "missile away" would take less than five minutes. Asked what the combat crew did after the launch, missileer Scott Mattson responded "We had no plan after that. If you survived the war, there was, you were on your own again. What topside would have looked like after a war, who knows."[107]

Targeting. Targeting of the Minuteman I missile was accomplished by targeting teams who physically traveled to LFs. Each Minuteman I could store two possible targets. Within the underground launch equipment room at the LF, the team would run a series of punched tapes through equipment that communicated targeting information to the missile's guidance system. A successful retargeting was confirmed by the combat crew in the LCF. The process took a minimum of several hours for each LF, so rapid and flexible retargeting was impossible. The missileer combat crews did not know the specific targets associated with their flight of missiles.

Security. Security of the LCFs and LFs was a major consideration in the design and operation of the Minuteman system. Above the Missile Combat Crew Commander's console in the LCC was a large mirror, permitting him or her to observe the deputy commander and the LCC entrance. Each LCF had a flight security controller (FSC), a noncommissioned officer who oversaw security alert teams at the flight's LCF and missile launch facilities. The pressurization of the buried HICS cables connecting the LCFs to the LFs was another security feature. A drop in the pressurization would alert the combat team in the LCC of mechanical failure or deliberate tampering with the communication link. They would advise the FSC who would dispatch a security team to investigate. Former personnel report that the security monitoring devices at the LFs were sensitive enough to be triggered by coyotes, foxes, or rabbits.[108]

Testing and Later Upgrades. The Follow-on Operational Test and Evaluation program ensured that missiles on alert would perform as anticipated. A launch facility was randomly selected, and its missile and all critical launcher components removed and transported to Vandenberg AFB in California for a test launch. Missileer Dennis Lyon explained that combat crews and missile maintainers would participate by preparing the missile in a LF, monitoring the missile, launching it, and assessing its accuracy.[109]

In 1985 the Air Force initiated the Minuteman Integrated Life Extension Program (Rivet MILE) to make needed improvements for keeping the weapons system operational through 2005, consisting of three-year cycles extending from 1985 through 1994. Historians Christine A. Curran and Jeffrey A. Hess explained that the $493 million program was targeted at improving support infrastructure and not upgrading the weapon system, including "the reconditioning, repair, and maintenance of launch facilities and launch control facilities."[110]

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[106] Thus, four combat crew members in two different LCFs were needed to approve a launch.
[107] Quebec 01 Historic Site, visitor video.
[108] Quebec 01 Historic Site, visitor video.
[109] Dennis Lyon, email to Thomas H. Simmons, April 6, 2020.
[110] Stumpf, *Minuteman*, 394; Christine A. Curran and Jeffrey A. Hess, historians and Clayton B. Fraser, delineator and photographer, Minuteman III ICBM Launch Control Facility November-1, New Raymer, Weld County, Colorado, survey (photographs, measured drawings, written historical and descriptive data), HAER No. CO-84, Historic American Engineering Record, National Park Service, U.S. Department of the Interior, 1997, 42 (hereafter November-1 HAER report).

THE MX/PEACEKEEPER MISSILE SYSTEM

MX/Peacekeeper Planning and Development

Although plans for a mobile version of the Minuteman were ultimately rejected, the Air Force continued to believe that a mobile system contributed to the survivability of its missile force. Planning began in the Nixon administration in 1972, when the Pentagon called for development of a new ICBM as a successor to the Minuteman that could destroy hardened targets and be based in a survivable manner.[111] The new weapon system was called the MX (for Missile eXperimental).[112] In the first year of his administration in 1977, President Jimmy Carter determined to proceed with the development and deployment of the MX and other military enhancements.[113] The new missile would be an answer to the Soviet Union's SS-18, a ten-warhead MIRV weapon system. In 1979 President Carter asserted the missile was needed as part of the nation's nuclear triad "to assure our country a secure strategic deterrent now and in the future. The MX will enable us to continue with a modernized, unsurpassed survivable strategic deterrent ICBM."[114] Despite the emphasis on mobility, Marvin Atkins, Director for Offensive and Space Systems in the Department of Defense (1978-83), stated that the initial parameters for the missile required that it fit within existing Minuteman launch facilities in case that became the selected basing plan.[115]

Determining how the MX should be deployed in a manner to ensure its survivability in a nuclear exchange proved controversial and became the subject of numerous studies. The basing proposals required impact analyses and public comment following the provisions of the 1970 National Environmental Policy Act. Approximately forty basing options were considered for the missiles, including "flying them around on C-5 cargo planes, shuttling them in railroad cars, trucking them down highways, and moving them through tunnels from one silo to another as in an elaborate shell game."[116] In September 1979 President Carter embraced the latter approach, proposing that the missile be deployed "in a sheltered, road-mobile system to be constructed in our western deserts," a scheme that became known as "racetrack" or "shellgame."[117] The concept required that each of the two hundred missiles move back and forth among twenty-three shelters or 4,600 total shelters. The Soviets would have to commit at least that number of warheads to ensure destruction of all of the MX missiles.[118] The planned deployment area was located in Nevada and western Utah. The proposal drew opposition from national environmental groups and the Church of Jesus Christ of Latter Day Saints based in Salt Lake City.[119]

Controversy over the Missile

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[111] US General Accounting Office, "Report to the Secretary of Defense: Status of the Peacekeeper (MX) Weapon System," GAO/NSIAD-84-112, 9 May 1984, 1. The concept of survivability derived from the 1954 Killian Report, also known as the Surprise Attack Study, which addressed vulnerability by strategizing dispersal of facilities and bombers to assure ability to retaliate. See Karen Lewis, et al., *A Systemic Study of Air Combat Command Cold War Material Culture*, Volume I: Historic Context and Methodology for Assessment (Mariah Associates, Inc./United States Air Force Air Combat Command, Dec 1995), 32.

[112] Jeffrey A. Larsen, "Strategic Arms Control and the U.S. Air Force: The SALT Era, 1969-1980," in *Milestones in Strategic Arms Control, 1945-2000*, James M. Smith and Gwendolyn Hall, eds. (Maxwell AFB, Alabama: Air University Press, 2002), 103.

[113] Strobe Talbott, *The Master of the Game: Paul Nitze and the Nuclear Peace* (New York: Alfred A. Knopf, 1988), 154.

[114] Jimmy Carter, "MX Missile System Remarks Announcing the Configuration for Basing the Missile System," September 7, 1979, The American Presidency Project, www.presidency.ucsb.edu.

[115] Marvin Atkins, interview for "War and Peace in the Nuclear Age," December 4, 1987, WGBH Television, Boston, Massachusetts. https://openvault.wgbh.org/catalog/V_D4739A0883454F408B33161C4DF5CF00.

[116] Fred Kaplan, "All It Touched Off Was a Debate," *New York Times*, September 18, 2005.

[117] Carter, "MX Missile System Remarks," September 7, 1979.

[118] The shell game concept was elaborated in an Air Force video. See "The MX Shell Game," https://www.youtube.com/watch?v=44zytG8O40w, posted November 29, 2009.

[119] Dan Whipple, "Wyoming's Nuclear Might: Warren AFB in the Cold War," n.d., www.WyoHistory.org.

Journalist Chris Matthews concluded that President Ronald Reagan and his advisors recognized an opportunity "to exploit emerging U.S. advances in strategic weaponry as a way to drive the Kremlin to the bargaining table."[120] Former Air Force Undersecretary Peter Teets deemed the MX "the most politically charged program in the 1980s."[121] John Pike of GlobalSecurity.org called the missile "the defining symbol of an era. For its supporters, it was 'peace through strength.' For its opponents, it was 'the mad momentum of the arms race.'"[122] In his 1980 presidential campaign, Ronald Reagan pointed to what he saw as a "window of vulnerability" in America's strategic defense posture.[123] Once elected, he persuaded Congress to fund a number of weapons systems intended to enhance the country's standing vis-à-vis the Soviet Union. Historian Charles D. Dusch, Jr. explained that "Reagan's initiatives focused on obtaining the resources needed to implement existing strategic goals successfully."[124] Reagan continued programs begun under Carter, such as air-launched and sea-launched cruise missiles (ALCMs and SLCMs), as well as obtaining the B-1 bomber, deploying the Peacekeeper and Trident D5 missiles, continuing research and development on the Midgetman (a single-warhead missile), and procuring the Advanced Technology Bomber (the B-2 Spirit.) In 1983 President Reagan championed the Strategic Defense Initiative (SDI, nicknamed "Star Wars") to create a defensive missile shield against nuclear attack using lasers and other advanced technology. The Soviets viewed the purpose of such a system as a means of preventing a retaliatory attack following a first strike by the US and its allies.[125]

The Reagan administration rejected the basing approach adopted by Carter and continued studying other options for the missile. In a November 1982 address the president noted that deceptive basing was "fundamentally sound," but concluded that the $40 to $50 billion cost of the systems and "the cost to our western citizens in terms of water, land, social disruption, and environmental damage seemed unreasonable."[126] The solution announced by Reagan involved deploying the missiles in launch facilities to be constructed in "closely spaced basing" or "dense pack" in southeast Wyoming under the control of F.E. Warren AFB. This approach called for putting each missile in newly-constructed launch facilities no more than 2,000' apart in an area of no more than fifteen square miles.[127] The president also renamed the MX missile the "Peacekeeper."[128] Proponents argued that closely based spacing would cause incoming Soviet missiles to explode and destroy each other (a theory known as "fratricide"), rather than their intended launch facility targets. Critics believed the fixed-basing plan contributed to the Peacekeeper's vulnerability to a Soviet attack.[129] Many in the news media and politics referred to the plan as "dunce pack," a term coined by Arnold L. Punaro, Staff Director of the Democratic Minority on the Senate Armed Services Committee.[130]

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[120] Chris Matthews, *Tip and the Gipper: When Politics Worked* (New York: Simon and Schuster, 2013), 312.

[121] *Denver Post*, September 22, 2005.

[122] *New York Times*, September 18, 2005.

[123] Kenneth Kitts, *Presidential Commissions and National Security: The Politics of Damage Control* (Boulder, Colorado: Lynne Rienner Publishers, 2006), 73.

[124] Charles D. Dusch, Jr., "Arms Control During the Reagan Administration," in *Milestones in Strategic Arms Control, 1945-2000*, James M. Smith and Gwendolyn Hall, eds. (Maxwell AFB, Alabama: Air University Press, 2002), 127.

[125] Rhodes, *Arsenals of Folly*, 159.

[126] Ronald Reagan, "Statement on Deployment of the MX Missile," November 22, 1981, Ronald Reagan Presidential Library and Museum, www.reaganlibrary.gov.

[127] John T. Correll, "Peacekeeper by Fits and Starts," *Air Force Magazine* (February 26, 2019). https://www.airforcemag.com/article/peacekeeper-by-fits-and-starts/.

[128] Peer Reviewer 2, comments on Quebec 01 LCF National Historic Landmark nomination, revised draft, July 2021. Thomas C. Reed, Reagan's Special Assistant for National Security Affairs and Secretary of the Air Force 1976-77, was present when the name "Peacekeeper" was selected. According to the peer reviewer, "to his everlasting regret, he [Reed] failed to fight for 'Minuteman IV' as the name."

[129] *New York Times*, November 22, 1982; Talbott, *The Master of the Game*, 192.

[130] Arnold L. Punaro with David Poyer, *On War and Politics: The Battlefield Inside Washington's Beltway* (Annapolis, Maryland: Naval Institute Press, 2016), 113.

The Political Battle for Funding and Deploying the Peacekeeper

Congress was unconvinced by the closely spaced basing concept and refused to fund it. President Reagan's announcement of a preferred alternative for basing the Peacekeeper did not end the debate. Faced with declining support in Congress for the Peacekeeper, President Reagan noted in December 1982 that "the need for the missile itself has long been apparent. Both Presidents Ford and Carter before me have vigorously argued that the country needs this new system. … A vote against MX production today is a vote against arms control tomorrow."[131]

To bolster support for the missile, in January 1983 Reagan created the Presidential Commission on Strategic Forces, headed by former Air Force Lt. Gen. Brent Scowcroft, to study US nuclear forces. In April 1983 the commission concluded that "deployment of MX is essential in order to remove the Soviet advantage in ICBM capability and to help deter the threat of conventional or limited nuclear attacks on the alliance. Such deployment is also necessary to encourage the Soviets to move toward the more stable regime of deployments and arms control. . . ."[132] The commission proposed basing the Peacekeepers in existing Minuteman III launch facilities at F.E. Warren Air Force Base in southeast Wyoming.

The Scowcroft Commission's support for the missile may have persuaded some wavering members of Congress to approve releasing funds in May 1983 for flight testing of the missile. That victory (and subsequent votes clearing hurdles for the missile) was narrow and bipartisan, coming from a Congress controlled by Democrats. Former President Richard Nixon judged that many in Congress voted for the MX "in the hope that they [the missiles] would be an effective bargaining chip in the Geneva negotiations."[133] Political scientist Kenneth Kitts argued that the vote supporting Peacekeeper ensured ultimate production of the missile: "With initial funding having been granted, the MX would soon acquire a political and industrial constituency all its own."[134] Although initial plans called for two hundred Peacekeepers, their high price tag ultimately led Congress to provide funding for only fifty.

In 1985 a final effort to adopt a deceptive basing scheme was proposed. The concept revisited the late 1950s proposal to deploy Minuteman missiles on the railroad network. The Peacekeeper Rail Garrison envisioned twenty-five missile trains, each carrying two Peacekeeper missiles in specially designed launcher cars. Journalist John T. Correll described the plan: "Day to day, the trains would be parked in special 'igloos' on military bases. Each 'garrison' would consist of about 50 acres of land and use several igloos to house the trains. In times of crisis, the trains would move out onto the 200,000 miles of commercial rail track."[135]

The rail garrison proposal did not gain support, and the plan to place the missiles in existing Minuteman launch facilities was carried out. In voting against funding for an additional twenty-one missiles in 1985, Sen. Tom Harkin (Democrat-Iowa) judged the Peacekeeper in fixed launch facilities a "glass-jaw missile … It's big, it's strong, but it can't take a punch."[136] The fifty missiles ultimately deployed are estimated to have cost at least $21.7 billion dollars (not counting the initial Minuteman investment for LCFs and LFs).[137] Reagan biographer

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[131] *New York Times*, December 11, 1982.

[132] *New York Times*, January 4, 1983 and April 12, 1983. The Soviets had already deployed the SS-18, a multiple-warhead ICBM. The commission also recommended developing a small, mobile ICBM (the Midgetman), which was never implemented.

[133] Richard Nixon, "Superpower Summitry," in *The Reagan Foreign Policy*, William G. Hyland, ed. (New York: New American Library, 1987), 120.

[134] Kitts, *Presidential Commissions and National Security*, 92.

[135] Correll, "Peacekeeper by Fits and Starts."

[136] *Los Angeles Times*, March 20, 1985.

[137] US General Accounting Office, "Report to the Secretary of Defense: Status of the Peacekeeper (MX) Weapon System," 5.

