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THINK OF THE PRESTIGE

The science of rocketry, and the science of weaponry, are sister sciences. It's been cynically said of German rocket scientist Wernher von Braun that "he aimed at the stars, and hit London."

After 1945, Wernher von Braun made a successful transition to American patronage and, eventually, to civilian space exploration. But another ambitious space pioneer -- an American citizen -- was not so lucky as von Braun, though his equal in scientific talent. His story, by comparison, is little known.

Gerald Vincent Bull was born in March 9, 1928, in Ontario, Canada. He died in 1990. Dr. Bull was the most brilliant artillery scientist of the twentieth century. Bull was a prodigiously gifted student, and earned a Ph.D. in aeronautical engineering at the age of 24.

Bull spent the 1950s researching supersonic aerodynamics in Canada, personally handcrafting some of the most advanced wind-tunnels in the world.

Bull's work, like that of his predecessor von Braun, had military applications. Bull found patronage with the Canadian Armament Research and Development Establishment (CARDE) and the

Canadian Defence Research Board.

However, Canada's military-industrial complex lacked the panache, and the funding, of that of the United States. Bull, a visionary and energetic man, grew impatient with what he considered the pedestrian pace and limited imagination of the Canadians. As an aerodynamics scientist for CARDE, Bull's salary in 1959 was only \$17,000. In comparison, in 1961 Bull earned \$100,000 by consulting for the Pentagon on nose-cone research. It was small wonder that by the early 1960s, Bull had established lively professional relationships with the US Army's Ballistics Research Laboratory (as well as the Army's Redstone Arsenal, Wernher von Braun's own postwar stomping grounds).

It was the great dream of Bull's life to fire cannon projectiles from the earth's surface directly into outer space. Amazingly, Dr. Bull enjoyed considerable success in this endeavor. In 1961, Bull established Project HARP (High Altitude Research Project). HARP was an academic, nonmilitary research program, funded by McGill University in Montreal, where Bull had become a professor in the mechanical engineering department. The US Army's Ballistic Research Lab was a quiet but very useful co-sponsor of HARP; the US Army was especially generous in supplying Bull with obsolete military equipment, including cannon barrels and radar.

Project HARP found a home on the island of Barbados, downrange of its much better-known (and vastly better-financed) rival, Cape Canaveral. In Barbados, Bull's gigantic space-cannon fired its projectiles out to an ocean splashdown, with little risk of public harm. Its terrific boom was audible all over Barbados, but the locals were much pleased at their glamorous link to the dawning Space Age.

Bull designed a series of new supersonic shells known as the "Martlets." The Mark II Martlets were cylindrical finned projectiles, about eight inches wide and five feet six inches long. They weighed 475 pounds. Inside the barrel of the space-cannon, a Martlet was surrounded by a precisely machined wooden casing known as a "sabot." The sabot soaked up combustive energy as the projectile flew up the space-cannon's sixteen-inch, 118-ft long barrel. As it cleared the barrel, the sabot split and the precisely streamlined Martlet was off at over a mile per second. Each shot produced a huge explosion and a plume of fire gushing hundreds of feet into the sky.

The Martlets were scientific research craft. They were designed to carry payloads of metallic chaff, chemical smoke, or meteorological balloons. They sported telemetry antennas for tracing the flight.

By the end of 1965, the HARP project had fired over a hundred such missiles over fifty miles high, into the ionosphere -- the airless fringes of space. In November 19, 1966, the US Army's Ballistics Research Lab, using a HARP gun designed by Bull, fired a 185-lb Martlet missile one hundred and eleven miles high. This was, and remains, a world altitude record for any fired projectile. Bull now entertained ambitious plans for a Martlet Mark IV, a rocket-assisted projectile that would ignite in flight and drive itself into actual orbit.

Ballistically speaking, space cannon offer distinct advantages over rockets. Rockets must lift, not only their own weight, but the weight of their fuel and oxidizer. Cannon "fuel," which is contained within the gunbarrel, offers far more explosive bang for the buck than rocket fuel. Cannon projectiles are very accurate, thanks to the fixed geometry of the gun-barrel. And cannon are far simpler and cheaper than rockets.

There are grave disadvantages, of course. First, the payload must be slender enough to fit into a gun-barrel. The most severe drawback is the huge acceleration force of a cannon blast, which in the case of Bull's exotic arsenal could top 10,000 Gs. This rules out manned flights from the mouth of space-cannon. Jules Verne overlooked this unpoetic detail when he wrote his prescient tale of space artillery, *FROM THE EARTH TO THE MOON* (1865). (Dr Bull was fascinated by Verne, and often spoke of Verne's science fiction as one of the foremost inspirations of his youth.)

Bull was determined to put a cannon-round into orbit. This burning desire of his was something greater than any merely pragmatic or rational motive. The collapse of the HARP project in 1967 left Bull in command of his own fortunes. He reassembled the wreckage of his odd academic/military career, and started a commercial operation, "Space Research Corporation." In the years to follow, Bull would try hard to sell his space-cannon vision to a number of sponsors, including NATO, the Pentagon, Canada, China, Israel, and finally, Iraq.

