OFFENSIVE SPACE CONTROL

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Offensive Space Control Operations

Offensive space control (OSC) are those offensive operations to prevent an adversary's hostile use of US/third-party space capabilities or negate an adversary's space capabilities.[1] OSC entails the negation of adversary space capabilities through deception, disruption, denial, degradation, or destruction.

Potential adversaries have access to a range of space systems and services that could threaten our forces and national interests. Even an adversary without indigenous space assets may use space through US, allied, commercial, or consortium space services. These services include precision navigation, high-resolution imagery, environmental monitoring, and satellite communications. Denying adversary access to space capabilities and protecting US and friendly space capabilities may require taking the initiative to preempt or otherwise impede an adversary.

OSC operations preclude an adversary from exploiting space to its advantage. OSC operations may target an adversary's space capability (space system, forces, information links, or third party space capability), using a variety of permanent and/or reversible means. Deception, disruption, denial, degradation, and destruction, commonly known as the "Five Ds," are the possible desired effects when targeting an adversary's space capability.

OSC Targeting Considerations

OSC targeting operations mirror the Air Force's standard targeting process of find, fix, track, target, engage, and assess (F2T2EA).[2] The F2T2EA process is also fundamental to DSC and SSA. F2T2EA relies upon ISR all throughout the process.

Find, Fix, and Track. The ability to find, fix, and track space objects, signals, and terrestrial nodes is fundamental to attack the adversary, defend/preserve friendly space capabilities, assess collateral effects on third party space assets, or understand the operational environment. Radar and optical sensors find, fix, and track objects in space just as sensors find, fix, and track airborne objects within an area of interest.

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[1] JP 3-14, *Space Operations*.
[2] Annex 3-60, *Targeting.*

An important aspect of find, fix, and track includes the ability to characterize space systems, signals, environment, and threats. Characterization builds knowledge of how systems operate, the signals they use, how they react to changes in conditions, the threats they pose to friendly/adversary operations, and other important factors. Understanding US space systems and the threats to them enhances our ability to preserve, withstand, or respond to an attack.

Target and Engage. Characterization data enhances our ability to target a space capability, often providing greater flexibility to achieve the desired effect. If we understand how the space system works, the decision and the trade-offs on how to affect the target will be easier. Deconfliction is just as important in space control operations as it is in other military operations. Electromagnetic spectrum and physical deconfliction must be accomplished to avoid "blue-on-blue" impacts and unintentional interference with other parties.

Assess. Assessment of the results of OSC or defensive space control (DSC) operations is critical. The ability to assess whether the environment or a threat is producing an effect, like interference, is crucial to ensuring proper response. Another major area concerning assessment is the ability to ascertain the effect these missions have on offensive and defensive operations. Effective ISR planning and execution are essential for accurate assessment. Today, our ability to characterize and assess a potential threat or target may be limited. Close cooperation with appropriate DOD and non-DOD agencies is critical to improve the availability of intelligence required to characterize and assess space systems, signals, environment, and threats.

OSC Targets

The targets for OSC operations stem from the nodes and links of adversary systems. When an adversary system is deemed reliant on space, OSC actions may target space nodes, terrestrial nodes, and/or communications links in order to affect the adversary system. Space nodes may include satellites, space stations, or other spacecraft. Adversary terrestrial nodes include land, maritime, or airborne equipment and resources used to deploy, enable, interact with, or otherwise affect the space node. Communication links tie nodes together and pass information between them. Understanding space capability as a system of nodes and links enables determining the best ways and means for affecting adversarial capability. The following paragraphs discuss examples of OSC targets.

On-Orbit Satellites. Satellites are on-orbit assets consisting of a mission sensor and a satellite bus. The mission sensor provides raw data, which is usually sent to a ground station for processing. The satellite bus carries the mission sensor and provides it power, thermal control, and communications. OSC operations may target the mission sensor or the satellite bus. For example, a laser may deny, disrupt, degrade, or destroy certain types of sensors. Kinetic ASAT weapons, on the other hand, usually target the satellite bus for physical destruction.

Communication Links. Space systems are dependent on RF and/or laser links to provide communication between space and terrestrial nodes (satellite to ground station or satellite to user) and between satellites (satellite to satellite). Links between terrestrial nodes (ground station to users) include fiber optic and traditional cable in addition to the RF and laser links. On-orbit satellites and ground-based satellite control stations/users send data up and down the link. In the up-link, command and control data tasks satellite mission payloads and subsystems. In the downlink, mission payload and satellite state-of-health data are sent to a ground station for processing. The ground station, after processing, often sends the mission data to the users via SATCOM for exploitation. In the case of SATCOM systems, data may be directly up-linked and then down-linked between users. Most space systems are ineffective without communication links.