Lou Cannon observed: "Because the multiple-warhead MX is much more destructive and accurate than the Minuteman, it was a far more worrisome weapon to the Soviets."[138]

The Reagan administration viewed approval and deployment of the Peacekeeper as vital in negotiating arms reductions with the Soviet Union as well as a needed weapons system. Secretary of State George P. Shultz asserted that "without the MX, we had no leverage with the Soviets," believing approval of Peacekeeper was necessary "for the sake of our security interests and for our negotiations [i.e., the Strategic Arms Reduction Talks (START)]."[139] In 1987 Secretary of Defense Caspar Weinberger explained: "We deployed the Minuteman in the 1960s and we never did anything about it until 1985 when the first MX missile went in, except talk. And the Soviets in the meantime deployed four whole new systems, . . ." He described the MX as "the designed missile, the planned missile, to replace the Minuteman. . . . So the MX was very important. It was not our only priority. But it was a very important priority."[140]

Peacekeeper Missile Characteristics

The Peacekeeper missile (LGM-118A) represented the largest, most accurate, and most lethal ICBM deployed to that time by the US. Like the Minuteman III, it was also a multiple independently targetable reentry vehicle (MIRV). The four-stage missile used an inertial guidance system, traveled at more than 15,000 miles per hour, had a range of more than 6,800 miles, weighed 195,000 pounds, and measured 71' in length and 7'-8" in diameter.[141] Four different companies produced the missile components: Thiokol the first stage, Aerojet the second stage, Hercules the third stage, and Rocketdyne the fourth stage. Martin Marietta and Denver Aerospace (later Lockheed Martin) assembled and tested the missiles.[142] The missile carried ten Avco MK-21 re-entry vehicles each carrying a 300-kiloton nuclear warhead, compared with the Minuteman III's three warheads. This provided greater flexibility, permitting one missile to deliver warheads to ten different targets.

The use of a Kevlar epoxy composite airframe reduced the missile's weight and permitted a larger nuclear payload. The first three stages used solid fuel, while the fourth stage (or post-boost vehicle) featured a storable liquid fuel propulsion system that permitted velocity and attitude adjustments. The Peacekeeper's enhanced inertial guidance system, coupled with the maneuverability of the fourth stage, improved targeting through more precise positioning of the warheads prior to release on their respective trajectories. The circular error probable for the Peacekeeper was just 394'.[143] Each of the ten warheads had a yield approximately twenty times the power of the device detonated at Hiroshima.[144]

The Peacekeeper was the first US ICBM to employ "cold launch" technology, an innovation that permitted the missile's deployment in existing Minuteman launch facilities. The process involved lowering a canister into the LF and then inserting the missile. During launch, high pressure steam ejected the missile from the launch

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[138] Lou Cannon, *President Reagan: The Role of a Lifetime* (New York: Public Affairs, 1991), 139.

[139] George P. Shultz, *Turmoil and Triumph: Diplomacy, Power and the Victory of the American Ideal* (New York: Simon and Schuster, 2010), 524 and 533.

[140] Caspar Weinberger, interview, "War and Peace in the Nuclear Age," WGBH, Boston, Massachusetts, December 4, 1987.

[141] Col. Timothy M. Laur and Steven L. Llanso, *Encyclopedia of Modern U.S. Military Weapons* (New York: Berkley Books, 1995), 465-66; Martin Marietta LGM-118A Peacekeeper, Fact Sheet, National Museum of the United States Air Force, www.nationalmuseum.af.mil, last updated July 13, 2015.

[142] Marietta, LGM-118A Peacekeeper.

[143] This meant that half of the missile's projectiles were expected to fall within a circle with a radius of 394'.

[144] Wade Boese, "United States Retires MX Missile," *Arms Control Today*, 1 October 2005; Laur and Llanso, *Encyclopedia of Modern U.S. Military Weapons*, 465-66.

facility to a height of 150' to 300' above the surface, where the first stage of the missile ignited and sent the missile on its way. By contrast, the Minuteman III first stage ignited in the underground launch facility.[145] The use of cold launch technology meant less launch damage to the LF, as well as the theoretical reloading of a replacement missile in less time by a smaller crew.[146]

Installation and Operation of the Peacekeeper Missile System at F.E. Warren AFB

In 1986, work started to deploy the Peacekeeper at F.E. Warren AFB, the only installation to receive the missile. The 400th Strategic Missile Squadron, with five LCFs and fifty LFs housing Minuteman IIIs, was selected to receive the Peacekeeper. A much larger missile than the Minutemen III, the Peacekeeper required modification of the launch facilities and upgrades to the launch control centers.[147] Ten Peacekeepers became operational in 1986, and by 1988 all fifty were on alert.[148] The LCFs and LFs continued the same functions, procedures, and staffing as under Minuteman III. Women began serving on Peacekeeper combat crews in early 1989.[149]

To ensure that the Peacekeeper would perform as expected, occasional test launches were performed at Vandenberg AFB in California, under the same procedures as used for the Minuteman. Missileer Jay E. Orgeron stated the Air Force tried to make the test launches "as real world as possible."[150] Missileer Dennis Lyon indicated that the 400th Strategic Missile Squadron at F.E. Warren AFB generally did three Peacekeeper test launches a year. He reported that three, two-person combat crews participated in the test launch and the purpose of the program was "to ensure that the field force was being properly maintained, that its reliability and performance were within specs, and that crew procedures were effective."[151]

The Nuclear Freeze Movement and Concern over Nuclear Weapons

The installation of Atlas, Titan, and Minuteman ICBMs attracted some opposition in the late 1950s and early 1960s from national peace organizations, as well as locally-led protests in individual missile fields, including sometimes fierce opposition from landowners slated to receive LCFs or LFs. The planning and selection of deployment locations preceded the enactment of the National Environmental Policy Act (1970), which would have required an extensive public engagement process and consideration of alternatives. Many residents of the areas accepted the missiles as part of daily life, reflecting a feeling of patriotism or a belief the installations enhanced local economies. Reagan's rhetoric and policies during the 1980 campaign and as president stimulated increased interest and concern about the nation's nuclear arsenal, including opposition to the Peacekeeper missile.

In December 1979 Randall Forsberg formulated what she called the Nuclear Weapons Freeze Campaign, a movement to halt the nuclear arms race by "freezing" existing levels of nuclear armaments held by the US and the Soviet Union, with the ultimate goal of reducing or eliminating such arms in the future. The movement gained the support of a number of peace groups, such as the Union of Concerned Scientists and Physicians for

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[145] Given the length of the Peacekeeper, the depth of existing launch facilities was not sufficient to permit Peacekeeper ignition underground.

[146] How this reprovisioning might have been accomplished during a nuclear exchange that targeted the missile fields is unclear and is likely still classified.

[147] Christina Bird and Eric L. Leonard, "No Lone Zone: Preservation Paths in Preserving ICBM Facilities," paper presented at the *Preserving U.S. Military Heritage: World War II to the Cold War Conference*, Fredericksburg, Texas, June 4-6, 2019. The use of the cold launch steam ejection system enabled the Peacekeeper to fit in Minuteman launch facilities. Other modifications included replacing the missile suspension system and adding buffer panels to the sides of the missile.

[148] Marietta LGM-118A Peacekeeper.

[149] "Female Missileers," Minuteman Missile National Historic Site, https://www.nps.gov/articles/femalemissileers.htm.

[150] Orgeron, interview, 2020.

[151] Lyon, email, 2020.

Social Responsibility. The movement succeeded in attaining passage of resolutions supporting the freeze in the early 1980s by cities, counties, and states, and by the US House of Representatives in 1983. Other activities of the movement included picketing gates of military bases housing nuclear weapons, holding protest vigils, and breaching launch facility perimeters and damaging surface components.[152] Installation of the Peacekeeper at F.E. Warren AFB in Wyoming drew more local opposition than earlier missile deployments in the state. Rancher Lindi Kirkbride argued the Peacekeeper installation would make the area more of a priority target for Soviet missiles: "We knew we were part of the hit list. We were up in the top three."[153]

During 1985-87 Nukewatch, a peace action organization that seeks the elimination of nuclear weapons, undertook an effort to map all of the nation's launch control facilities and launch facilities. A follow-up project quality checked the results in 1987-88 and led to publication of *Nuclear Heartland* (1988). The effort became the most effective program undertaken by anti-nuclear weapons groups. Nukewatch co-director Samuel E. Day, Jr. explained the mapping project made the facilities "accessible for the first time to large numbers for whom nuclear weapons and nuclear warheads are only an abstraction—never seen, never sensed, never experienced. In calling attention to a weapons system long accepted and justified in the name of 'nuclear deterrence,' the mapping project also challenged the basis of the policy of deterrence."[154]

Agreements to Reduce Nuclear Weapons

In the 1970s, the US and the Soviet Union took steps to slow the arms race. The 1972 Strategic Arms Limitation Treaty (later known as SALT I) froze each country's number of land- and sea-based ballistic missiles at current levels. The agreement also limited anti-ballistic missiles (ABMs) to one deployment area and a maximum of one hundred missiles. In 1979 the two nations agreed on SALT II, which capped the number of launchers possessed by each nation at 2,400, banned new launchers, limited the numbers of warheads per missile, and restricted missile size and payloads.[155] The US Senate did not ratify the treaty, and President Carter withdrew it from consideration after the Soviet invasion of Afghanistan in December 1979. The deployment of the Peacekeeper in the late 1980s took place concurrently with growing efforts to reduce the US and Soviet Union's stockpiles of nuclear weapons. Ronald Reagan had entered the presidency championing large increases in the defense budget and new weapons systems, but he declared in his State of the Union address in 1984 that "a nuclear war cannot be won and must never be fought."[156] In 1987 the US and the Soviet Union agreed to the Intermediate Nuclear Forces (INF) Treaty in 1987, which removed intermediate- and short-range nuclear missiles from Europe.

The fall of the Berlin Wall in 1989 and the collapse of Soviet control resulted in the rise of democratic governments in Central and Eastern Europe. In July 1991 Reagan's successor, President George H.W. Bush, and Soviet President Mikhail Gorbachev signed the Strategic Arms Reduction Treaty (START I), which called for the two nations to reduce the number of warheads each held to 6,000 and the number of launch platforms to 1,600, including long-range bombers and ICBMs. In 1991 the formal dissolution of the Soviet Union and the

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[152] Lawrence S. Wittmer, "The Nuclear Freeze and Its Impact," December 1, 2010, Arms Control Association. Armscontrol.org; Day. *Nuclear Heartland*, 20-23.

[153] "Ground Zero, Wyoming," Main Street Wyoming Series, video documentary (Riverton, Wyoming: KCWC Wyoming Public Television, 2007).

[154] Day, *Nuclear Heartland*, 26.

[155] Office of the Historian, US Department of State, "Strategic Arms Limitations Talks/Treaty (SALT) I and II," history.state.gov (accessed June 28, 2021).

[156] Quoted in Andrew Lanham, "Lessons from the Nuclear Freeze Movement," *Boston Review*, March 14, 2017, bostonreview.net. Reagan's position may have been impacted by his viewing of the made-for-television film "The Day After," in October 1983. The film depicted the aftermath of a nuclear war on a Lawrence, Kansas, family, and Reagan wrote in his diary that the program was "very effective and left me greatly depressed."

creation of the Russian Federation marked the end of the Cold War. In September 1991, Bush ordered that the remaining 450 Minuteman II missiles be withdrawn from alert. All Minuteman IIs were removed from launch facilities by 1995.[157]

In the final days of the George H.W. Bush administration in January 1993, the US and the Russian Federation signed a new Strategic Arms Reduction Treaty (START II), which limited each country's number of warheads to 3,500 and prohibited more than one warhead per missile. The US Senate ratified the treaty in 1996, followed by the Russian legislature in 2000. The 2002 Strategic Offensive Reductions Treaty (SORT) further reduced the number of deployed nuclear warheads to between 1,700 to 2,200 for each nation.

The end of the Cold War brought reorganization to the missile force. In 1992 the Strategic Air Command was dissolved and land-based ICBMs and manned bombers turned over to the Air Combat Command. In 1993 the missiles came under the control of the Air Force Space Command (AFSPC). In November 1993 AFSPC provided formal guidance to replace "Launch Control Facility" with the term "Missile Alert Facility" for both Minuteman and Peacekeeper installations.[158]

Decommissioning the Peacekeeper

The START II Treaty, which limited missiles to a single warhead, proved a death knell to the ten-warhead Peacekeeper. The missile could have been retained with its payload reduced to a single warhead, but scientists John A. Swegle and Douglas J. Tincher noted: "Under the circumstances, continued maintenance of Peacekeeper as a single-warhead delivery system made no sense."[159] Deactivation of the Peacekeepers began in 2003, and the missiles were removed by 2005. After 2013 all but one of the fifty Peacekeeper launch facilities were filled with earth and gravel; one LF was retained as a training facility. The former LF sites were offered for sale, with adjoining landowners given first purchase option.[160]

When the final Peacekeeper was retired in September 2005, most concurred that the missile played a role in helping to end the Cold War. To mark the missile's deactivation, Secretary of Defense Donald Rumsfeld asserted: "Our nation prevailed over a determined Soviet adversary with the close of the Cold War, and the Peacekeeper played an important role in that monumental achievement."[161] At the missile retirement ceremony at F.E. Warren Air Force Base, Air Force Undersecretary Ronald Sega credited the Peacekeeper with helping to end the Cold War and asserted: "Along with the rest of the nuclear triad, the Peacekeeper was a great stabilizing force in an increasingly unstable world."[162]

Jack Matlock, Jr., former ambassador to the Soviet Union (1987-91), acknowledged the Peacekeeper played "a very small part" in ending the Cold War and stated that President Reagan saw the missile as a "negotiating chip." Matlock pointed to the rise of such Russian leaders as President Mikhail Gorbachev, who held different

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[157] Lonnquest and Winkler, *To Defend and Deter*, 132-33.

[158] Association of Air Force Missileers, Key ICBM History Timeline, November 5, 1993, Association of Air Force Missileers website, https://www.afmissileers.org/KEY-ICBM-HISTORY (accessed December 29, 2021); Mark Sundlov, Director, Soldiers Memorial Military Museum, Missouri Historical Society, St. Louis, Missouri, email to Thomas H. Simmons, December 29, 2021. The terminology change may have reflected reduced international tensions in the post-Cold War period. Sundlov, a former missileer, opined that "MAF seems to be a more accurate term and places the emphasis on 'alert' rather than on 'launch control.'"

[159] John A. Swegle and Douglas J. Tincher, "Reductions without Regret," SRNL-STI-2013-00551, Savannah River National Laboratory, September 9, 2013, 6.

[160] "Peacekeeper Silos to Be Eliminated," Media advisory, F.E. Warren AFB, August 23, 2013. Other environmental mitigation measures would have been performed at each site, including removal of equipment and tanks. Some ranchers who acquired LFs use the fenced areas for livestock corrals or hay or vehicle storage.

[161] *Deseret News*, October 7, 2005.

[162] "Peacekeeper Missile Mission Ends during Ceremony," www.af.mil, September 20, 2005.

perspectives on the arms race than earlier Kremlin officials, as an additional factor.[163] Arnold Punaro, retired Marine Corps major general and Senate Armed Services Committee staff director in the 1980s, believes the Peacekeeper played a key role in winning the Cold War: "The forts that we now go visit as museums were the MX missiles of their day. They preserved our defenses, deterred attacks."[164]

No Minuteman or Peacekeeper missile on alert was ever launched at an adversary from a launch facility in the American heartland. With the decommissioning of the Peacekeeper, the remaining Minuteman III missiles alone comprise the land-based leg of the US nuclear triad. Four hundred fifty missiles are deployed at F.E. Warren AFB, Wyoming, Malmstrom AFB, Montana, and Minot AFB, North Dakota.

