

Lasers in Homeland Security Applications

After the tragic events of September 11 of 2001, the department of Homeland Security was created. Its primary function is to utilize technology and information gathering capabilities to secure the United States homeland against future terrorist attacks. An increasing effort has been to monitor vital facilities and U.S. borders using video surveillance. For this surveillance to be effective sophisticated systems are being used that can monitor remote sites both in the presence and absence of daylight. New laser systems have been proposed and are under construction for defending the homeland from ballistic attacks. These laser systems are found at fixed locations on the ground, aboard mobile platforms, ships or airplanes.

Video reconnaissance

Video reconnaissance utilizes a wide range of imaging systems to cover area that would be difficult to cover with armed forces. The entire perimeters of nuclear power plants, water treatment facilities, or a city's sub-way system are examples of continuous video surveillance. Video reconnaissance allows a single operator to monitor hundreds of video cameras. The performance of these video cameras is crucial to the effectiveness of these surveillance systems. These systems need to operate during a variety of lighting conditions but they are generally effective only in the presence of light.

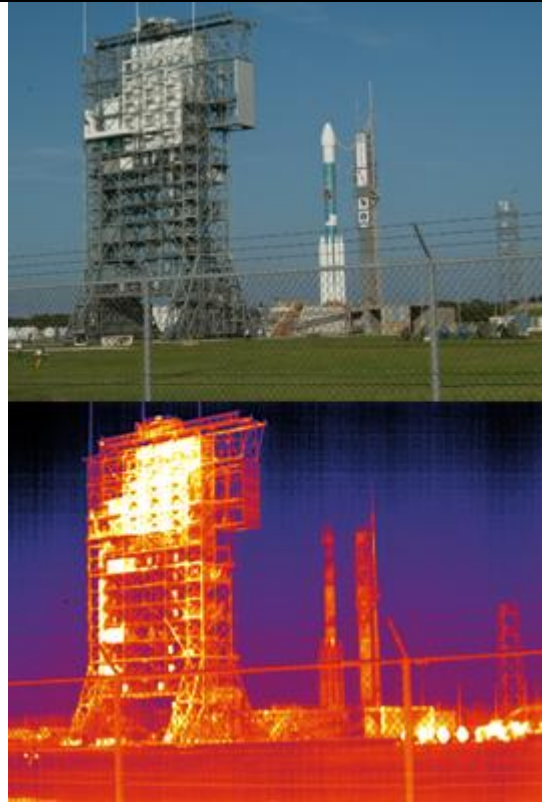


Infrared Systems

Infrared systems operate in the absence of light, and they can be used at night or in dark areas where sunlight cannot reach. Infrared light is emitted by all objects that are heated. The hotter the object is the more infrared light it emits. Infrared detectors have the ability to see these heated objects. The imagery they produce is proportional to the temperature differences of objects imaged by the lens system. The ability to see temperature difference called heat signatures gives infrared systems the unique ability to effectively see in the dark. This makes them highly useful for security applications.

The picture on the right shows a top-to-bottom comparison image of a Delta II rocket in the late afternoon before launch. On the top is a photograph in visible light, while on the bottom is the infrared image showing the launch vehicle at night. The coldest surfaces in the infrared image are blue/black while the hottest ones are yellow/white. The comparison between these two images reveals many interesting features of infrared light.

In many places the infrared image almost mimics a photographic negative, with light objects in the visible photograph looking dark in the infrared and vice versa. This is not a simple photographic effect, but a result of the fact that darker surfaces absorb sunlight more efficiently and become hotter than lighter surfaces



Defense Lasers

The first time that lasers accompanied US military forces into combat was in the Vietnam War, where they designated targets for laser-guided bombs. Since then, such devices have been used to determine distance to a target, to signal and communicate, and to disrupt optical devices of hostile forces. The laser even has been used at times merely to frighten enemies; US troops can scare away "bad guys" by putting visible laser aiming "spots" on their chests at night. In the near future, however, lasers will take a dramatic step forward. No longer will they serve only as weapon enablers or as non-lethal systems. The lasers will themselves become hard-kill weapons. Megawatt-class devices will be put on the ground, in the air, and into space, where they will function as lightning-fast defensive systems.

According to the Air Force Magazine online, the AL-1 Airborne Laser will be the first line of defense against theater ballistic missiles, starting around 2004. Orbiting the sky near the edge of the battlefield, the AL-1 will detect missile launches with infrared devices, then use a trio of lasers to spot, track, and target the missile, as well as focus the massive battle laser in a nose turret. The missile will explode when the laser heats and ruptures its surface, causing the rocket fuel inside to explode. Debris--and the warhead--will fall back onto the launch area.

Source:

<http://www.afa.org/magazine/sept1999/0999laser.s.asp>



The AL-1 Airborne Laser System

<http://www.afa.org/magazine/sept1999/0999laser.s.asp>





Tactical High Energy Laser

THEL/ACTD, built by TRW is the world's first high-energy laser weapon system designed for operational use, to shoot down a rocket carrying a live warhead. For this critical first test of THEL/ACTD's defensive capabilities, an armed Katyusha rocket was fired from a rocket launcher placed at a site in White Sands Missile Range. Seconds later, the THEL/ACTD, located several miles away at HELSTF, detected the launch with its fire control radar, tracked the streaking rocket with its high precision pointer tracker system, then engaged the rocket with its high- energy chemical laser. Within seconds, the 10-foot-long, 5-inch-diameter rocket exploded.

Source: www.spacedaily.com/news/laser-00g.html

