BY ORDER OF THE COMMANDER
SPACE OPERATIONS COMMAND

SPACE OPERATIONS COMMAND
MISSION DIRECTIVE 801

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Mission Directive

GLOBAL POSITIONING SYSTEM (GPS)

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This mission directive implements guidance in AFI 38-101, *Manpower and Organization*. Its purpose is to define the mission, organization, and responsibilities of the USSF 2d Space Operations Squadron (2 SOPS). This MD applies to all 2 SOPS personnel. This MD does not apply to Air National Guard, Air Force Reserve Command, or United States Air Force units and members. Refer recommended changes and questions about this publication to the OPR using DAF Form 847, *Recommendation for Change of Publication*; route DAF Forms 847 from the field through the appropriate functional's chain of command. Submit requests for waivers through the chain of command to the Publication OPR for non-tiered compliance items. Ensure that all records created as a result of processes prescribed in this publication are maintained IAW AFI33-322, *Records Management and Information Governance Program.* This publication may not be supplemented or further implemented/extended.

SUMMARY OF CHANGES

Content within this MD was expanded to capture civilian participation within the GPS mission area and identify organized units affiliated with the 2 SOPS.

1. Mission. Perform Command and Control (C2) of USSF Satellite Navigation (SATNAV) capabilities to provide positioning, navigation, and timing (PNT) and nuclear detonation detection. Capabilities are delivered 24/7/365 globally to US & Allied militaries and other government-authorized users as well as civil users for established strategic PNT mission taskings derived from the Title 10 United States Code Section 2281, Global Positioning System, DoDI 4650.08, *Positioning, Navigation, and Timing and Navigation Warfare*, and JP 3-85, *Joint Electromagnetic Spectrum Operations*. The encrypted military PNT signal requires specialized receivers for operation in electronically challenged environments containing both naturally occurring as well as intentional threats to maintain the Electromagnetic Protect (EP) element of Electromagnetic Warfare (EW). The unencrypted civil PNT signal does not offer military EP mitigations. The fielded USSF PNT program delivering strategic PNT is the Global Positioning System (GPS) operated by the USSF 2SOPS which is assigned Deployment Indicator Code 9 Unit Type Code of "1SPBA – SPC Position Nav Timing-GPS."

1.1. **2 SOPS organized/designed mission:** For strategic PNT Electronic Protect (EP) delivery to US & Allied militaries and other government-authorized users, 2 SOPS operates the GPS satellite vehicle constellation via the ground control segment while the other military services deploy user equipment receivers for force structure in their assigned operational domains. 2 SOPS includes the Master Control Station (MCS) and GPS Warfighter Collaboration Cell (GWCC), the latter to maximize GPS delivery of strategic PNT across the range of military operations (ROMO) in contested, degraded, and operationally limited (CDO) environments. 2 SOPS delivery of GPS EP is a single NAVWAR element of an overarching Combatant Command (CCMD) PNT Electronic Warfare (EW) campaign which may also employ complementary and/or alternate PNT EP sources fielded by the other military Services in their regional-tactical environments as well as integrate non-2 SOPS Electromagnetic Attack (EA) and Electromagnetic Support (ES) capabilities. For civil users, 2 SOPS executes C2 of the GPS constellation via the ground control segment (CS), in turn, enabling a range of US government policy goals and civilian programs assigned to non-DOD cabinet departments and agencies which advance public safety as well as foster economic opportunities for private industry.

1.1.1. **2 SOPS Weapon systems and equipment.** The GPS consists of space, ground control, and user segments. 2 SOPS operates the ground CS to C2 satellite vehicles (SV) in Medium Earth Orbit (MEO) delivering military and civil PNT signals to air, ground, maritime (surface), and spaceborne user equipment (UE) receivers. While UE fielding is controlled by the other military Services for their respective force structure, 2 SOPS operates the CS via the MCS at Schriever Space Force Base (SSFB), Colorado. The MCS delivers military PNT EP signals and is responsible for all aspects of constellation C2. This includes use of global monitor station data to compute the precise locations of the satellites, generation of navigation messages for upload to the satellites, and monitoring satellite broadcast for system integrity to ensure constellation health and accuracy. The operational crews also provide routine satellite bus and payload status monitoring, perform critical maintenance and anomaly resolution, including repositioning satellites to maintain an optimal constellation.