ROLE OF THE QUEBEC 01 LAUNCH CONTROL FACILITY

Selection of Francis E. Warren Air Force Base for a Minuteman Missile Wing

Reflecting the deployment and operation of the nation's successive missile systems over the 1965-2005 period is the role played by the Quebec 01 Launch Control Facility north of Cheyenne, Wyoming. In March 1962 the Secretary of the Air Force selected Francis E. Warren Air Force Base (AFB), Cheyenne, Wyoming, to house a Minuteman missile wing, and Quebec 01 was part of the initial deployment of Minuteman IB missiles.

The facility began as Fort D.A. Russell, a cavalry post established by the US Army in 1867 to protect construction of the Union Pacific Railroad.[165] The fort became a permanent Army post in 1884 and many brick buildings were constructed. It continued to house infantry, cavalry units, and artillery. Renamed Fort Francis E. Warren in 1930, the facility received hundreds of new buildings in 1940-41 and served as a training base for the Quartermaster General Corps. The post became an Air Force installation in 1947 and was designated F.E. Warren Air Force Base in 1949. The facility expanded its training mission, as well as processing thousands of reservists to active duty during the Korean War. In 1957 the Air Force selected F.E. Warren AFB to become an ICBM installation, initially housing Atlas D and E missiles.[166]

The 90th Strategic Missile Wing, the fifth Minuteman missile wing, was activated at F.E. Warren AFB in July 1963 under the Strategic Air Command. The wing was placed in charge of the base's Minuteman missiles and consisted of four strategic missile squadrons: the 319th, 320th, 321st, and 400th. Each squadron was composed of five flights designated by a letter in the military alphabet, Alpha through Tango, with each flight controlling ten missiles. The two hundred missiles of the squadron were deployed in an area north and east of Cheyenne, in Laramie, Platte, and Goshen counties of southeast Wyoming; Cheyenne County, Nebraska; and Logan and Weld counties, Colorado (see Figure 6). The missile field covered approximately 12,600 square miles (roughly the area of the State of Maryland), extending from Wheatland and Torrington, Wyoming, on the north; to Sidney and Lodgepole, Nebraska, on the east; and to Sterling and New Raymer, Colorado, on the south.[167]

The 90th Strategic Missile Wing traces its lineage to the 90th Bombardment Group (Heavy), activated in 1942, which flew B-24 Liberator bombers in the War in the Pacific. Headed by Col. Arthur H. Rogers, the unit was known as the Jolly Rogers and adopted a skull above crossed bombs for its tail art. The 90th Bombardment

[163] Boese, "United States Retires MX Missile," *Arms Control Today.*

[164] *New York Times*, September 18, 2005.

[165] Fort D.A. Russell was designated a National Historic Landmark on May 15, 1975.

[166] George R. Adams, Francis E. Warren Air Force Base, NRIS.69000191, National Register of Historic Places, district nomination, September 1, 1974; "Fort F.E. Warren Becomes an Air Force Installation," Warren ICBM and Heritage Museum, Cheyenne, Wyoming.

[167] November-1 HAER report, 4; Stumpf, *Minuteman*, 131.

Group was deactivated in 1947.[168] Upon reactivation as a strategic missile wing, the unit continued the use of the earlier imagery which was displayed on unit patches and depicted in wall art at LCFs.

Construction

The Ralph M. Parsons Company of Los Angeles, California, and J.T. Banner & Associates of Laramie, Wyoming, designed the launch control facilities and launch facilities. On October 15, 1962 Morrison-Knudsen Company (M-K) of Boise, Idaho, and its associated subcontractors received an $83.95 million contract for construction of the F.E. Warren facilities that included twenty missile flights composed of twenty launch control facilities (LCFs) and two hundred launch facilities (LFs). The Warren AFB missile wing was one of only two to receive twenty missile flights and two-hundred missiles. Contract modifications brought the final cost to $90.1 million. Construction extended 603 days, from October 1962 to July 1964.[169]

One of the deployment's LCFs was Quebec 01, located twenty-five miles north of Cheyenne in Laramie County, Wyoming, on the west side of two-lane US Highway 87 (see Figure 7).[170] In 1962 the sparsely settled rolling landscape of the area included three ranches associated with members of the Duvall family (Hoyt, F.L., and Dick), located on both sides of the highway.[171] The initial 4.49 acres of land for Quebec 01 was purchased from Hoyt L. and Leona Duvall in 1962.[172] Construction of the facilities for the Quebec flight began in January 1963 and were completed in July 1964 as part of the 400th Strategic Missile Squadron. The Quebec flight's deployment area lay on the west edge of the F.E. Warren missile field near its northwest corner. Missile launch facilities linked to Quebec 01 were designated Quebec 02 through 11 and were deployed from west of Chugwater to several miles southwest of the LCF. Five LFs lay north of Quebec 01, three south, and two east, on the east side of US Highway 87.

The first Minuteman missiles for the F.E. Warren missile field arrived by rail from Hill AFB in Ogden, Utah, in June 1964. The squadrons became operational in stages: the 321st in July 1964, the 320th in December 1964, and the 321st in March 1965. The Quebec 01 LCF and its LFs were part of the 400th Strategic Missile Squadron, which was activated in July 1962 and became operational in June 1965. The 1990 Bristol Ridge, Wyoming, USGS topographic map identified the LCF as a "pumping station," a possible effort at misdirection from its actual purpose.

Operation of the Quebec 01 Launch Control Facility

When it went on alert in June 1965, the 400th Strategic Missile Squadron was equipped with Minuteman IB missiles (see Figure 8). Quebec 01 on US 87 north of Cheyenne was the most accessible LCF in the squadron. Missileer Jay E. Orgeron recalled "Quebec was the ideal place to go," given its proximity to F.E. Warren AFB. Missileer André Shappell concurred, noting it was only twenty-five or thirty miles down the road from Cheyenne.[173] Accordingly, it was the LCF most often made available for visits by higher echelon military and

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[168] Kyle J. Brislan, "The End of the 90th Strategic Missile Wing," *Cheyenne Minuteman*, August 31, 1991. https://cheyenneminuteman.com. The imagery was inspired by the Jolly Roger flag flown by pirate ships in the eighteenth century, which featured a white skull above crossed bones on a black field.

[169] Stumpf, *Minuteman*, 131, 150, and 415.

[170] "Quebec" comes from the military alphabet or, formally, the International Radiotelephony Spelling Alphabet. The other flights in the squadron were designated Papa, Romeo, Sierra, and Tango.

[171] US Geological Survey, Bristol Ridge, Wyoming, 7.5' quadrangle map, 1962; AA Roads, Interstate 25, Wyoming, www.aaroads.com, accessed January 11, 2020. Interstate 25 through this area was not completed until 1967.

[172] US Army Corps of Engineers, Segment "FQ-1," project map (showing boundaries of leased and purchased parcels for the Quebec 01 LCF), October 8, 1962 (updated through October 1, 1971), on file F.E. Warren AFB, Cheyenne, Wyoming. Adjacent tracts totaling about three acres were leased from Duvall during construction and then released to him in December 1964.

[173] Orgeron, interview; Shappell in Quebec 01 Historic Site, video.

political visitors (Distinguished Visitors, DVs, in military jargon). Former Quebec 01 Facility Manager Mark Warner called it the "showsite" for the 90th Strategic Missile Wing and agreed that there were frequent tours.[174]

The LCF gained a vehicle storage building in 1966. The following year, Interstate 25 replaced US 87 through the area. In 1969 an additional 1.37 acres was acquired from the surrounding Duvall ranch. This included a plot to the east for a helicopter pad and land at the southwest holding the south sewage lagoon. F.E. Warren began operating helicopters in 1965 to transport personnel and supplies to LCFs and LFs in the missile field. Quebec 01's location on the open Wyoming prairie meant that wind and weather often impacted personnel at the LCF. Former missileer Orgeron recalled one day at Quebec 01 when it was snowing so hard that one could not see the vehicle storage building from the windows of the flight security controller's office a short distance north.[175]

The missiles based at F.E. Warren AFB had not been upgraded to Minuteman IIs by the time the Minuteman III became available. Therefore, the intermediate upgrade was skipped, and the changeover to Minuteman IIIs began in November 1972. Quebec 01 and the remainder of the 400th Strategic Missile Squadron became the first unit to go operational with the Minuteman III, completing the conversion in November 1973 (see Figure 9). The replacement of all two hundred missiles at F.E. Warren AFB extended until January 1975.

The Peacekeeper Missile Comes to Quebec 01

F.E. Warren AFB was the only location in the country (or world) to receive the Peacekeeper missile, installed in fifty modified Minuteman launch facilities of the 400th Missile Squadron, 90th Strategic Missile Wing. The three remaining squadrons continued to control 150 Minuteman III missiles. The launch tubes in the LFs at F.E. Warren were 90' deep, which may have been a factor in its selection to house the Peacekeeper, a much longer missile than the Minuteman.[176] The selection of Wyoming for the Peacekeeper deployment drew some opposition. In the late 1980s four hundred people attended a rally at LF Q 05 not far from Cheyenne.[177] Peace activists protested and monitored the conversion to Peacekeeper at some launch facilities, including Q 02 (see Figure 10).[178]

The 400th Strategic Missile Squadron's flights receiving the fifty Peacekeepers (flights Papa, Quebec, Romeo, Sierra, and Tango) were located at the northwest end of the missile field. The organizational structure under Minuteman was continued, with each flight consisting of one LCF and ten LFs. Existing 1960s-era Minuteman LCFs and launch facilities were repurposed for Peacekeeper, requiring upgraded electronics in the LCC and modifications to the LFs. In April 1986 work to convert the first LCC from Minuteman III to Peacekeeper began. Quebec 02 became the first launch facility to receive a launch canister for the Peacekeeper, and the full Quebec flight became operational by December 1986 (see Figure 11). All fifty Peacekeepers achieved operational capability by December 1988.[179] In April 1990 a Soviet inspection team visited Quebec 01 as part of the START arms control process.[180]

The 90th Strategic Missile Wing went through several redesignations in the last part of the twentieth century, becoming the 90th Missile Wing in 1991. After SAC was deactivated in 1992, the 90th was placed under the Air

[174] Mark "Ty" Warner, email to Thomas H. Simmons, February 21, 2020.
[175] Orgeron, interview.
[176] Stumpf, *Minuteman*, 96. Stumpf reported the two wings at F.E. Warren and Grand Forks AFBs plus the 564 Strategic Missile Squadron at Malmstrom AFB had the deeper launch facilities, "possibly to accommodate a future missile after Minuteman III."
[177] Day, *Nuclear Heartland*, 22.
[178] Day, *Nuclear Heartland*, 31.
[179] Stumpf, *Minuteman*, Appendix 3.8, Wing V Chronology, 5-7.
[180] Quebec 01 Historic Site, Facebook post, May 27, 2020.

Combat Command. In 1993 the unit was renamed the 90th Space Wing and became part of the Air Force Space Command. The 1994 unit insignia of the 400th Missile Squadron reflected its Peacekeeper mission, picturing a descending bomb, ten warhead trajectories arcing to their targets, and a sea of flames below.

Quebec 01 controlled Peacekeeper missiles from 1986 to the decommissioning of the missile in 2005 (see Figures 12 through 16). In about 1993 Quebec 01 was renamed a "missile alert facility" (MAF). The 400th Missile Squadron was deactivated in July 2006.[181] As part of the Peacekeeper decommissioning, the electronics in subsurface areas were removed from all five MAFs in the Quebec flight. The 50'-deep elevator shafts in the LCSBs were filled with construction debris and capped with concrete for all of the MAFs except Quebec 01.

QUEBEC 01 BECOMES A WYOMING STATE PARK

A 2013 programmatic agreement between the Wyoming SHPO and the US Air Force provided that Quebec 01 might be transferred to the State of Wyoming "for use as a museum and interpretive facility," a possibility included in the treaty between the US and Russian Federation.[182] The Air Force worked to restore electronic equipment, computer racks, and furniture to Quebec 01 to prepare for its transfer to the state. The electronic equipment is nonfunctional and is not connected to the former launch facilities. Francis Shive, former facility manager at Quebec 01, has visited the restored site and describes the LCC as "very, very close to what an actual configuration would have been back then. There may be a few variations, but they are insignificant."[183]

During 2018-19, the state developed an interpretive plan for the property and created and installed interpretive signage. A soft opening of the historic site occurred in August 2019, when Milward Simpson, former director of State Parks and Cultural Resources Department, said he was "pleased that the military had the vision that this was a way to tell a story that really needs to be told."[184] The formal dedication of the historic site came in October 2019. The site is operated by the Wyoming State Parks, Historic Sites and Trails Division of the Wyoming State Parks and Cultural Resources Department.

PREVIOUS RECOGNITION

According to the 2013 *Historic Structure Report* for Quebec 01, the Department of Defense determined the Quebec 01 LCF eligible for listing in the National Register of Historic Places "as an exceptionally significant property" for the role as an operational and launch support facility for Minuteman I and Minuteman III Intercontinental Ballistic Missiles (ICBMs) from 1964-1986, and the Peacekeeper ICBM system from 1986-2005."[185] In 2005 the Department of Defense determined the Peacekeeper ICBM System eligible for listing in the National Register of Historic Places (National Register) because it "possesses exceptional importance for the role it played in national defense during the Cold War (1946-1989)."[186] The Fort D. A. Russell National Historic Landmark at Francis E. Warren AFB boundary in Cheyenne, Wyoming, does not include any of the base's launch control facilities (LCFs) or launch facilities (LFs) responsible for controlling or launching Minuteman or Peacekeeper missiles.

COMPARATIVE ANALYSIS

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[181] "F.E. Warren AFB Says Farewell to 400th MS at Inactivation Ceremony," July 24, 2006, Air Force Space Command, www.afsc.af.mil.

[182] Programmatic Agreement between Francis E. Warren Air Force Base and the Wyoming State Historic Preservation Officer Regarding the Implementation of the Strategic Arms Reduction Treaty at Francis E. Warren Air Force Base, Cheyenne, Wyoming, March 4, 2013, 2.

[183] Shive, interview.

[184] Quoted in "Quebec 01 Site Opened," *Cowboy State Daily*, last updated August 21, 2019, www.cowboystatedaily.com.

[185] *Historic Structure Report*, 1.

[186] *Historic Structure Report*, ES-1

In comparison to any other extant facility, the Quebec 01 Launch Control Facility/Missile Alert Facility is the most intact representation of a resource controlling the Minuteman I and III and Peacekeeper ICBMs. This is a significant distinction, as this squadron at F.E. Warren AFB was the only location in the nation to house the Peacekeeper, the most advanced American ICBM in the latter stages of the Cold War.

Other Peacekeeper Missile Alert Facilities,
Papa 01, Romeo 01, Sierra 01, and Tango 01 MAFs, F.E. Warren AFB, Wyoming, not designated
The only direct comparative properties for the Quebec 01 Launch Control Facility/Missile Alert Facility are the other four LCFs/MAFs that controlled both Minuteman IB and III and Peacekeeper missiles (Papa 01, Romeo 01, Sierra 01, and Tango 01). Quebec 01 is by far the best preserved of MAFs within its flight. In accord with the treaty with the Russian Federation, at the time the Peacekeeper was decommissioned electronic equipment was removed and elevator shafts filled in the other four MAFs. As the underground components speak directly to the role of the LCF/MAF, these changes to the other four MAFs constitute an irreversible loss of integrity. The topside buildings remain, with the exception of the launch control support building at Romeo 01. Therefore, none of the other four MAFs possess the high level of integrity required for nomination as a National Historic Landmark.