In the meantime, the Vietnam War was raging. Bull's researches on projectile aerodynamics had made him, and his company Space Research Corporation, into a hot military-industrial property. In pursuit of space research, Bull had invented techniques that lent much greater range and accuracy to conventional artillery rounds. With Bull's ammunition, for instance, US Naval destroyers would be able to cruise miles off the shore of North Vietnam, destroying the best Russian-made shore batteries without any fear of artillery retaliation. Bull's Space Research Corporation was manufacturing the necessary long-range shells in Canada, but his lack of American citizenship was a hindrance in the Pentagon arms trade.

Such was Dr. Bull's perceived strategic importance that this hindrance was neatly avoided; with the sponsorship of Senator Barry Goldwater, Bull became an American citizen by act of Congress. This procedure was a rare honor, previously reserved only for Winston Churchill and the Marquis de Lafayette.

Despite this Senatorial fiat, however, the Navy arms deal eventually fell through. But although the US Navy scorned Dr. Bull's wares, others were not so short-sighted. Bull's extended-range ammunition, and the murderously brilliant cannon that he designed to fire it, found ready markets in Egypt, Israel, Holland, Italy, Britain, Canada, Venezuela, Chile, Thailand, Iran, South Africa, Austria and Somalia.

Dr. Bull created a strange private reserve on the Canadian-American border; a private arms manufactory with its own US and Canadian customs units. This arrangement was very useful, since the arms-export laws of the two countries differed, and SRC's military products could be shipped-out over either national border at will. In this distant enclave on the rural northern border of Vermont, the arms genius built his own artillery range, his own telemetry towers and launch-control buildings, his own radar tracking station, workshops, and machine shops. At its height, the Space Research Corporation employed over three hundred people at this site, and boasted some \$15 million worth of advanced equipment.

The downfall of HARP had left Bull disgusted with the government-supported military-scientific establishment. He referred to government researchers as "clowns" and "cocktail scientists," and decided that his own future must lay in the vigorous world of free enterprise. Instead of exploring the upper atmosphere, Bull

dedicated his ready intelligence to the refining of lethal munitions. Bull would not sell to the Soviets or their client states, whom he loathed; but he would sell to most anyone else. Bull's cannons are credited with being of great help to Jonas Savimbi's UNITA war in Angola; they were also extensively used by both sides in the Iran-Iraq war.

Dr. Gerald V. Bull, Space Researcher, had become a professional arms dealer. Dr. Bull was not a stellar success as an arms dealer, because by all accounts he had no real head for business. Like many engineers, Bull was obsessed not by entrepreneurial drive, but by the exhilarating lure of technical achievement. The atmosphere at Space Research Corporation was, by all accounts, very collegial; Bull as professor, employees as cherished grad-students. Bull's employees were fiercely loyal to him and felt that he was brilliantly gifted and could accomplish anything.

SRC was never as great a commercial success as Bull's technical genius merited. Bull stumbled badly in 1980. The Carter Administration, annoyed by Bull's extensive deals with the South African military, put Bull in prison for customs violation. This punishment, rather than bringing Bull "to his senses," affected him traumatically. He felt strongly that he had been singled out as a political scapegoat to satisfy the hypocritical, left-leaning, anti-apartheid bureaucrats in Washington. Bull spent seven months in an American prison, reading extensively, and, incidentally, successfully re-designing the prison's heating-plant. Nevertheless, the prison experience left Bull embittered and cynical. While still in prison, Bull was already accepting commercial approaches from the Communist Chinese, who proved to be among his most avid customers.

After his American prison sentence ended, Bull abandoned his strange enclave in the US-Canadian border to work full-time in Brussels, Belgium. Space Research Corporation was welcomed there, in Europe's foremost nexus of the global arms trade, a city where almost anything goes in the way of merchandising war.

In November 1987, Bull was politely contacted in Brussels by the Iraqi Embassy, and offered an all-expenses paid trip to Bagdad.

From 1980 to 1989, during their prolonged, lethal, and highly inconclusive war with Iran, Saddam Hussein's regime had spent some eighty billion dollars on weapons and weapons systems. Saddam

Hussein was especially fond of his Soviet-supplied "Scud" missiles, which had shaken Iranian morale severely when fired into civilian centers during the so-called "War of the Cities." To Saddam's mind, the major trouble with his Scuds was their limited range and accuracy, and he had invested great effort in gathering the tools and manpower to improve the Iraqi art of rocketry.

The Iraqis had already bought many of Bull's 155-millimeter cannon from the South Africans and the Austrians, and they were most impressed. Thanks to Bull's design genius, the Iraqis actually owned better, more accurate, and longer-range artillery than the United States Army did.

Bull did not want to go to jail again, and was reluctant to break the official embargo on arms shipments to Iraq. He told his would-be sponsors so, in Bagdad, and the Iraqis were considerate of their guest's qualms. To Bull's great joy, they took his idea of a peaceful space cannon very seriously. "Think of the prestige," Bull suggested to the Iraqi Minister of Industry, and the thought clearly intrigued the Iraqi official.