1.1.2. **2 SOPS applicable threat environments.** 2 SOPS operates the GPS to provide strategic PNT EP as one element of NAVWAR for a CCMD PNT EW campaign principally challenged by jamming, spoofing, cyber, and kinetic threats. While the CCMD

establishes intent, objectives, and priorities for military PNT EP, PNT ES, and PNT EA provided by the various Service Generate, Present, & Sustain (GP&S) force elements, 2 SOPS utilizes a combination of signal power and encryption for strategic PNT EP delivery to mitigate Intelligence Community (IC) validated jamming, spoofing, and cyber threats for peer and near-peer nation-state actors as well as non-state entities. Regarding kinetic threats, design of the GPS offers a degree of resilience through an optimized MEO satellite constellation, primary & back-up ground control, distributed antenna and monitoring network, and a diversified user equipment receiver architecture; external to GPS, other CCMD capabilities to defeat kinetic threats add additional layers of resilience. 2 SOPS will, on order or in accordance with approved guidance/direction/rules of engagement, execute Tactics, Techniques, and Procedures (TTPs) to protect and defend the constellation against near-term kinetic space-to-ground, space-based threats, and current cyber threats and assure the PNT signal. 2 SOPS has been organized/designed to operate in Threat Level 1, Threat Level 2, Threat Level 3, and Threat Level 4.

1.1.3. **2 SOPS Future Requirements.** 2 SOPS continuously monitors and supports modernization efforts to the SV and CS (identified in paragraphs **1.1** and **1.1.1** above). The GPS constellation is a mix of old and new satellites. The launch of new Block III and IIIF SVs enables military signal EP upgrades to address IC-validated jamming, spoofing, and cyber threat projections. GPS III/IIIF SVs also bring new civil signals for accuracy improvement and safety-of-life applications. For the CS, the installation of the Next Generation Operational Control System (OCX) focuses on IC-validated cyber threat mitigation and enables C2 of new GPS III/IIIF SV capabilities. While SV and CS are the USSF OT&E boundary for 2 SOPS, the military Services are integrating new Military GPS User Equipment (MGUE) for their respective force structure programs. Collectively, all 3 segments are required to deliver strategic SATNAV EP capability to a CCMD.

1.1.4. **2 SOPS Air Reserve Component Total Force Integration relationship.** 19th Space Operations Squadron (19 SOPS) is the AFRC classic associate unit to 2 SOPS. The objectives of this total force association are to optimize force structure through integration of resources and personnel, facilitate training and execution of mission, benefit mission through depth of experience inherent in the Air Reserve Component (ARC), and encourage retention of skilled personnel in the Total Force.

1.2. **2 SOPS OL A Organized/Designed Mission.** OL A (SF9R30) ground antenna is assigned to 2 SOPS and is located at Ascension Island Administration (ADM), St. Helena (STHEL). OL A transmits commands, navigation data uploads, and processor program loads to the satellites. Monitoring Station (MS) Ascension Island is co-located with OL A ground antenna. The OL A MS is equipped with an atomic clock standard and GPS receivers to continuously collect GPS data for all the satellites in view from their locations. The collected data is sent to the MCS where it is processed to estimate satellite orbits (ephemerides) and clock errors, among other parameters, and to generate the Navigation Message. The MS also collect navigation signals, range/carrier measurements and atmospheric data. **Note:** Satellite Control Network (SCN) GAs augment AEP operations.

1.2.1. **2 SOPS OL A Weapon systems and equipment.** OL A ground antenna is functionally a sub system of the Global Positioning System/Operational Control System (GPS/OCS). The ground antenna consists of the Antenna Control Unit (ACU), the High-Power Amplifier (HPA), Control and Status Display and the Tracking Pedestal.

1.2.2. **2 SOPS OL A Applicable Threat Environments.** OL A is principally challenged by jamming, spoofing and cyber threats.