Other Minuteman Missile LCFs/MAFs
Launch Control Facility Delta-01 and Launch Facility Delta-09, Cottonwood and Wall vicinity, South Dakota, Minuteman Missile National Historic Site, 1999
Launch Control Facility Delta-01 and Launch Facility Delta-09 are located along Interstate 90 southeast of Wall, South Dakota. From 1963 through 1994, they were part of the missile wing controlled by Ellsworth AFB, associated with Minuteman IB and then Minuteman II missiles. Under the 1991 Strategic Arms Reduction Treaty they were decommissioned. The facilities were designated as the Minuteman Missile National Historic Site in 1999. The Delta resources exhibit different historical associations than Quebec 01, serving only Minuteman IB and II missiles and not Minuteman III or Peacekeeper missiles.

Oscar-Zero Missile Alert Facility, Cooperstown, North Dakota, National Register of Historic Places, 2008 (NRIS.080000994)
Under the control of the Grand Forks AFB, the Oscar-Zero Missile Alert facility was completed in 1965 and controlled Minuteman II and III missiles from 1965-97. In 2009 the site opened as the Ronald Reagan Minuteman Missile Site, a public historic site operated by the State Historical Society of North Dakota. The site also includes the November-33 Launch Facility.[187] The Oscar-Zero MAF has different historical associations than Quebec 01, as it controlled Minuteman II and III missiles and was not associated with Minuteman I or the Peacekeeper missile.

Oscar-01 Missile Alert Facility, Whiteman AFB, Missouri, not designated but determined eligible to the National Register of Historic Places in 1998
Oscar-01 served as a Minuteman missile alert facility at Whiteman AFB, Missouri. It controlled Minuteman IB and II missiles from 1963 to 1993. Since 1996 the base has maintained the facility as a historic site open for tours. A National Park Service website noted "Oscar-01 was the only Minuteman control center that was built within the confines of an air force base; all other control centers were constructed in the rural areas surrounding bases. Oscar-01 was also the first control center where all-female, mixed-gender, and all African-American

[187] State Historical Society of North Dakota, Ronald Reagan Minuteman Missile Site, Oscar-Zero, website, https://www.history.nd.gov/historicsites/minutemanmissile/oscarzerohistory.html, accessed January 15, 2021. The LF was not included in the National Register nomination; the launch facility had been filled in upon decommissioning.

crews served alerts."[188] The Missouri SHPO determined Oscar-01 eligible to the National Register in 1998. Oscar-01 displays different historical associations than Quebec 01, as it was only associated with the Minuteman IB and II missiles and not Minuteman III or Peacekeeper.

Active Minuteman III MAFs, various states, not designated

There are approximately forty-five still operational MAFs that control the nation's remaining force of four hundred fifty operational Minuteman III missiles. These are associated with Malmstrom AFB, Montana, Minot AFB, North Dakota, and F.E. Warren AFB, Wyoming.[189] These MAFs reflect continuing operational use and have evolved with incremental upgrades and changes, including alterations to the interior configuration of the underground launch control capsules, the nature of the electronic components in the LCC, and substantial expansion of the surface launch control support building to accommodate longer duty tours. None of these MAFs were involved with the deployment of the Peacekeeper missile, an historic association distinct to Quebec 01.

[188] National Park Service, Oscar-One MAF, https://www.nps.gov/places/oscar-one.htm, accessed January 15, 2021.
[189] The F.E. Warren AFB deployment also includes facilities in Colorado and Nebraska.

6. PROPERTY DESCRIPTION AND STATEMENT OF INTEGRITY

Ownership of Property		**Category of Property**	
Private:		Building(s):	
Public-Local:		District:	X
Public-State:	X	Site:	
Public-Federal:		Structure:	
		Object:	

Number of Resources within Boundary of Property:

Contributing		**Noncontributing**	
Buildings:	4	Buildings:	0
Sites:	1	Sites:	0
Structures:	3	Structures:	0
Objects:	6	Objects:	3
Total:	14	Total:	3

PROVIDE PRESENT AND PAST PHYSICAL DESCRIPTIONS OF PROPERTY
(Please see specific guidance for type of resource[s] being nominated)

LOCATION AND SETTING
Located adjacent to Interstate 25 in Laramie County, Wyoming, the Quebec 01 facility stands 25 miles north of Cheyenne and 15.5 miles south of Chugwater (see Location Map).[190] The facility was constructed in 1964-65 as a launch control facility for the Minuteman IB missile. The elements of the facility, which mostly date to 1964-65, include: an underground launch control center and launch control equipment building and a surface launch control support building (LCSB), vehicle storage building (1966), sewage lagoons, and a helipad (1969), as well as smaller-scale features such as several different types of communication antennas, air intake and exhaust ducts, a basketball court, and a horseshoe pit (see Sketch Map). A chain link security fence topped with barbed wire encloses the area containing the standing resources.[191] The proposed NHL boundary encompasses 5.9 acres comprising the county assessor parcel holding Quebec 01. The long axis of the facility is oriented west-northwest to east-southeast.[192] All of the historic resources associated with the operation of the facility retaining historic integrity are included within the boundary. Fourteen of the seventeen resources are assessed as contributing to the property's national historic significance.

HISTORIC PHYSICAL APPEARANCE
The historic appearance of Quebec 01 remains virtually unchanged today. Most changes involve small-scale resources removed or added after the end of the national period of significance in 1991. No longer present is the ICBM super-high frequency satellite terminal (ISST), a pole-mounted radome that stood at the northeast corner

[190] Quebec 01 is located a half-mile west of Interstate 25, southwest of Exit 39. Quebec is the military phonetic term for the letter Q. The other four missile flights were designated P, R, S, and T.
[191] *Historic Structure Report*, 2-1 through 2-15.
[192] While containing the same components, the other LCFs in the 400th Missile Squadron displayed differing surface layouts and orientations.

of the LCSB; it was removed after 2003.[193] Two recreational resources were added or moved after the end of the period of significance, during Quebec 01's final years as an active Peacekeeper missile facility. These include a horseshoe pit (constructed ca. 1994) and a basketball pole and hoop (moved to its current location after 1995). After the US Air Force transferred ownership to the State of Wyoming, the installation became a state park in 2019, and a visitor information sign was installed adjacent to the security gate.

PRESENT PHYSICAL APPEARANCE

The present appearance of Quebec 01 very closely reflects its character during the period of national significance. The accompanying Sketch Map shows the nominated area, photograph locations, and constituent resources, which are discussed below. The 5.9-acre district includes all of one legal parcel in Laramie County, Wyoming. Fourteen of seventeen resources in the district are assessed as contributing. The Quebec 01 resources are discussed below, starting with the site and proceeding with its underground elements and then those on the surface.[194] An accompanying table lists the resources within the district, showing the type of resource and its contributing status. Twenty-nine photographs of Quebec 01 are included.

Quebec 01 LCF/MAF Site, 1963-64, Resource 1, Site, Contributing, Photographs 1 through 3, 24, and 28

The unremarkable appearance of Quebec 01's surface components belies its sophisticated subsurface character. The frame buildings on the surface or "topside" supported the two-person combat crew underground, as well as the ten missile launch facilities under Quebec 01's control. The level, treeless tract encompasses 5.9 acres, but most of the resources are located within two connected, off-set squares of land totaling about 2.5 acres in area. This smaller tract is surrounded by an 8'-tall chain link security fence surmounted with four strands of barbed wire. A motorized gate mounted on a overhead track provides entry on the east side at the access road leading to Interstate 25 (Photograph 2). An original flagpole stands inside the fence, north of the gate.

The northwest portion of the fenced area contains most of the LCF's resources, with the larger launch control support building (LCSB) situated near its center. The building is now used as an interpretive museum for the site and is staged to reflect its historic uses. The underground portions of the complex are accessed by elevator from the east end of LCSB and consist of the launch control center to the south and the launch control equipment building to the north.[195]

The smaller vehicle storage building stands southeast of the LCSB. It housed security and snow removal vehicles for the installation. The area between the LCSB and the garage is paved with asphalt and used for parking. The area north of the LCSB contains the hardened high-frequency receiving antenna and intake and exhaust ducts for the underground launch control equipment building. Southwest of the LCSB is a basketball pole and the hardened ultra-high-frequency antenna (Photograph 3).

The southeast square of land inside the security fence is mostly open, containing only the hardened high-frequency transmitting antenna and a horseshoe pit. Other features of the facility are located outside the secure area, including a concrete helipad and Wyoming Parks sign to the east and two sewage lagoons to the west, enclosed by a separate chainlink fence. Water for the LCF came from a deep well. To the south just outside the nominated area, on land under different ownership, are several wood posts with metal bands encircling their tops. The posts mark the route of the HICS communication cables that linked the LCF to missile launch

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[193] Christina Bird, Superintendent, Quebec-01 Missile Alert Facility, Chugwater vicinity, Wyoming, email to Thomas H. Simmons, February 1, 2021. The state park would like to reinstall the antenna if a suitable replacement can be located.

[194] In addition to fieldwork completed in October 2019, the description heavily relies upon the Quebec 01 *Historic Structure Report*.

[195] *Historic Structure Report*, 1-7.

facilities miles distant.

Underground Resources

The heart of the Quebec 01 launch control facility is approximately 50' underground at the east end of the surface launch control support building (LCSB). The launch control center (LCC) lies to the south and the launch control equipment building (LCEB) is to the north, connected by a tunnel. The design of Quebec 01's underground components was used for Minuteman Wings III through VI; Wings I and II placed the equipment building functions on the surface in the LCSB. The long axis of the underground resources is oriented north-northeast/south-southwest, perpendicular to the axis of the LCSB. Access from the east end of the surface LCSB is provided by a freight elevator housed in a reinforced concrete shaft; the shaft also includes a metal ladder with a safety cage offering an alternative means of access. The elevator descends to the level of a short east-west connecting corridor that links to a junction with a longer north-south tunnel. A twelve-ton blast door limits access to the tunnel junction and displays the 90th Strategic Missile Wing insignia (a skull superimposed over crossed bombs, in black) on the side facing the elevator. Historian David K. Stumpf explains this blast door is taller and wider than the one protecting the LCC to permit larger equipment, such as the diesel generator and brine chiller, to be removed for repair or replacement in the LCEB.[196]

From the tunnel junction, the south reinforced concrete tunnel leads to a second blast door protecting and limiting access to the LCC (Photograph 4). The eight-ton blast door is composed of welded steel shells filled with concrete grout. The outside of the door features the insignia of the 400th Strategic Missile Squadron, including a descending bomb, ten warhead trajectories arcing to their targets, and a sea of flames.[197] North of the tunnel junction, the east wall of the north tunnel is decorated with a large painted mural showing a Peacekeeper missile in flight superimposed over the nose of a World War II B-24 Liberator (Photograph 5). The aircraft's nose art depicts a large white duck wearing an American flag neckerchief and carrying a black hammer in pursuit a smaller black bear carrying a Soviet flag. The hammer is emblazoned with the skull and crossed bombs insignia of the 90th Strategic Missile Squadron. At the bottom of the aircraft fuselage is the inscription: "The Jolly Roger Express." Written at the top of the wall are: "Showplace of the 90th," "Quebec" (superimposed over a Q), and "Only 30 Minutes Out," the latter a reference to the approximate travel times of the missiles to their Soviet targets and those of crewmen to their base in Cheyenne. A handwritten note in black marker states: "Last man out, 20 April 2006, Q-1 deactivated, TSgt Foster."

Launch Control Center, 1963-64, Resource 2, Building, Contributing, Photographs 6 through 9

Two commissioned officers (the missile combat crew) stayed on duty at computer consoles in the underground launch control center (LCC, also known as "the capsule") on twenty-four-hour alerts, waiting for a possible command to fire one or more of the ten missiles in the flight. The LCC design aimed to provide sufficient protection for the combat crew to enable them to carry out this duty while under active attack from enemy nuclear missiles. The interior of the LCC is reminiscent of that of a submarine or space vehicle (Photograph 6). A National Park Service Special Resource Study for Minuteman missile sites described the LCC as "a protective shell, shaped like an enormous capsule" and provided a succinct general description:

> The shell measures 29 feet in diameter and 54 feet in length (outside dimensions), and is constructed of heavily reinforced concrete with four-foot-thick walls. The interior surface is lined with ¼-inch-thick steel plate. Suspended inside the shell is a boxlike acoustical enclosure containing the launch control consoles, communications and missile monitoring equipment, and accommodations for the two-person launch crew. The acoustical enclosure is rectangular in plan,

[196] Stumpf, *Minuteman*, 118.
[197] A different insignia appears in a ca. 1986 photograph of the blast door.

> measuring approximately 12 feet wide and 28 feet long. Each corner of the room is suspended by a large pneumatic cylinder called a "shock isolator," which would help the control room survive a near-hit from a nuclear weapon. Hanging from heavy chains attached to the ceiling of the shell, the shock isolators would allow the enclosure to bounce in any direction with only minimal damage.[198]

Within the acoustical enclosure the Missile Combat Crew Commander's (MCCC or commander) console is located at the far end (south) and the Deputy Missile Combat Crew Commander's (DMCCC or deputy commander) console is halfway along the west wall (Photographs 7 through 9). The two crew members are seated at right angles to one another, with the commander facing south and the deputy commander facing west. Seating for each crew member is a high-back aircraft seat anchored to metal rails.[199] To facilitate access to the various instruments, the commander's seat can move backwards and forwards from the console, while the deputy's seat moves side to side. The seats are equipped with lap and shoulder belts, needed to keep the crew in position in the event a nearby nuclear blast shakes the LCC.

The commander's console includes instruments to monitor the operational and security status of each of the ten missiles in the flight. The deputy commander's console holds radio and telephone equipment to communicate with other launch control facilities, wing headquarters, and the Strategic Air Command (SAC). Each console contains a panel for launching missiles using a spring-loaded, key-operated switch. Above the deputy's console is a red metal safe secured with two padlocks containing sealed authentication documents (used to verify orders) and the two launch keys for the launch panels.

In addition to the deputy commander's position, the west wall contains stacked racks of removable panels of computer equipment, communication radio transmitters and receivers, a telephone relay system, and a power control panel. At the north end of the wall is a curtained latrine alcove with a stainless steel toilet. The north end of the east wall contains a small refrigerator and microwave oven, followed by a narrow sleeping bunk screened by a curtain toward the south end. The steel floor is covered with commercial carpeting. Removable steel plates permit access to storage areas below, containing survival water and food, emergency batteries, and a motor-generator. The ceiling is covered by a beige fabric liner to screen wiring and help reduce noise inside the enclosure. The capsule was air conditioned to reduce heat emitted by the electronic equipment racks.

Steel catwalks permit access between the acoustic enclosure and the external capsule. The wall of the capsule exhibits messages written in marker by personnel (typically outgoing missileers) from the 1980s to the decommissioning of the Peacekeeper in 2005. The southwest corner of the capsule has a heavy steel hatch accessing the escape tube to the surface. The escape tube provided an alternative means of egress if the elevator shaft was inaccessible due to debris from an attack. According to David K. Stumpf, the tube is 23' to 47' in length and "leads up at a 30-degree angle to the exit hatch 5 feet below the surface. The escape tube is filled with sand to prevent collapse from ground shock."[200] A shovel was provided to the combat crew to dig through the last 5' of soil.

Alterations and Historic Integrity. The instrumentation and computer racks in the LCC were removed as part of the decommissioning of the facility. Replacements were salvaged from other MAFs but are not functional and/or lack electrical supplies. Some installed computer racks are not exact duplicates of original components.

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[198] *Minuteman Missile Sites*, 48. There were also sway dampers to limit horizontal movement. The Quebec 01 LCC was 31' in length.