Ground Stations. Ground-based systems perform satellite command and control and mission data processing. Ground stations are normally permanent structures that may represent a single point of failure in a space system. Mobile ground stations can also be used to command a satellite, but may have no ability, or a limited capacity, for processing satellite mission data.

Launch Facilities. The ability to place satellites into orbit is the first step to space access; fundamental to the ability to operate and maintain space-based capability. Whether this capability is indigenous, or provided by a third party, it is the only means to deploy satellites to space and represents a primary choke-point for interdicting an adversary's efforts to augment or reconstitute space forces.

Command, Control, Communication, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) Systems. C4ISR systems are critical to the effective employment of forces and assets. Attacking such systems would substantially reduce the enemy's capability to detect, react, and bring forces to bear against friendly forces. Attacking C4ISR systems may contribute to OSC operations but may also contribute to other operations such as strategic attack or counterair operations, depending on the intended effects. Attacking these nodes can cripple the adversary kill chain by denying access to information or negating adversary leadership.

Third Party Providers. An adversary may gain significant space capabilities by using third party space systems. Using diplomatic or economic means to deny an adversary access to these third party (commercial or foreign) space capabilities will generally require the assistance of other US governmental agencies.

OSC Resources and Forces

The effectiveness of OSC operations to affect the array of targets previously listed depends on the availability and capabilities of certain resources and systems. The choice of system depends upon the situation, threats, weather, and available intelligence. To the greatest extent practicable, use systems and methods which minimize risk to friendly forces, civilians, and civilian property. For example, an aircraft employing standoff weapons may provide the same effect as a special operations team, with less risk to friendly forces. The following paragraphs discuss some of the forces and weapon systems that could potentially be used to conduct OSC.

Aircraft. Friendly aircraft provide non-kinetic and kinetic capabilities against surface targets associated with an adversary's space capabilities. For example, electronic attack platforms (manned and remotely piloted aircraft) could affect the links of an adversary's space system by employing stand-off and stand-in techniques. By attacking terrestrial nodes with electronic attack, bombs, or air-to-surface missiles, aircraft may disrupt, deny, degrade or destroy an adversary's ability to control their satellites or deliver space effects.

Surface-to-Surface Missiles. Missiles may be employed against a variety of an adversary's space capabilities including launch facilities, ground stations, and space nodes.

Special Operations Forces. Special operations forces (SOF) can conduct a wide range of special operations core operations and activities against terrestrial nodes. As examples, SOF may conduct a direct action mission against terrestrial nodes, provide terminal guidance for conventional air assets, or provide localized jamming against an adversary's links.

Surface Forces. Surface forces may include conventional land or maritime forces or SOF, as described above. Surface forces can achieve significant effects between the lethality of supporting surface fires and the ability to occupy and secure key areas. For example, surface forces can attack a ground-based satellite control station in order to disrupt, degrade, or destroy an adversary's space capability.

Offensive Space Control Systems. These systems are designed specifically for OSC operations, such as a counter satellite communications capability designed to disrupt satellite-based communications used by an adversary. Another OSC system is a counter surveillance reconnaissance capability designed to impair an adversary's ability to obtain targeting, battle damage assessment, and information by denying their use of satellite imagery.

Anti-Satellite Weapons. Anti-satellite (ASAT) weapons include direct ascent and orbital systems that employ various mechanisms to affect or destroy an on-orbit spacecraft.

Directed Energy Weapons. Directed energy weapons, such as lasers, may be land-, maritime-, air-, or space-based. Depending on the power level used, directed energy

weapons are capable of a wide range of effects against on-orbit spacecraft, including: heating, blinding optics, degradation, and destruction. Under certain circumstances, lasers may also be effective against space launch vehicles while in-flight.

Cyberspace Operations. Many OSC targets, particularly elements of the terrestrial node, may be affected by various cyberspace operations. Some techniques afford access to targets that may be inaccessible by other means.

Electronic Warfare Weapons. Electronic warfare weapons may include electromagnetic jammers, directed energy weapons as described above, and antiradiation missiles. Electromagnetic jammers, may be used to disrupt adversary links. Antiradiation missiles passively home on a radiation source and may be used to strike ground-based space surveillance radars or satellite control stations.[3]

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[3] JP 3-13.1, *Electronic Warfare.*