1.2.3. **2 SOPS OL A Future Requirements.** OL A is at the end of its design life (EOL). Given current timeline for OCX Operational Acceptance (AO), OL A will need to retain and continue supporting certain legacy, obsolete equipment well past 2025 for OCX operations. Numerous GA parts/equipment have reached or exceed EOL. Additionally, the supporting industrial base has been depleted of the required capability to support sustainment of the existing GA system's configuration. Complete Technical refresh of the OL A GA is recommended, so operational effectiveness can be maintained, and suitability objectives can be met.

1.2.4. **2 SOPS OL A Air Reserve Component TFI Relationship.** N/A

1.3. **2 SOPS OL B Organized/Designed Mission.** OL B (SF9RB0) ground antenna is assigned to 2 SOPS and is located at Kwajalein Army Installation (AIN), Marshal Islands. OL B transmits commands, navigation data uploads, and processor program loads to the satellites. Monitoring Station (MS) Kwajalein is co-located with OL B ground antenna. The OL B MS is equipped with an atomic clock standard and GPS receivers to continuously collect GPS data for all the satellites in view from their locations. The collected data is sent to the MCS where it is processed to estimate satellite orbits (ephemerides) and clock errors, among other parameters, and to generate the Navigation Message. The MS also collect navigation signals, range/carrier measurements and atmospheric data. **Note:** Satellite Control Network (SCN) GAs augment AEP operations.

1.3.1. **2 SOPS OL B Weapon systems and equipment.** OL B ground antenna is functionally a sub system of the Global Positioning System/Operational Control System (GPS/OCS). The ground antenna consists of the Antenna Control Unit (ACU), the High-Power Amplifier (HPA), Control and Status Display and the Tracking Pedestal.

1.3.2. **2 SOPS OL B Applicable Threat Environments.** OL B is principally challenged by jamming, spoofing and cyber threats.

1.3.3. **2 SOPS OL B Future Requirements.** OL B is at the end of its design life (EOL). Given current timeline for OCX Operational Acceptance (AO), OL B will need to retain and continue supporting certain legacy, obsolete equipment well past 2025 for OCX operations. Numerous GA parts/equipment have reached or exceed EOL. Additionally, the supporting industrial base has been depleted of the required capability to support sustainment of the existing GA system's configuration. Complete Technical refresh of the OL B GA is recommended, so operational effectiveness can be maintained, and suitability objectives can be met.

1.3.4. **2 SOPS OL B Air Reserve Component TFI Relationship.** N/A

1.4. **2 SOPS OL C Organized/Designed Mission.** OL C (SF9R80) ground antenna is assigned to 2 SOPS and is located at Cape Canaveral SFS, FL. OL C transmits commands, navigation data uploads, and processor program loads to the satellites. Monitoring Station (MS) Cape is co-located with OL C ground antenna. The OL C MS is equipped with an atomic clock standard and GPS receivers to continuously collect GPS data for all the satellites in view from their locations. The collected data is sent to the MCS where it is processed to estimate satellite orbits (ephemerides) and clock errors, among other parameters, and to generate the

Navigation Message. The MS also collect navigation signals, range/carrier measurements and atmospheric data. **Note:** Satellite Control Network (SCN) GAs augment AEP operations.

1.4.1. **2 SOPS OL C Weapon systems and equipment.** OL C ground antenna is functionally a sub system of the Global Positioning System/Operational Control System (GPS/OCS). The ground antenna consists of the Antenna Control Unit (ACU), the High-Power Amplifier (HPA), Control and Status Display and the Tracking Pedestal.

1.4.2. **2 SOPS OL C Applicable Threat Environments.** OL C is principally challenged by jamming, spoofing and cyber threats.

1.4.3. **2 SOPS OL C Future Requirements.** OL C is at the end of its design life (EOL). Given current timeline for OCX Operational Acceptance (AO), OL C will need to retain and continue supporting certain legacy, obsolete equipment well past 2025 for OCX operations. Numerous GA parts/equipment have reached or exceed EOL. Additionally, the supporting industrial base has been depleted of the required capability to support sustainment of the existing GA system's configuration. Complete Technical refresh of the OL C GA is recommended, so operational effectiveness can be maintained, and suitability objectives can be met.

1.4.4. **2 SOPS OL C Air Reserve Component TFI Relationship.** N/A.

