SECTION 1

Background:
The Debate over Weaponizing Space

The launch of the Sputnik–the first artificial earth-orbiting satellite–on October 4, 1957 by the Soviet Union marked the beginning of intense superpower space rivalry with the US that lasted throughout the Cold War. Both superpower militaries recognized the value of space as the ultimate high ground and a wave of hundreds of satellite launches commenced.

The launches were primarily dominated by military missions, but civilian scientific exploration of space also grew. The Soviet military controlled both military and civilian space activities, but the United States created the National Aeronautics and Space Administration (NASA), separating civilian and military space endeavors.

There was fierce competition between the United States and the Soviet Union in both civilian and military missions. Even as the United States landed the first human on the moon, the Soviet Union chalked up records for the longest human space flight, as well as for the first docking of two ships in space.

With the revolution in computers and telecommunications, a new element entered the space arena: commercial utilization. The growth in this sector has been dramatic in the last two decades. Highly capable military satellites are expensive, but commercial satellites can be built for much less. Miniaturization of electronics, efficient power sources, and growth in computing power made smaller satellites possible and thus affordable also to many countries of the world. While the commercial satellite market is dominated by telecommunications, other applications, such as telemedicine and earth imagery, are beginning to take hold. The demand for broadband services, although slower than earlier projected, is expected to grow. Another aspect of the present satellite market is the growth of dual-

use systems in which military and commercial users share the services offered by a single satellite. In fact, the bulk of U.S. military communications is now carried by commercial satellites.

The landmark 1967 Outer Space Treaty that was signed by most members of the U.N., including the United States and the Soviet Union, prohibited the use of space for stationing any weapons of mass destruction. It also banned the moon and other celestial bodies from being used for military purposes. In fact, the first U.S.-U.S.S.R. Strategic Arms Limitation Treaty (SALT) signed in 1972 enshrined a promise by each country not to attack the other's "national technical means of verification," a euphemism for photo-reconnaissance satellites possessed by both sides. The two superpowers recognized and agreed that satellite reconnaissance was of fundamental importance for maintaining a credible nuclear deterrent and for reducing uncertainty in decision making by each knowing what the other was doing.[1]

In the late 1950s and early 1960s the United States and the Soviet Union conducted a series of atmospheric tests[2], the most notable being the 1.4 megaton explosion at an altitude of 400 km in the South Pacific, called Starfish.[3]

The United States carried out Starfish in 1962. It brought to light the harmful effects of a high-altitude nuclear explosion (HANE). Three satellites were reportedly temporarily put out of commission by the bombardment of energetic particles created by the nuclear reaction. Nuclear weapons tests in the atmosphere and beyond have been banned since 1963 after adoption of the Partial Test Ban Treaty. However, the effects from the Starfish test created concern that a rogue nation could carry out such an explosion to damage U.S. satellites.

Notwithstanding treaties and pronouncements, both sides maintained research and development in anti-satellite weapons technology (ASAT) programs. Both the United States and the Soviet Union experimented with ground-based kinetic interceptors, lasers, and microwave weapons. According to Albert Wheelon, who was Deputy Director of the CIA and directed the first U.S. reconnaissance satellite program known as Corona, the United States established two anti-satellite systems in the Pacific Ocean in 1963, and kept them in operation for almost ten years. The United States also developed an ASAT that was to be launched from an F-15 aircraft to hit low earth orbit (LEO) satellites. This technology employed a

two-stage 2,600 lb. rocket and an infrared sensor for terminal guidance. This system was flight tested three times in 1985, once against an orbiting target.[4] The Soviets also flight tested a co-orbital anti-satellite system that was successful in 11 out of 26 tests in orbit.[5] Space-based weapons such as kinetic or directed energy interceptors have also been studied. However, neither the Soviet Union nor the United States has retained an ASAT system, although no treaty governing space operations bans such systems.

In 1972, the Anti-Ballistic Missile (ABM) Treaty between the United States and the Soviet Union outlawed development and testing of any missile defense system that was mobile, sea-based, or space-based. It also prohibited any space-based components that incorporate "other physical principles" such as the laser. However, in 2002 the United States exercised its option to withdraw unilaterally from the Treaty.

It is clear that both sides observed restraint in their pursuit of anti-satellite weaponry in general and space weapons in particular. The restraint was derived from the consensus that everyone's satellites are highly vulnerable. Again, in Wheelon's opinion, the United States was capable of destroying Soviet satellites with its ASAT systems based in Kwajalein Atoll and Johnston Island, systems which were established in 1963. The Soviets could do the same to the Corona, the first U.S. spy satellites in LEO, with their nuclear-tipped ABM system around Moscow.[6]

"Militarization" vs. "Weaponization"

The military applications of satellites were primarily in the areas of intelligence gathering, reconnaissance, navigation, and communications. In addition, both the United States and the Soviet Union created an early warning system to detect and track each other's intercontinental ballistic missile launches. The militaries of both countries have fielded many single satellites and whole orbital formations that, according to Russian political analyst Andrei Kislyakov, can be described as "general-purpose military space systems." Therefore, one could speak generally of the so-called "militarization" of space, which has existed since the days of the first launches. But as Kislyakov correctly points out, "Although military-oriented, they are not weapons since they are not intended to engage hostile targets and do not pose an offensive threat in or “from space."[7] This is an important de-

marcation between militarization and weaponization.

Throughout the Cold War, satellites were not openly used during warfare for tactical purposes such as active targeting or guidance of weapons. The situation changed in a marked way with the new weapons introduced in the first Gulf War in 1991-the significant deployment of precision satellite-guided weapons and use of satellite communications for tactical purposes such as relaying information from AWACS, JSTARS, and more recently from unmanned aerial vehicles such as the Predator.

Yet while militarily very useful, the Global Positioning System (GPS) constellation is not a space weapon. For the purposes of this Panel's work, we have adopted the term "weaponization" of space to mean the placement of actual weapon systems in space. The Panel recognizes that there are various functions that space weapons can perform. The major ones are attack on satellites, attack on ground assets, and interception of missiles in either boost-phase or in mid-course.

The Panel recognizes the fact that satellites or satellite systems are vulnerable to attacks from many different sources by multiple means other than space-based weapons. The sources include ground-based anti-satellite weapons, jamming of communication links, attacks on satellite earth stations, and even detonation of a nuclear weapon in space. The report discusses these vulnerabilities and threats and examines mitigation strategies.