[199] This same type of seat was used in B-52 bombers.

[200] Stumpf, *Minuteman*, 116.

Signs and standalone movable displays were installed to interpret the history of Quebec 01. The resource retains historic integrity.

Launch Control Equipment Building, 1963-64, Resource 3, Building, Contributing, Photographs 10 through 12

Beyond the "Jolly Roger Express" mural described earlier, the north-south tunnel extends farther north, providing access to the underground launch control equipment building. The tunnel provides direct access to the LCEB; there is no blast door (Photograph 10). The LCEB held air filtration and emergency power equipment to support and sustain the two-person combat crew, enabling self-sufficiency for approximately nine weeks. The Historic Structure Report for Quebec 01 describes the LCEB as "a blast-hardened structure of steel and reinforced concrete, but it is not a cylinder with rounded ends like the Launch Control Center. It is a flat-bottomed structure with sloping sides, a rounded top and flat ends. The equipment it contains is supported by a floor suspended on 12 coil-spring shock isolators. There are no sway dampers as in the Launch Control Center."[201]

The west wall of the LCEB at its north end holds a chemical, biological, and radiological filter and fan unit (Photograph 11). A brine chiller clean room stands in the southwest corner of the LCEB. At the north end of the LCEB is an interpretive display of the guidance and control system used by the Peacekeeper missile. Intake and exhaust air ducts extend from the north end of the LCEB to the intake/exhaust vents on the surface. Each duct features a blast valve to seal off the underground units from the surface air in the event of a nuclear blast. The east side of building holds a power switching bank, with a diesel electric generator farther north (Photograph 12). A 3,700-gallon underground water tank lies northwest of the LCEB, and a 14,000-gallon diesel fuel storage tank and an emergency sewage tank are underground to the southeast.

Alterations and Historic Integrity. Some ductwork removed from the LCEB after decommissioning was recreated using the original specifications. Signs and standalone movable interpretive displays have been installed to interpret the history of Quebec 01. The resource retains historic integrity.

Surface Resources: Buildings

Launch Control Support Building, 1963-64, Resource 4, Building, Contributing, Photographs 13 through 19

The launch control support building (LCSB) now houses a museum with interpretive signs and displays for the site. The interior has been configured and furnished to reflect such original uses as sleeping quarters, kitchen, office space, restrooms, and a dining and recreation area for personnel, as well as access to the underground components. During its time as an active LCF, the building was staffed twenty-four hours a day, including a facility manager, security personnel, and a cook. This building provides access to and support for the underground components described above.

The one-story, shallow-pitched, side-gable roof LCSB has an irregular footprint and is the largest resource at Quebec 01, measuring approximately 124' x 33'. The frame building stands on a concrete slab foundation, facing south-southwest toward an asphalt paved parking area.[202] The walls are clad with horizontal, wide-lap, steel siding, stamped with a wood-grain texture. All windows are one-over-one-light vinyl-clad windows. The

[201] Clayton B. Fraser, Missile Alert Facility Quebec-1, F.E. Warren Air Force Base, Peacekeeper ICBM, Cheyenne vicinity, Laramie County, Wyoming. Survey (photographs, measured drawings, written historical and descriptive data), draft, HAER No. WY-89, Historic American Engineering Record, National Park Service, U.S. Department of the Interior, March 2001, on file Heritage Partnership Programs, National Park service, Denver, Colorado.

[202] To simplify directional references used in this description section, the front will be referred to as the south wall.

building has flush eaves, and the roof is clad with asphalt composition shingles. The northeast corner of the roof displays a large steel vent.

The front (south) at its east end contains seven one-over-one-light windows (Photograph 13). To the west is an inset entrance holding a flush steel door with a rectangular light. The wall steps in, and its narrow west wall is unfenestrated. At this point a wood utility pole with a metal rod affixed to its top stands next to the wall. Beyond, the wall holds a single flush steel door, double (taller) steel flush pedestrian doors, a flush steel door with a rectangular light, paired windows (shorter), two single windows, a flush steel door opening onto a concrete apron, and two single windows (Photograph 14). The west wall is unfenestrated (Photograph 15).

The north wall at its west end contains three sets of paired windows, followed by one set of paired shorter windows (Photograph 16). Farther east, a projecting patio displays a shed roof, wood posts, partial enclosure with plexiglass panels on its west and north walls, and a concrete deck; a flush steel door with a rectangular light and a window face the patio. Beyond, the wall contains a single window followed by paired windows. Farther east is a shed roof projection. Its narrow west wall holds a rectangular, metal, louvered vent; its north wall is unfenestrated; and its east wall contains double flush steel doors. The east wall then holds paired windows and a second set of taller double flush steel doors. At the south end of the east wall is a shorter gabled bay (part of the security office) with a window on its narrow north wall and four windows on its east wall (Photograph 17).

Interior. The main entrance opens onto a small north-south vestibule/hall. A door in its east wall opens onto the L-shaped flight security office at the east end of the building. The office occupies the gabled projection at the east end of the building with windows on three sides providing a good view of the entrance gate and the areas to the east, northeast, and southeast. The security office controlled the entrance to the elevator room to the north which provided access to the underground part of the facility. North of the elevator room is a bedroom, followed by a generator room at the northeast corner. The entrance vestibule terminates on the north in an open area extending along the north side of the building, which held a lounge, billiards room, and dining room (from east to west) (Photograph 18). The lounge now has a visitor reception desk. West of the dining room is the kitchen (Photograph 19). A door on the north wall of the dining room opens onto the enclosed patio.

West of the kitchen the building contains a double-loaded center hall terminating in a closet at the west end of the building. Three bedrooms lie north of the hall in the northwest corner of the building. South of the hall (from west to east) are a bedroom at the southwest corner, an entrance hallway, another bedroom, and separate men's and women's restrooms. Farther east, the rooms along the south side of the building include a utility room, water treatment room, communications equipment room, and a closet and telephone room.

Alterations and Integrity. The original cement asbestos wall shingles were removed and replaced with steel horizontal lap siding in the early-1980s. At the same time a garage in the northeast corner of the building was converted to a bedroom, and bedrooms/restrooms were modified to accommodate female personnel. Those changes occurred within the period of significance. According to the *Historic Structure Report*, the original windows were replaced in the 1990s with the current windows: "vinyl-clad wood sash glazed with insulating glass."[203] The building was reroofed with like materials in 2018, a pedestrian access ramp added, doorknobs replaced with door levers, and new plexiglass panels installed on the partially enclosed patio on the north.

Vehicle Storage Building, 1966, Resource 5, Building, Contributing, Photographs 20 and 21

[203] Fraser, Quebec-1 HAER, 7.

Original standard plans for LCSBs included a garage bay for vehicle storage, but, after the need for more space became apparent, a separate vehicle storage building was soon erected. The area freed in the LCSB was then used for other purposes. The vehicle storage building served initially as storage for vehicles and snow removal equipment. A recreational exercise area was later added. It now is used to store museum artifacts. The one-story, front-gable roof vehicle storage building (40' x 32') faces northeast and stands on a reinforced concrete slab foundation. The frame building is clad with steel horizontal lap siding, stamped in a wood grain pattern and painted cream, and there are metal corner boards. The roof has flush eaves and is clad with asphalt composition shingles. A metal chimney stands at the southwest corner of the roof.

The front contains a center tall garage door entrance flanked by shorter ones. Each entrance contains an overhead metal sectional garage door; the sections are stamped with a series of horizontal lines, resembling boards. Each entrance is flanked by metal bollards. The west wall holds two flush metal doors at its south end. The north door has a rectangular light, while the upper part of the south door is covered with plywood. The south and east walls are unfenestrated. A full-height pole with a weathervane is attached to the rear of the building.

Alterations and Integrity. The original cement asbestos wall shingles were removed and replaced with steel horizontal lap siding in the early 1980s during the period of significance. The HAER report stated that the weathervane, originally at the northwest end of the launch control support building, was placed on the vehicle storage building in the mid-1980s. The building was reroofed using like materials in 2018.

Surface Resources: Communications Equipment

Reliable, secure, redundant, and survivable communications equipment played a necessary role in enabling contact between the LCF/MAF and command authorities for receipt of launch orders or other messages. All of the antennas are located within the facility's security fence.[204]

Hardened High-Frequency Receiving Antenna, 1963-64, Resource 6, Object, Contributing, Photograph 22

Located roughly 58' north of the launch control support building is the blast-hardened high-frequency receiving antenna, a communication system that remained active until 1971. The draft HAER documentation explained that the high-frequency radio provided SAC with "point-to-point voice communications as a backup of the land-line systems for control of the weapon systems."[205] The surface components of the system consist of a 16'-diameter circular concrete pad holding five circular antenna deployment ports evenly positioned around the perimeter and a center circular access port. A thin, steel, monopole antenna now projects from the south port. Below the surface is a 37'-deep reinforced concrete cylinder holding the antenna deployment cylinders. The system provided redundancy: if the surface antenna were damaged or destroyed, a replacement could be deployed by actuating a squib (a miniature explosive device) in one of the remaining ports. *Alterations and Integrity*. There are no apparent alterations, and the resource retains historic integrity.

Hardened Ultra-High-Frequency Antenna, 1963-64, Resource 7, Object, Contributing, Photograph 23

The blast-hardened ultra-high-frequency antenna is located west of the vehicle storage building and southwest of the LCSB. A conical white fiberglass radome shields the antenna's "massive, cast-steel frustum" and rests on a metal plate attached to a 16'-square concrete pad.[206] The function of the antenna was to receive

[204] David K. Stumpf, Titan II ICBM Missile Site 8 (571-7), National Historic Landmark nomination, September 1993. Following Stumpf's approach, the communications antennas at Quebec 01 were categorized as objects, as resources that "are relatively small in scale and simply constructed."

[205] Fraser, Quebec-1 HAER, 11.

[206] Engel, *The Missile Plains*, 86. A frustum is defined as the portion of a cone or pyramid which remains after its upper part has been cut off by a plane parallel to its base, or which is intercepted between two such planes.

communications from the Airborne Launch Control Center and Strategic Air Command satellites. The conical shape of the radome provided an opportunity for old hands at the LCF to initiate newcomers, as one reminisced: "I remember out on Q1 back in either the late 80's or early 90's, it was the in thing to have the newbie go out [to] the 'cone' & do a check. We told him it was a last defense nuke & it was sticking out of the ground in [a] show of defense if the LCF ever was under siege. Once the new guy came back in, he was c[hec]k'd for radiation using the hand held metal detector wand. Of course it beeped like crazy as it was waived across the new guy. The look on their face was priceless."[207]

Alterations and Integrity. There are no apparent alterations, and the resource retains historic integrity.

Hardened High-Frequency Transmitting Antenna, 1963-64, Resource 8, Object, Contributing, Photograph 24

Located roughly 156' southeast of the vehicle storage building is the hardened high-frequency transmitting antenna, the counterpart of the receiving antenna north of the LCSB. The antenna remained active until 1971. The surface components of the system consist of a 22'-diameter circular concrete pad holding an inner 10'-diameter concrete hatch bolted into a steel flange. A center circular disc of concrete is flanked by two raised metal hatches with handles. A description for a similar antenna at a Minuteman LCF in South Dakota explained the antenna "consists of an underground, reinforced-concrete cylinder, approximately twenty-one feet in diameter and fifty feet deep (outside dimensions). The well of the cylinder contains a telescoping, four-sided radio antenna originally capable of extending to a maximum height of 120 feet."[208] *Alterations and Integrity*. There are no apparent alterations, and the resource retains historic integrity.

Surface Resources: Other Resources

Other surface facilities at Quebec 01 included resources for air handling, recreation, transportation, and sewage treatment.

Flagpole, 1963-64, Resource 9, Object, Contributing, Photograph 25

The steel flagpole for the installation stands inside the security fence about 30' north of the entrance gate. The metal pole with ball finial is installed in a square concrete base. *Alterations and Integrity*. There are no apparent alterations, and the object retains historic integrity.

Air Intake/Exhaust Ducts, 1963-64, Resources 10 and 11, Objects, Contributing, Photograph 26

Approximately 52' north of the northeast corner of the LCSB stand two intake and exhaust ducts providing air to the underground LCEB. The intake duct (Resource 10) is to the west and the exhaust duct (Resource 11) is to the east. Called "top hats" by personnel because of their shape, the metal drum vents are roughly 5' in diameter, resting on slightly raised 7'-square painted concrete pads. The ducts incorporate 36" blast valves designed to seal off the LCEB from outside air in the event of a nuclear attack. *Alterations and Integrity*. There are no apparent alterations, and the objects retain historic integrity.

Helipad, 1969, Resource 12, Structure, Contributing, Photograph 27

The helipad lies outside the fenced security perimeter of the installation on the south side of the access road 275' east of the security gate. Helicopters began flying to LCFs at F.E. Warren AFB in 1965 to transport personnel and supplies. The UH-1N "Twin Huey" helicopters likely landed on the asphalt paved parking area south of the LCSB prior to the construction of helipads in 1969. This square concrete helipad measures 50' x 50'. Marking the center of the landing site is a painted black and white cross superimposed on a smaller white

[207] Quebec 01 Historic Site, Robert Soto Facebook post, June 18, 2019.
[208] Engel, *The Missile Plains*, 86.

square outlined in black. *Alterations and Integrity*. There are no apparent alterations and the resource retains historic integrity.

Sewage Lagoons, 1963-64 and 1969, Resources 13 and 14, Structures, Contributing
The facility's location in a rural area required sewage lagoons for treating wastewater at Quebec 01. The north lagoon was part of the original construction in 1964-65; additional land was acquired in 1969 and the south lagoon was then constructed. The lagoons converted effluents in wastewater to sludge. The sewage lagoons are located outside the security fence, about 210' west of the LCSB. They stand in their own rectangular fenced area of about one acre. Each lagoon consists of an open settling basin surrounded by an earth berm that slopes to the surface of the water. *Alterations and Integrity*. At some point between 1994 and 2006 the south lagoon was reduced in size to the same size as the north lagoon. The lagoons were relined in 2018 and are still in use. The resources retain historic integrity.

Basketball Pole and Backboard, pre-1991, Resource 15, Object, Noncontributing, Photograph 3
A basketball pole and backboard stands at the west edge of the asphalt parking area between the LCSB and the ultra-high-frequency antenna. It was installed prior to 1991 outside the generator room of the LCSB, but was moved to its present location between 1995 and 1999.[209] The L-shaped metal pole is anchored in concrete and curves at the top to attach to a metal backboard. A metal hoop is attached to the lower front of the backboard and displays the remains of a net. *Alterations and Integrity*. There are no apparent alterations to the resource, but it is assessed as noncontributing since it was moved to its current location after the period of national significance.

Horseshoe Pit, circa 1994, Resource 16, Object, Noncontributing, Photograph 28
A horseshoe pit is situated south of the vehicle storage building and north-northwest of the hardened high frequency transmitting antenna. The pit was built by MAF personnel as a recreational option in about 1994.[210] The pit is roughly 52'-long between backboards and is oriented north-northeast/south-southwest. At each end is a wood backboard composed of 2' x 4' and 2' x 6' horizontal boards bolted to 4' x 4' posts. In front of the backboard is a wood-framed box holding a metal stake, flanked by concrete paver pitching platforms. *Alterations and Integrity.* There are no apparent alterations, but the resource is assessed as noncontributing since it was constructed after the period of national significance.