1.5. **2 SOPS OL D Organized/Designed Mission.** OL D (SF9R90) ground antenna is assigned to 2 SOPS and is located at Diego Garcia Naval Air Station (NAS), Diego Garcia. OL D transmits commands, navigation data uploads, and processor program loads to the satellites. Monitoring Station (MS) Diego is co-located with OL D ground antenna. The OL D MS is equipped with an atomic clock standard and GPS receivers to continuously collect GPS data for all the satellites in view from their locations. The collected data is sent to the MCS where it is processed to estimate satellite orbits (ephemerides) and clock errors, among other parameters, and to generate the Navigation Message. The MS also collect navigation signals, range/carrier measurements and atmospheric data. **Note:** Satellite Control Network (SCN) GAs augment AEP operations.

1.5.1. **2 SOPS OL D Weapon systems and equipment.** OL D ground antenna is functionally a sub system of the Global Positioning System/Operational Control System (GPS/OCS). The ground antenna consists of the Antenna Control Unit (ACU), the High-Power Amplifier (HPA), Control and Status Display and the Tracking Pedestal.

1.5.2. **2 SOPS OL D Applicable Threat Environments.** OL D is principally challenged by jamming, spoofing and cyber threats.

1.5.3. **2 SOPS OL D Future Requirements.** OL D is at the end of its design life (EOL). Given current timeline for OCX Operational Acceptance (AO), OL D will need to retain and continue supporting certain legacy, obsolete equipment well past 2025 for OCX operations. Numerous GA parts/equipment have reached or exceed EOL. Additionally, the supporting industrial base has been depleted of the required capability to support sustainment of the existing GA system's configuration. Complete Technical refresh of the OL D GA is recommended, so operational effectiveness can be maintained, and suitability objectives can be met.

1.5.4. **2 SOPS OL D Air Reserve Component TFI Relationship.** N/A.

1.6. **2 SOPS Alternate Master Control Station (AMCS) Organized/Designed Mission.** 2 SOPS operates the CS via the AMCS at Vandenberg Space Force Base (VSFB), California, when directed (on a 72-hour deployment order).

1.6.1. **2 SOPS OL AMCS Weapon systems and equipment.** The AMCS delivers military PNT EP signals and is responsible for all aspects of constellation C2. This includes use of global monitor station data to compute the precise locations of the satellites, generation of navigation messages for upload to the satellites, and monitoring satellite broadcast for system integrity to ensure constellation health and accuracy. The operational crews also provide routine satellite bus and payload status monitoring, perform critical maintenance and anomaly resolution, including repositioning satellites to maintain an optimal constellation.

1.6.2. **2 SOPS OL AMCS Applicable Threat Environments.** 2 SOPS OL AMCS utilizes a combination of signal power and encryption for strategic PNT EP delivery to mitigate Intelligence Community (IC) validated jamming, spoofing, and cyber threats for peer and near-peer nation-state actors as well as non-state entities.

1.6.3. **2 SOPS OL AMCS Future Requirements.** 2 SOPS OL AMCS, the installation of the Next Generation Operational Control System (OCX) focuses on IC-validated cyber threat mitigation and enables C2 of new GPS III/IIIF SV capabilities.

1.6.4. **2 SOPS OL AMCS Air Reserve Component TFI Relationship.** 19th Space Operations Squadron (19 SOPS) is the AFRC classic associate unit to 2 SOPS. The objectives of this total force association are to optimize force structure through integration of resources and personnel, facilitate training and execution of mission, benefit mission through depth of experience inherent in the Air Reserve Component (ARC), and encourage retention of skilled personnel in the Total Force.

2. Command.

2.1. Combatant Command (COCOM) authority is vested in the Commander, United States Space Command (CDRUSSPACECOM) for employment of US PNT EP capabilities. When directed by CDRUSSPACECOM, the COMSPACEFOR exercises operational control (OPCON) and the Combined Force Space Component Commander (CFSCC) exercises Tactical Control (TACON) to plan, deploy, and execute PNT EP capabilities.

