



CURTIS E. LEMAY CENTER

FOR DOCTRINE DEVELOPMENT AND EDUCATION



ANNEX 3-14 SPACE OPERATIONS

POSITIONING, NAVIGATION, AND TIMING

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Space-based PNT has grown into a global utility whose multi-use services are integral to US national security, economic growth, transportation safety, and homeland security, and are an essential element of the worldwide economic infrastructure. GPS is a key component of multiple sectors of US critical infrastructure.

Space-based PNT assets provide essential, precise, and reliable information that permits joint forces to more effectively plan, train, coordinate, and execute operations. Precision timing provides the joint force the capability to synchronize operations and enables communications capabilities such as frequency hopping and cryptologic synchronization to improve communications security and effectiveness. PNT also enables precision attack from stand-off distances, thereby reducing collateral damage and allowing friendly forces to avoid threat areas. JP 3-14 states "navigation warfare" ensures friendly forces have unfettered access to PNT, while denying adversarial use of the same.¹ Specialized military user equipment, signal spectrum, and security are key components of providing a navigation warfare advantage to US and allied forces. Of note, denial of the "navigation" signal may have a direct negative impact on joint systems that have nothing to do with "navigation." This is particularly true for communications systems that rely on PNT.

Space-based PNT systems, in combination with terminal units, provide the joint force with precise three-dimensional position capability, navigation options, and a highly accurate time reference. When conducting joint military operations, it is essential that PNT services be available with the highest possible confidence. PNT plays a key role in military operations in all domains. PNT capabilities are increasing across the space, control, and user segments (see figure **Positioning, Navigation, and Timing**).

¹ JP 3-14, [Space Operations](#)



Positioning, Navigation, and Timing

Examples of PNT Enabling Operations

PNT Enabling [Land Operations](#). Minefields and obstacles can be accurately surveyed, emplaced, and recorded. The accuracy of artillery fire is improved through precise gun emplacement, precision gun laying, precision observer location, a reduction in adversary target location error, and precision guided artillery and mortar rounds. Armored units can travel “buttoned-up” and still maintain highly accurate position awareness.

PNT Enabling [Maritime Operations](#). Ships and submarines can precisely plot their position, thereby allowing safe port operations and navigation through restricted waters. Coastlines can be accurately surveyed by using a combination of laser range finding and highly accurate position information. Mines can be laid and precisely plotted for friendly force avoidance and safe, efficient retrieval.

PNT Enabling [Air Operations](#). Information on PNT enhances airdrop, air refueling, search and rescue, reconnaissance, terminal approach and recovery, low-level navigation, targeting, and precision weapons delivery. Air corridors for friendly return-to-force procedures can be set with greater accuracy, and aircraft have a greater capability to safely follow these corridors. PNT also enables near-real-time reallocation of airborne firepower for nontraditional ISR and dynamic targeting.

PNT Enabling [Space Operations](#). PNT provides exact positioning to other satellites to enable their “position autonomy.” PNT enables “orbital rendezvous” between space systems (e.g., space docking for the International Space Station). PNT also provides precise timing to communications satellites and to systems in geosynchronous orbits.

PNT Enabling [Cyberspace Operations](#). PNT provides the timing signal that routers, data links, and a wide variety of telecommunications systems use to operate. PNT also provides the ability to geolocate other communication devices that are GPS enabled.