Quebec 01 Historic Site Information Panel, 2019, Resource 17, Object, Noncontributing, Photograph 29
Wyoming State Parks and Cultural Resources Department installed this small welcome/information panel in 2019, when the facility opened as a state historic site. The sign stands on a concrete slab and is composed of two square steel posts supporting crosspieces holding a side gable roof hood clad in standing seam metal roofing panels. The hood shelters the sign, which provides information about visiting the site. *Alterations and Integrity*. The sign appears unchanged since its installation but is assessed as noncontributing due to its construction after the national period of significance.

Table 2. Contributing Status of Resources within the Quebec 01 LCF/MAF NHL District

[209] Quebec 01 Historic Site, Lyle Swartz Facebook posts, January 25, 2021. Swartz noted the basketball pole was present when he first arrived at Quebec 01 in 1991 but was moved after he left in 1995. It is shown in its current location in 1999 HAER photographs of the facility.

[210] Quebec 01 Historic Site, Lyle Swartz Facebook posts, June 18, 2019 and January 25, 2021. Swartz stated that "I helped build those pits with Pat 'Stumpy' Gallaher" and provided an estimated date of construction.

Resource Number	Historic Building Name	Contributing Status	Resource Type	Year Built
1	Launch Control Facility/Missile Alert Facility Site	Contributing	Site	1963-64
2	Launch Control Center	Contributing	Building	1963-64
3	Launch Control Equipment Building	Contributing	Building	1963-64
4	Launch Control Support Building	Contributing	Building	1963-64
5	Vehicle Storage Building	Contributing	Building	1966
6	Hardened High-Frequency Receiving Antenna	Contributing	Object	1963-64
7	Hardened Ultra-High-Frequency Antenna	Contributing	Object	1963-64
8	Hardened High-Frequency Transmitting Antenna	Contributing	Object	1963-64
9	Flagpole	Contributing	Object	1963-64
10	Air Intake Duct	Contributing	Object	1963-64
11	Air Exhaust Duct	Contributing	Object	1963-64
12	Helipad	Contributing	Structure	1969
13	Sewage Lagoon (North)	Contributing	Structure	1963-64
14	Sewage Lagoon (South)	Contributing	Structure	1969
15	Basketball Pole and Backboard	Noncontributing	Object	pre-1991
16	Horseshoe Pit	Noncontributing	Object	ca. 1994
17	Quebec 01 Historic Site Information Panel	Noncontributing	Object	2019

INTEGRITY

The Quebec 01 Launch Control Facility/Missile Alert Facility retains an excellent level of the seven aspects of historic integrity dating to the period of national significance (1965-1991).

Location. The historic resources within the district maintain the highest level of integrity of location, as all but one remain on their original sites. A basketball pole and backboard were relocated after the period of significance.

Design. The complex retains a very high integrity of design, as documented by comparisons to historic photographs. The layout and appearance of surface features appear nearly unchanged from historic oblique aerial photographs. The surface buildings retain fenestration and have not been expanded. The 2005 decommissioning of the LCF resulted in removal of the electronic equipment from the launch control center (LCC). After plans were formulated to turn the property over to the State of Wyoming for use as a historic site, the Air Force restored the LCC using historic photographs and original drawings. Salvaged components, including computer racks, consoles, and other equipment were reinstalled. Former Warren AFB missileers donated items and expertise to this effort. Interpretive signs and displays explaining the resource's Cold War role have been added topside and underground as part of the property's new mission as a state historical site.

Setting. The resource retains excellent integrity of setting. The site is surrounded by open grazing land with a handful of scattered ranch headquarters, as it was prior to the start of construction in 1962. Within the nominated area, the principal buildings and nearly all small-scale features remain. A small communication radome is no longer present. A few small-scale resources have been added or moved after the national period of significance, including a moved basketball pole and backboard, an added horseshoe pit, and a Wyoming State Parks information sign.

Materials. Quebec 01 retains excellent integrity of materials. The steel siding on the topside buildings dates to the early 1980s, within the period of national significance, although the LCSB's windows were replaced in the 1990s.

Workmanship. The prosaic topside support buildings display utilitarian construction that one might see on any military or industrial/commercial installation. The significant part of the workmanship in the facility lies beneath the surface, in the fabrication of the steel and reinforced concrete containers for the launch control center and the launch control equipment building, connecting tunnel, and reinforced concrete elevator shaft. The use of space within the LCC was carefully planned and executed to house the electronic equipment needed to monitor and launch the flight of nuclear-armed missiles, as well as to provide for the needs of and physically protect the two-person combat crew.

Feeling. The subsurface spaces housing the launch control center (LCC) and support equipment speak most directly to the role played by the facility and convey a sense of its serious purpose during the Cold War. Former missileer Lt. Col. Peter Aguirre noted: "It's difficult to explain the sense you have down there, but it's a lot like being in a submarine. The sounds and the smells you never forget."[211] Contributing to this sense of feeling is the extensive use of reinforced concrete, subdued lighting, the two blast doors with unit insignias, and the wall art promising delivery of nuclear warheads "only 30 minutes out." Topside, the property decidedly retains the feeling of an isolated missile defense facility that stood on continuous alert during the Cold War. The formidable security fence topped with barbed wire and varied communication antennas on site illustrate the role

[211] Quoted in Jennifer Nalewicki, "Wyoming Is Turning a Former Cold War Nuclear Site into a Tourist Attraction," *Smithsonian Magazine* website, last updated February 8, 2016, smithsonianmag.com.

undertaken by the facility. Inside the LCSB, the layout and utilitarian furnishings illustrate what daily service life was like for the military personnel assigned here.

Association. Quebec 01's association with national defense ended in 2005 with the decommissioning of the Peacekeeper missile. The property was turned over to the State of Wyoming and opened as a historic site in 2019 operated by Parks, Historic Sites, and Trails "to preserve and interpret the Cold War history of the late twentieth and early twenty-first centuries, fostering an understanding of the mission and duties of the personnel and crews assigned to work there."[212] The resource continues its close association with the era by drawing the interest and support of former US Air Force missileers and other visitors.

[212] Quebec 01 Historic Site, website, https://wyoparks.wyo.gov/index.php/about-quebec-01.

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Previous documentation on file (NPS):

___ Previously listed in the National Register (fill in 1 through 6 below)
_X_ Not previously listed in the National Register (fill in **only** 4, 5, and 6 below)

1. NR #:
2. Date of listing:
3. Level of significance:
4. Applicable National Register Criteria: A X B __ C X D __
5. Criteria Considerations (Exceptions): A__ B __ C __ D __ E __ F __ G X
6. Areas of Significance: Military, Engineering

_X_ Previously Determined Eligible for the National Register: Date of determination: ca. 2005
__ Designated a National Historic Landmark: Date of designation:
__ Recorded by Historic American Buildings Survey: HABS No.
_X_ Recorded by Historic American Engineering Record: HAER No. WY-89 (draft, not yet on file with the Library of Congress)
__ Recorded by Historic American Landscapes Survey: HALS No.

Location of additional data:

State Historic Preservation Office:
Other State Agency:
Federal Agency:
Local Government:
University:
Other (Specify Repository): F.E. Warren AFB, Cheyenne, Wyoming

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Figures Log

Location Map

Sketch Map with Photograph Locations

Historic Figures:

Figure 1. A static display near the main gate at F.E. Warren AFB shows three of the ICBMs deployed at the installation and controlled by Quebec 01 (left to right): Peacekeeper, Minuteman III, and Minuteman IB. Courtesy of US Air Force, R.J. Oriez, photographer, April 7, 2012.

Figure 2. This chart displays the polar flight profile of a Minuteman III missile from a launch facility to a potential target in the Soviet Union. Courtesy of Gregory S. Mack, delineator, Delta Flight, Ellsworth AFB, South Dakota, Historic American Engineering Record documentation, SD-50.

Figure 3. Minuteman missiles were deployed in missile fields controlled by six Air Force bases. Courtesy of Sharon E. Fleming, delineator, Delta Flight, Ellsworth AFB, South Dakota, Historic American Engineering Record documentation, SD-50, 1995, on file with the Library of Congress.

Figure 4. This generalized perspective view of a typical launch control facility shows the launch control support building on the surface and the underground components, including the elevator access shaft, tunnel junction, launch control center, and launch control equipment building. The escape tunnel stopped short of the surface. The vehicle storage building is not shown. Courtesy of *Quebec 01 Missile Alert Facility State Historic Site, Interpretive Plan*, 16.

Figure 5. Subsurface construction was underway in 1963 at a similar launch control facility. The launch control center (LCC) is in the foreground with the elevator shaft to the left and the launch control equipment building (LCEB) in the background. The opening for the escape tube to the surface is at the top left of the LCC. The vertical white pipes are the air intake and exhaust ducts. Courtesy of 90th Civil Engineering Squadron, F.E. Warren AFB, in *Historic Structure Report, Missile Alert Facility Quebec-1*, 1-8.

Figure 6. The missile field associated with F.E. Warren AFB is shown in this map, with missile flights (A through T) indicated by the shaded polygons. Missile alert facilities are denoted by numbered squares and launch facilities by numbered circles. The location of Quebec 01 is indicated by the arrow and label at the left edge of the figure. Courtesy of Minuteman III Launch Control Facility November-1, Historic American Engineering Record, HAER No. CO-84, 1997 (annotated extract), on file at the Library of Congress.

Figure 7. This oblique aerial photograph (ca. 1966-mid-1980s) shows the Quebec 01 LCF (view southwest). The larger building is the launch control support building and the smaller one is the vehicle storage building. The buildings appear to still be clad with the original dark cement asbestos shingles. The sewage lagoons are in the upper right. The basketball pole and hoop and horseshoe pit are not present. Courtesy of Quebec 01 Historic Site, Facebook post, June 16, 2020.

Figure 8. These ca. 1968 views show the interior of a launch control support building, possibly Quebec 01, F.E. Warren AFB. The Quebec 01 LCF then controlled Minuteman IB missiles. Courtesy of *Minuteman Service News*, September-October 1968, 7.
Figure 9. The interior of the launch control center is shown in this ca. 1985 photograph during the Minuteman

III period. A missileer is at the deputy commander's communications console. In the distance to the left is the commander's launch control console. Courtesy of *Historic Structure Report, Missile Alert Facility Quebec-1*, 2-6.

Figure 10. The installation of Peacekeeper missiles at F.E. Warren in the late 1980s drew some peace protesters to squadron launch facility Q 02. Courtesy Karen A. Byars, photographer, ca. 1986, in Day, *Nuclear Heartland*, 31.

Figure 11. This ca. 1986 view shows a woman missileer standing by the blast door next to the launch control center. Courtesy of F.E. Warren AFB, reproduced in *Historic Structure Report*, 2-11.

Figure 12. A blanket of snow covered the Quebec 01 LCF in February 1994 when this oblique aerial (view west) was taken. Note the hardened intersite cable system (HICS) wood posts outside the fence in the center left of the image. Courtesy of TSgt. Rose Reynolds, photographer, February 1, 1994, on file National Archives, Still Pictures, identifier number 6490122, College Park, Maryland.

Figure 13. The launch control support building and ICBM super-high frequency satellite terminal (ISST) (the radome) stand to the right and vehicle storage building is at left in this 1999 photograph (view northwest). Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89-006, 1999.

Figure 14. The launch control support building is to the left and the vehicle storage building stands at right in this 1999 photograph (view east). Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89, 1999.

Figure 15. The underground launch control capsule is pictured here, with the missile commander's console at the far end and the deputy missile commander's console to the right in this 1999 photograph. Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89, 1999.

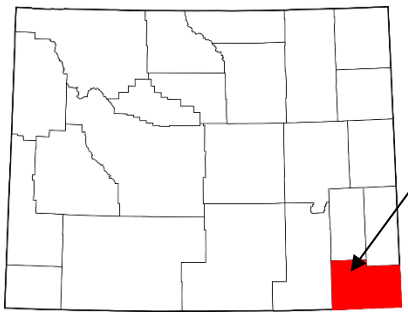
Figure 16. The common area of the topside launch control support building is shown in this 1999 photograph. Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89, 1999.

LOCATION MAP

The white labeled box indicates the location of the UTM of the nominated property, and the black line is the boundary of the nominated area, Chugwater vicinity, Laramie County, Wyoming.

Latitude:	**Longitude:**
41.543165	-104.902730

Image Date: July 11, 2016
Datum: WGS84



Quebec 01 LCF/MAF (shown in Wyoming context with Laramie County shaded)


QUEBEC 01 LCF/MAF
NHL BOUNDARY
Contributing Status
Contributing
Noncontributing
Photo Locations
NHL Boundary
0 25 50 100 Feet
N
Resources 2 and 3 are located underground. Both are Contributing.
Base aerial photo: Laramie County GIS June 2019.

Figure 1. A static display near the main gate at F.E. Warren AFB, Cheyenne, Wyoming, shows three of the ICBMs deployed at the installation and controlled by Quebec 01 (left to right): Peacekeeper, Minuteman III, and Minuteman IB. Courtesy of US Air Force, R.J. Oriez, photographer, April 7, 2012.

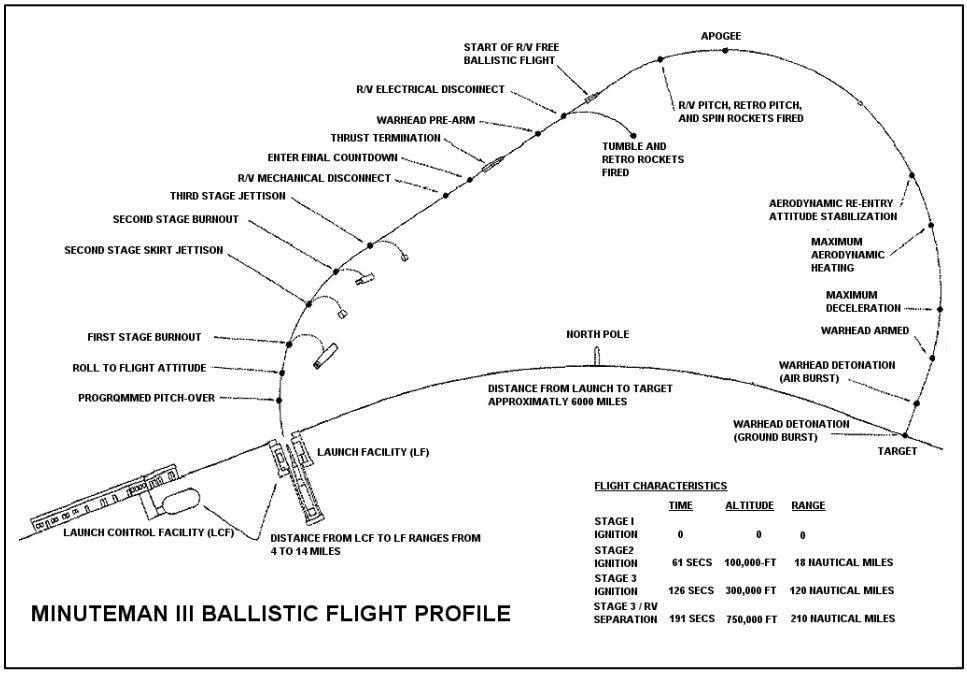


Figure 2. This chart displays the polar flight profile of a Minuteman III missile from a launch facility to a potential target in the Soviet Union. Courtesy of Gregory S. Mack, delineator, Delta Flight, Ellsworth AFB, South Dakota, Historic American Engineering Record documentation, SD-50.