2.2. Service authority is vested in the Chief of Space Operations, United States Space Force (USSF) for employment of US PNT capabilities and support to the Department of Defense (DoD) for providing sustainment and operations support to meet the performance requirements of the Federal Radionavigation Plan prepared jointly by the Secretary of Defense, Secretary of Transportation, and Secretary of Homeland Security, in addition to all enacted laws, executive orders, ratified treaties and US space policies. The unit commander is authorized to communicate, coordinate, and work with other units or agencies on matters relating to mission accomplishment or regarding administrative or logistical support under applicable agreements and memorandums of understanding.

3. Responsibilities.

3.1. Comply with requirements identified in all HHQ instructions, DAFIs, SPFIs and SpOCIs including: AFI 1-2 Commander's Responsibilities, AFSPCI 10-1204, Satellite Operations,

AFSPCI 10-605, Operational Acceptance Process, AFI 13-602 Volumes 1 through 3, and SPOCMAN13-6GPS Volumes 1 through 3.

3.1.1. The Commander, 2d Space Operations Squadron:

3.1.1.1. When directed by CFSCC, operates, and employs the GPS to execute the assigned mission order – planning order (PLANORD), deployment order (DEPORD), execution order (EXORD) – to deliver strategic PNT EP. Direct liaison authorization (DIRLAUTH) is dependent on C2 considerations for a particular GPS EP mission and/or effect.

3.1.1.2. Provides NAVWAR in support to CCMD and allied/partner operations.

3.1.1.3. Coordinates Request for Information (RFI) and assesses threats to the GPS constellation and signal.

3.1.1.4. Provides Rapid Warfighter Effects (RWE) in support of Joint Staff taskings.

3.1.2. Delivers GPS capabilities in support of National Military Command Center (NMCC) takings to support the joint force.

3.1.3. Is responsible to ensure that operations and signals provided are IAW with Interface Control Documents as approved by the PNT Executive Committee and in compliance with US laws, executive orders, and ratified treaties.

3.1.4. Operates and employs GPS to support transportation, support interference detection and mitigation efforts and how PNT enables critical infrastructure and supports the development of new and expanded civil and commercial uses for the GPS.

3.1.5. Ensures all agreed upon requirements are met that are outlined in approved Interagency Memorandum of Agreements

3.1.6. Is responsible as the SECDEF's representative to support the USG Crucible process for all DoD equities to include identifying, reporting, analyzing, mitigating, and assisting with domestic (all U.S. territories) EMI events for the entire duration of an incident. The unit is responsible for this support at unclassified, secret, and top-secret SCI levels 24 hours a day, 365 days a year.

3.1.7. Ensures GPS signal optimization to meet DOT and DHS safety standards.

3.1.8. Is responsible to ensure that engineers and certified mission ready crew force are trained and ready to include the integration of military, government civilian, and support contractor resources.

STEPHEN N. WHITING, Lieutenant General, USSF
Commander

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

10 USC § 2281, Global Positioning System

AFI 38-101, *Manpower and Organization*, 29 August 2019

AFI 33-322, *Records Management and Information Governance Program*, 23 March 2020

DoDI 4650.08, *Positioning, Navigation, and Timing and Navigation Warfare*, 27 December 2018

JP 3-85, *Joint Electromagnetic Spectrum Operations*, 22 May 2020

Prescribed Forms

None

Adopted Forms

DAF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

2 SOPS—2d Space Operations Squadron

19 SOPS—19th Space Operations Squadron

AMCS—Alternate Master Control Station

Block III SV—3rd generation GPS satellite vehicle

Block IIIF SV—3rd generation GPS satellite vehicle follow-on

C2—Command and Control

CCMD—Combatant Command

CDRUSSPACECOM—Commander, United States Space Command

CFSCC—Combined Force Space Component Commander

CS—Control Segment

EA—Electromagnetic Attack

EP—Electromagnetic Protect

ES—Electromagnetic Support

EW—Electromagnetic Warfare

GPS—Global Positioning System

IC—Intelligence Community

MCS—Master Control Station

MEO—Medium Earth Orbit

MPNTP—Master PNT Plan

NAVWAR—Navigation Warfare

OT&E—Organize, Train, and Equip

PNT—Positioning, Navigation, and Timing

SATNAV—Satellite Navigation

SV—Satellite Vehicle

USSPACECOM—United States Space Command