The Israelis, in September 1988, had successfully launched their own Shavit rocket into orbit, an event that had much impressed, and depressed, the Arab League. Bull promised the Iraqis a launch system that could place dozens, perhaps hundreds, of Arab satellites into orbit. *Small* satellites, granted, and unmanned ones; but their launches would cost as little as five thousand dollars each. Iraq would become a genuine space power; a minor one by superpower standards, but the only Arab space power.

And even small satellites were not just for show. Even a minor space satellite could successfully perform certain surveillance activities. The American military had proved the usefulness of spy satellites to Saddam Hussein by passing him spysat intelligence during worst heat of the Iran-Iraq war.

The Iraqis felt they would gain a great deal of widely applicable, widely useful scientific knowledge from their association with Bull, whether his work was "peaceful" or not. After all, it was through peaceful research on Project HARP that Bull himself had learned techniques that he had later sold for profit on the arms market. The design of a civilian nose-cone, aiming for the stars, is very little different from that of one descending with a supersonic

screech upon sleeping civilians in London.

For the first time in his life, Bull found himself the respected client of a generous patron with vast resources -- and with an imagination of a grandeur to match his own. By 1989, the Iraqis were paying Bull and his company five million dollars a year to redesign their field artillery, with much greater sums in the wings for "Project Babylon" -- the Iraqi space-cannon. Bull had the run of ominous weapons bunkers like the "Saad 16" missile-testing complex in north Iraq, built under contract by Germans, and stuffed with gray-market high-tech equipment from Tektronix, Scientific Atlanta and Hewlett-Packard.

Project Babylon was Bull's grandest vision, now almost within his grasp. The Iraqi space-launcher was to have a barrel five hundred feet long, and would weigh 2,100 tons. It would be supported by a gigantic concrete tower with four recoil mechanisms, these shock-absorbers weighing sixty tons each. The vast, segmented cannon would fire rocket-assisted projectiles the size of a phone booth, into orbit around the Earth.

In August 1989, a smaller prototype, the so-called "Baby Babylon," was constructed at a secret site in Jabal Hamrayn, in central Iraq. "Baby Babylon" could not have put payloads into orbit, but it would have had an international, perhaps intercontinental range. The prototype blew up on its first test-firing.

The Iraqis continued undaunted on another prototype super-gun, but their smuggling attempts were clumsy. Bull himself had little luck in maintaining the proper discretion for a professional arms dealer, as his own jailing had proved. When flattered, Bull talked; and when he talked, he boasted.

Word began to leak out within the so-called "intelligence community" that Bull was involved in something big; something to do with Iraq and with missiles. Word also reached the Israelis, who were very aware of Bull's scientific gifts, having dealt with him themselves, extensively.

The Iraqi space cannon would have been nearly useless as a conventional weapon. Five hundred feet long and completely immobile, it would have been easy prey for any Israeli F-15. It would have been impossible to hide, for any launch would throw a column

of flame hundreds of feet into the air, a blazing signal for any spy satellite or surveillance aircraft. The Babylon space cannon, faced with determined enemies, could have been destroyed after a single launch.

However, that single launch might well have served to dump a load of nerve gas, or a nuclear bomb, onto any capital in the world.

Bull wanted Project Babylon to be entirely peaceful; despite his rationalizations, he was never entirely at ease with military projects. What Bull truly wanted from his Project Babylon was **prestige**. He wanted the entire world to know that he, Jerry Bull, had created a working space program, more or less all by himself. He had never forgotten what it meant to world opinion to hear the Sputnik beeping overhead.

For Saddam Hussein, Project Babylon was more than any merely military weapon: it was a **political** weapon. The prestige Iraq might gain from the success of such a visionary leap was worth any number of mere cannon-fodder battalions. It was Hussein's ambition to lead the Arab world; Bull's cannon was to be a symbol of Iraqi national potency, a symbol that the long war with the Shi'ite mullahs had not destroyed Saddam's ambitions for transcendent greatness.

The Israelis, however, had already proven their willingness to thwart Saddam Hussein's ambitions by whatever means necessary. In 1981, they had bombed his Osirak nuclear reactor into rubble. In 1980, a Mossad hit-team had cut the throat of Iraqi nuclear scientist Yahya El Meshad, in a Paris hotel room.

On March 22, 1990, Dr. Bull was surprised at the door of his Brussels apartment. He was shot five times, in the neck and in the back of the head, with a silenced 7.65 millimeter automatic pistol.

His assassin has never been found.

FOR FURTHER READING:

ARMS AND THE MAN: Dr. Gerald Bull, Iraq, and the Supergun by
William Lowther (McClelland- Bantam, Inc., Toronto, 1991)

**BULL'S EYE: The Assassination and Life of Supergun Inventor
Gerald Bull** by James Adams (Times Books, New York, 1992)