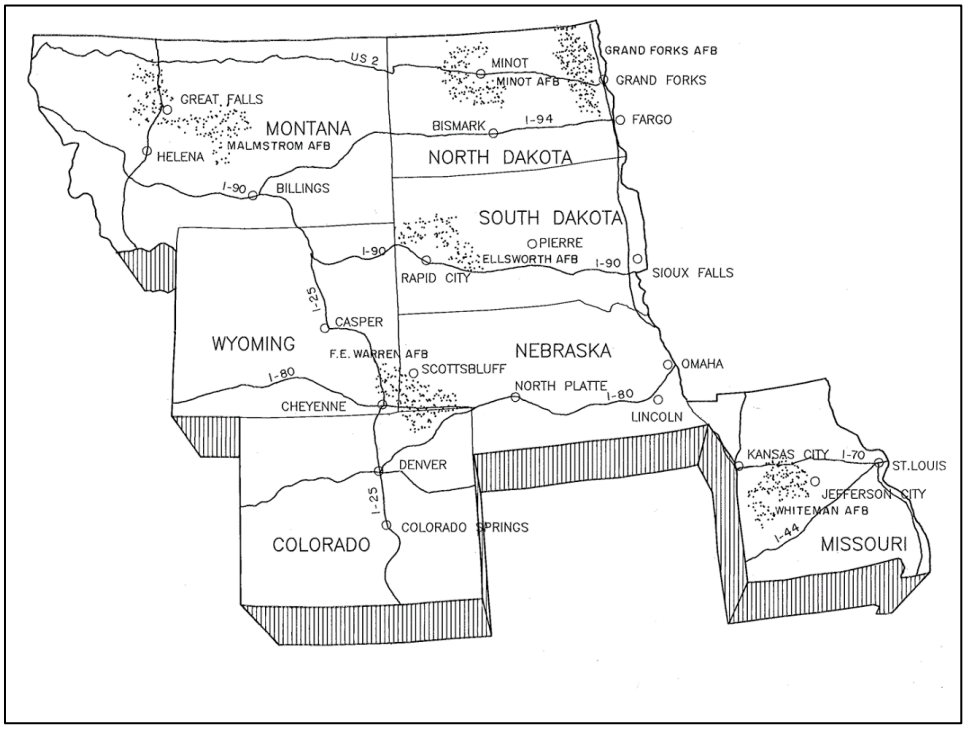


Figure 3. Minuteman missiles were deployed in missile fields controlled by six Air Force bases. Courtesy of Sharon E. Fleming, delineator, Delta Flight, Ellsworth AFB, South Dakota, Historic American Engineering Record documentation, SD-50, 1995, on file with the Library of Congress.

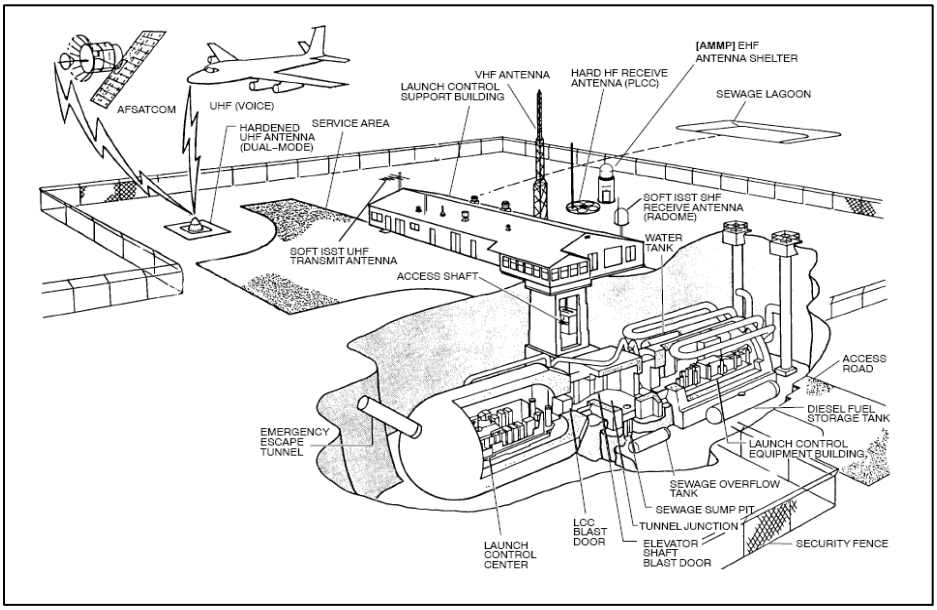


Figure 4. This generalized perspective view of a typical launch control facility shows the launch control support building on the surface and the underground components, including the elevator access shaft, tunnel junction, launch control center, and launch control equipment building. The escape tunnel stopped short of the surface. The vehicle storage building is not shown. Courtesy of *Quebec 01 Missile Alert Facility State Historic Site, Interpretive Plan*, 16.

Figure 5. Subsurface construction was underway in 1963 at a similar launch control facility. The launch control center (LCC) is in the foreground with the elevator shaft to the left and the launch control equipment building (LCEB) in the background. The opening for the escape tube to the surface is at the top left of the near end of the LCC. The vertical white pipes are the air intake and exhaust ducts. Courtesy of 90th Civil Engineering Squadron, F.E. Warren AFB, in *Historic Structure Report, Missile Alert Facility Quebec-1*, 1-8.

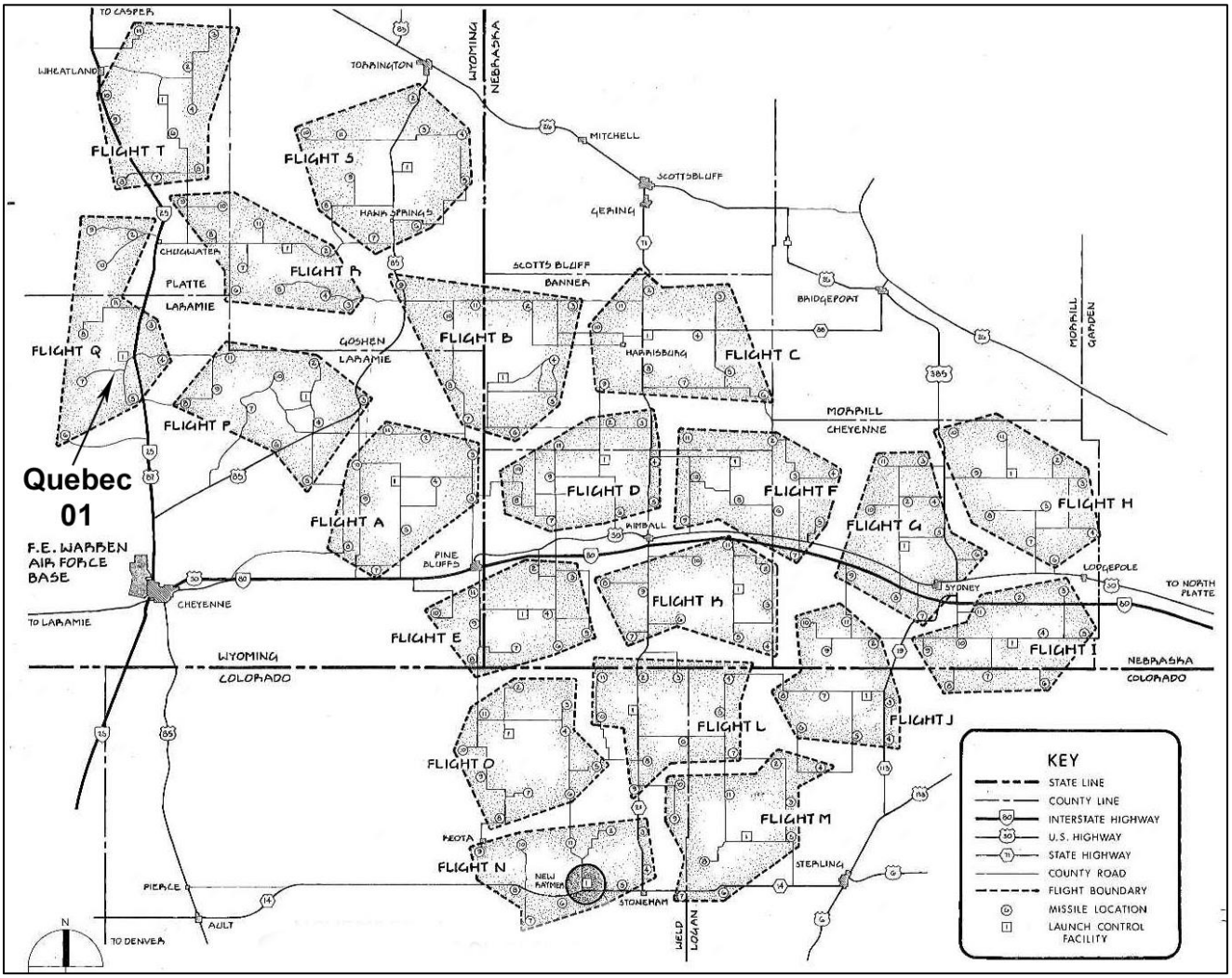


Figure 6. The missile field associated with F.E. Warren AFB is shown in this map, with missile flights (A through T) indicated by the shaded polygons. Missile alert facilities are denoted by numbered squares and launch facilities by numbered circles. The location of Quebec 01 is indicated by the arrow and label at the left edge of the figure. Courtesy of Minuteman III Launch Control Facility November-1, Historic American Engineering Record, HAER No. CO-84, 1997 (annotated extract), on file at the Library of Congress.

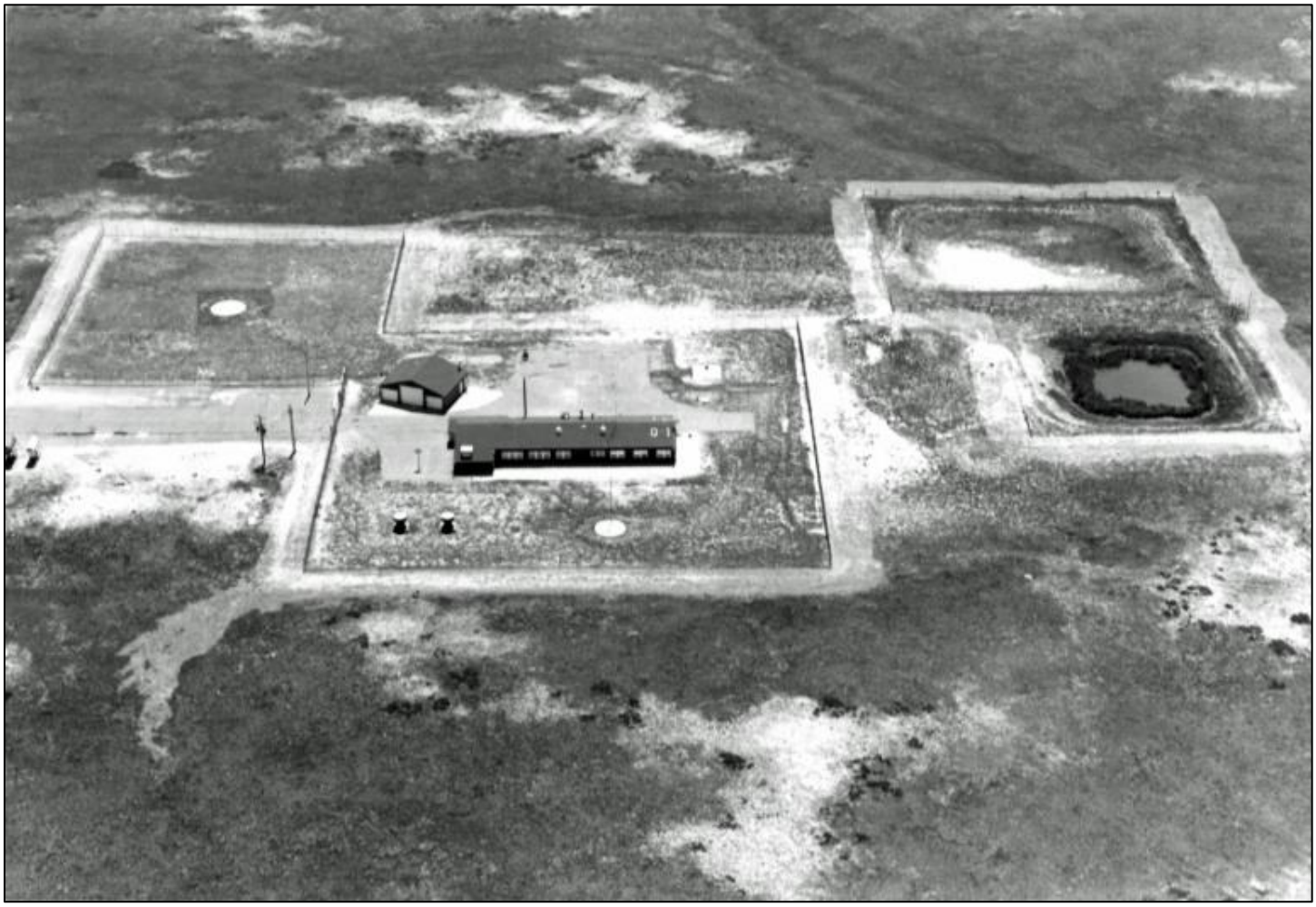


Figure 7. This oblique aerial photograph (ca. 1966-mid-1980s) shows the Quebec 01 LCF (view southwest). The larger building is the launch control support building and the smaller one is the vehicle storage building. The buildings appear to still be clad with the original dark cement asbestos shingles. The sewage lagoons are in the upper right. The basketball pole and hoop and horseshoe pit are not present. Courtesy of Quebec 01 Historic Site, Facebook post, June 16, 2020.

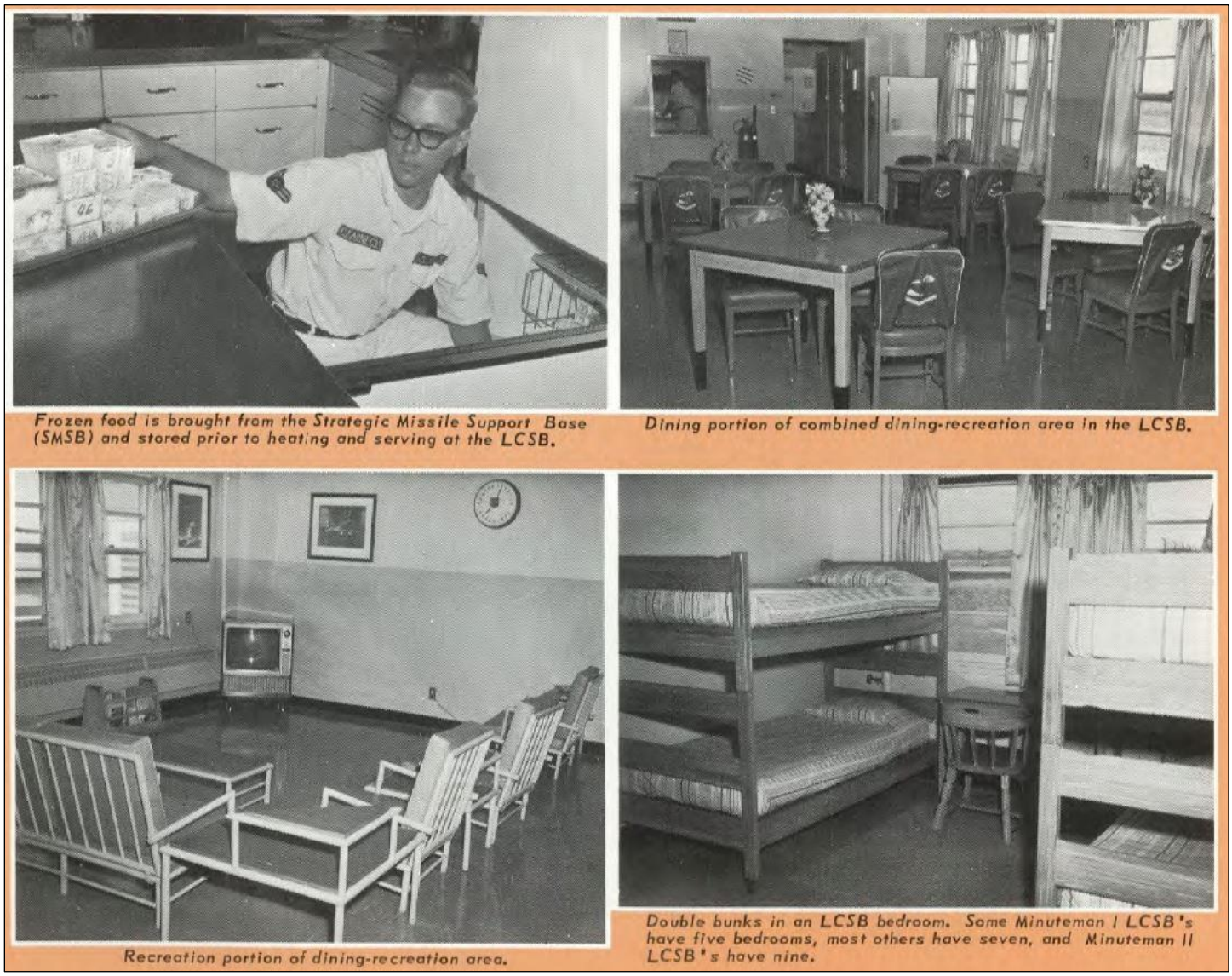


Figure 8. These circa 1968 views show the interior of a launch control support building, possibly Quebec 01, F.E. Warren AFB. The Quebec 01 LCF then controlled Minuteman IB missiles. Courtesy of *Minuteman Service News*, September-October 1968, 7.

Figure 9. The interior of the launch control center is shown in this ca. 1985 photograph during the Minuteman III period. A missileer is at the deputy commander's communications console. In the distance to the left is the commander's launch control console. Courtesy of *Historic Structure Report, Missile Alert Facility Quebec-1*, 2-6.

Figure 10. The installation of Peacekeeper missiles at F.E. Warren in the late 1980s drew some peace protesters to squadron launch facility Q 02. Courtesy Karen A. Byars, photographer, ca. 1986, in Day, *Nuclear Heartland*, 31.

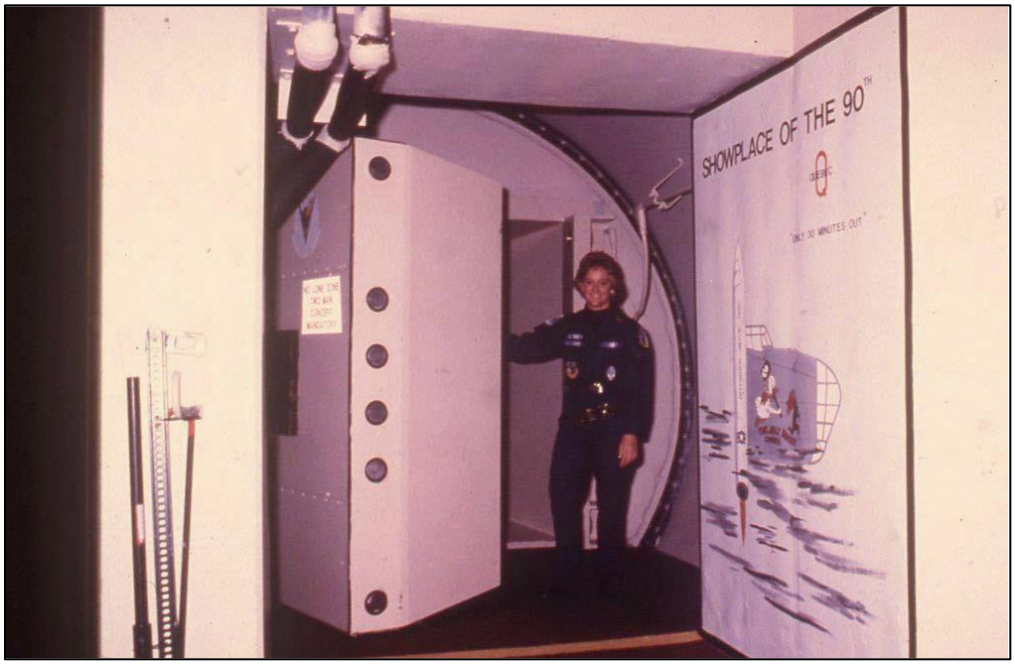


Figure 11 This ca. 1986 view shows a woman missileer standing by the blast door next to the launch control center. Courtesy of F.E. Warren AFB, reproduced in *Historic Structure Report*, 2-11.

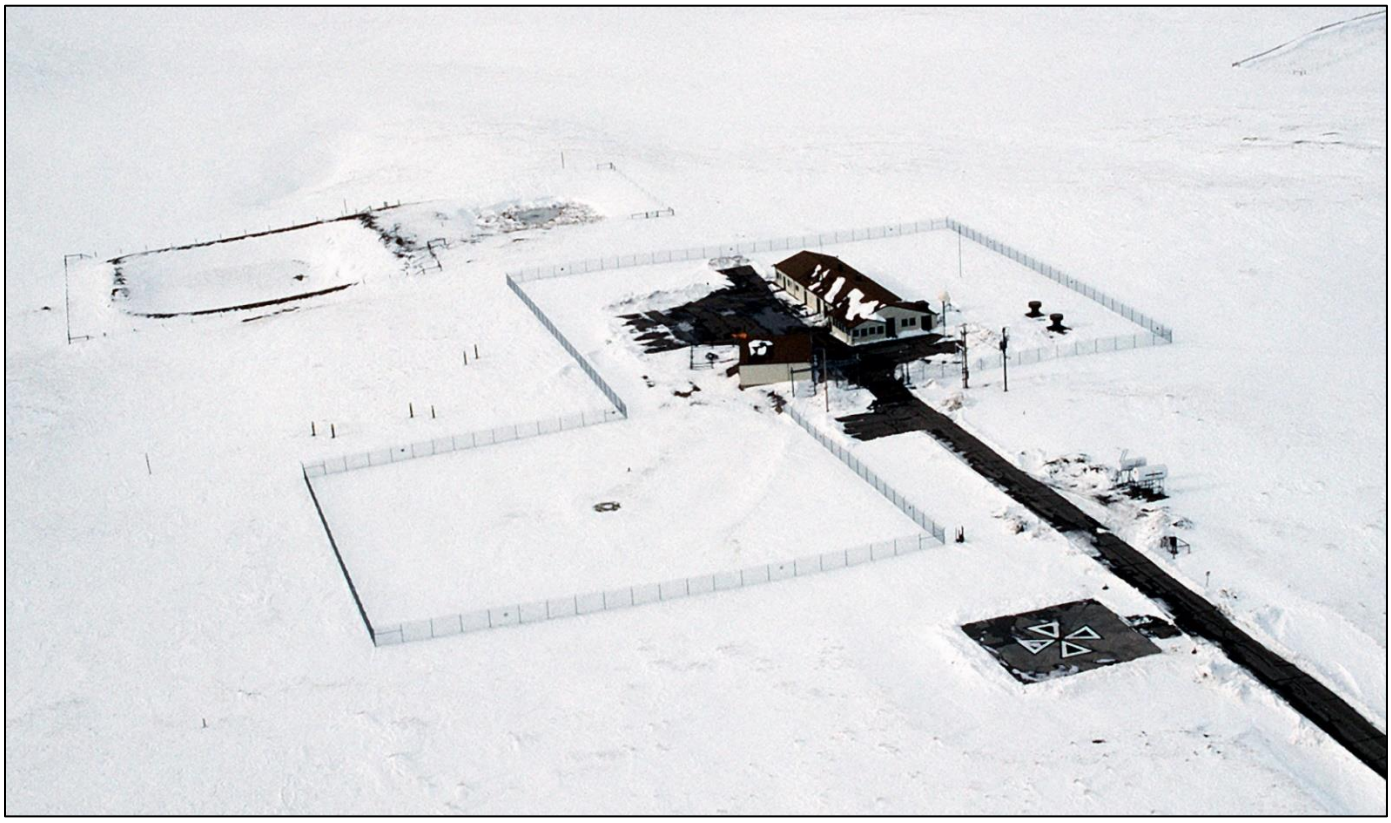


Figure 12. A blanket of snow covered the Quebec 01 LCF in February 1994 when this oblique aerial (view west) was taken. Note the HICS wood posts outside the fence in the center left of the image. Courtesy of TSgt. Rose Reynolds, photographer, February 1, 1994, on file National Archives, Still Pictures, identifier number 6490122, College Park, Maryland.

Figure 13. The launch control support building and ICBM super-high frequency satellite terminal (ISST) (the radome) stand to the right and vehicle storage building is at left in this 1999 photograph (view northwest). Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89-006, 1999.

Figure 14. The launch control support building is to the left and the vehicle storage building stands at right in this 1999 photograph (view east). Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89, 1999.

Figure 15. The underground launch control capsule is pictured here, with the missile commander's console at the far end and the deputy missile commander's console to the right in this 1999 photograph. Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89, 1999.

Figure 16. The common area of the topside launch control support building is shown in this 1999 photograph. Courtesy of Historic American Engineering Record draft documentation, Photograph HAER WY-89, 1999.

Photograph Log

Name of Property: Quebec 01 Launch Control Facility/Missile Alert Facility
City or Vicinity: Chugwater vicinity
County: Laramie
State: Wyoming
Photographer: Thomas H. Simmons
Date: October 2019

Photograph 2. Overview of Quebec 01 from access road. View west-northwest.

Photograph 2. Security gate with the launch control support building, flagpole, and air intake and exhaust ducts to right and vehicle storage building to left. View northwest.

Photograph 3. Overview from west edge of parking area, showing launch control support building (left) and vehicle storage building and basketball pole to right. View east-southeast.

Photograph 4. View from tunnel junction into the LCC. The blast door is to the left. View south-southwest.

Photograph 5. Interior underground, mural on east wall of north of the tunnel junction. View north.

Photograph 6. Interior of the LCC from the north end. The commander's console is at the far end, the deputy commander's console is in the foreground to the right. Along the left wall are a microwave, refrigerator, and bunk. View south-southwest.

Photograph 7. The commander's console is at the south end of the LCC. Note the mirror and 24-hour-clock (above right). View southwest.

Photograph 8. The west wall of the LCC holds computer racks (left), the DMCCC's console with the red, double-padlocked, launch key safe above, and a toilet in an alcove at the end. View north-northwest.

Photograph 9. The west wall of the LCC holds the DMCCC's console (right) and the south wall the MCCC's console (in distance to left). View southwest.

Photograph 10. View of the LCEB from the tunnel junction. View north-northeast.

Photograph 11. The west wall of the LCEB holds the brine chiller (far right) with chemical, biological, and radiological filters and a fan unit to the right. An interpretive display stands at the north end. A generator is located on the east wall (right). View northwest.

Photograph 12. The east wall of the LCEB contains a diesel electric generator (left) and an automatic switching unit to the right. View south.

Photograph 13. Launch control support building (LCSB), front (south) wall (left) and east wall (right). View northwest.

Photograph 14. LCSB front (south) wall, with vehicle equipment building to right. View north-northeast.

Photograph 15. LCSB front (south) wall (right) and west wall (left). View east.

Photograph 16. LCSB rear (north) wall and west wall (right). View southeast.

Photograph 17. LCSB rear (north) wall to right and east wall (left). View west-southwest.

Photograph 18. LCSB interior, recreation area with eating area and kitchen beyond. View northwest.

Photograph 19. Interior LCSB, kitchen. View west-northwest.

Photograph 20. Vehicle storage building, front (north) and east walls. View west.

Photograph 21. Vehicle storage building, rear (north) wall to right and west wall to left. View east.

Photograph 22. Hardened high-frequency receiving antenna. View southwest.

Photograph 23. Hardened ultra-high-frequency antenna. View north-northwest.

Photograph 24. Hardened high-frequency transmitting antenna. View north-northwest.

Photograph 25. Flagpole. View northeast.

Photograph 26. Air intake duct (left) and air exhaust duct (right). View east-northeast.

Photograph 27. Helipad. View west-southwest.

Photograph 28. Horseshoe pit in foreground with the vehicle storage building and LCSB beyond and security gate to right. View north-northwest.

Photograph 29. Wyoming Parks information sign with the LCSB and vehicle storage building inside the security fence beyond. View west-northwest.

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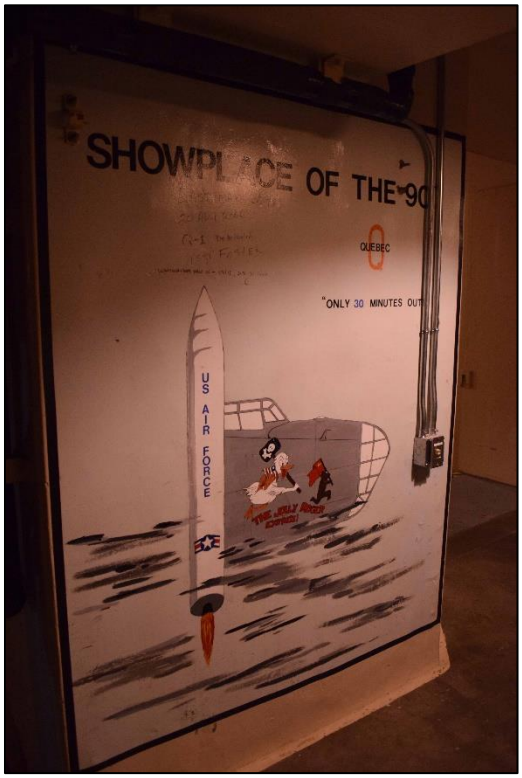

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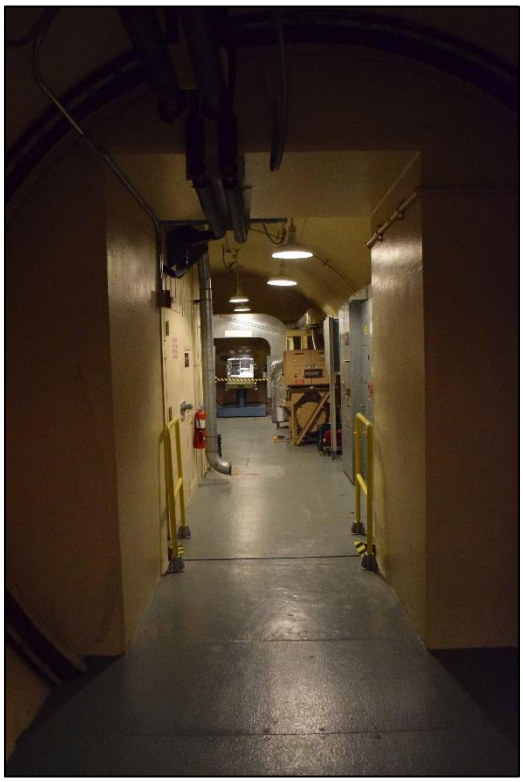

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