Proliferated Warfighter Space Architecture (PWSA)

Tracking Layer

Mission

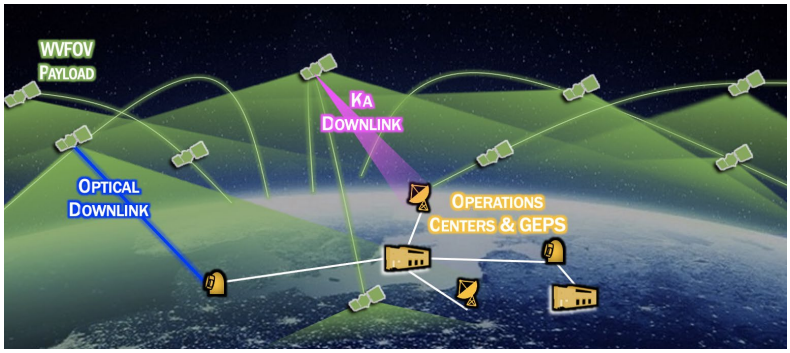
Speed. Delivery. Agility.

The PWSA Tracking Layer provides global, persistent indications, detection, warning, tracking, and identification of advanced missile threats, including hypersonic missile systems.

A Constellation Designed for Space-Based Tracking of Missile Threats

The Tracking Layer is a proliferated constellation with, ultimately, more than 100 space vehicles (SVs) in low-Earth orbit (LEO) with space-borne capabilities designed to detect and track infrared signatures of conventional and advanced missile threats. Each Tracking SV is configured with an infrared sensing payload. The Tracking Layer will provide global, persistent indications, detection, warning, tracking, and identification of conventional and advanced missile threats, including hypersonic missile systems. The Tracking Layer will also demonstrate missile defense capability by incorporating fire control-quality infrared sensors in the constellation. The Tracking Layer will integrate with the PWSA Transport Layer to provide mission data directly over data links. With 2-year spirals of the PWSA, called "tranches", additional Tracking Layer SVs are deployed to proliferate the constellation and to eventually replenish SVs with targeted technological enhancements.

- In **Tranche 0 (T0)**, the "Warfighter Immersion Tranche" (**2023**), the T0 Tracking Layer will provide periodic regional access and demonstrate the capability to detect and track hypersonic vehicles alongside the Missile Defense Agency's HBTSS demo.
- In **Tranche 1 (T1),** the "Initial Warfighting Capability Tranche" (**2025**), the T1 Tracking Layer will provide persistent global mono coverage of missile warning, missile tracking (MW/MT) capability. Tracking SVs are planned to start launching in April 2025.



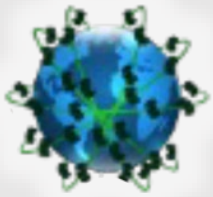
Notional operational depiction of PWSA Tracking Layer SVs.

Transport Layer Constellation Summary	T0 Tracking	T1 Tracking
Total Space Vehicles	8 SVs	35 SVs*
Orbital Planes	2	5
Orbital Altitude	1000km	1000km
Inclination	81^0	81^0

*Does not include 4 planned Fire Control Demo SVs

Tranche 1 Tracking Layer is the First Step Toward an Accelerated Global MW/MT Capability

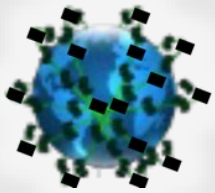
SDA Tranche 1



Near global *mono* coverage capability

- Polar coverage for missile warning and tracking of hypersonic glide vehicles and other advanced below-the-horizon threats
- Near-global track custody for radar cueing-quality data
- 35 SVs in five planes

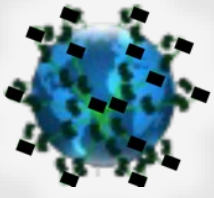
SDA Tranche 1+SSC Epoch 1



Near global *stereo* coverage capability

- Addition of medium-Earth orbit (MEO) bolsters low-latitude coverage and track custody
- Global track custody for radar cueing and initial targeting-quality data
- 35 LEO SVs + MEO SVs (two planes)

SDA Tranche (1+2)+SSC Epoch 1



Robust global coverage capability

- Global coverage for advanced missile warning and tracking
- Near-global track custody for radar cueing and stereo fire control-quality tracks
- 89 LEO SVs + MEO SVs

*SSC = Space Systems Command

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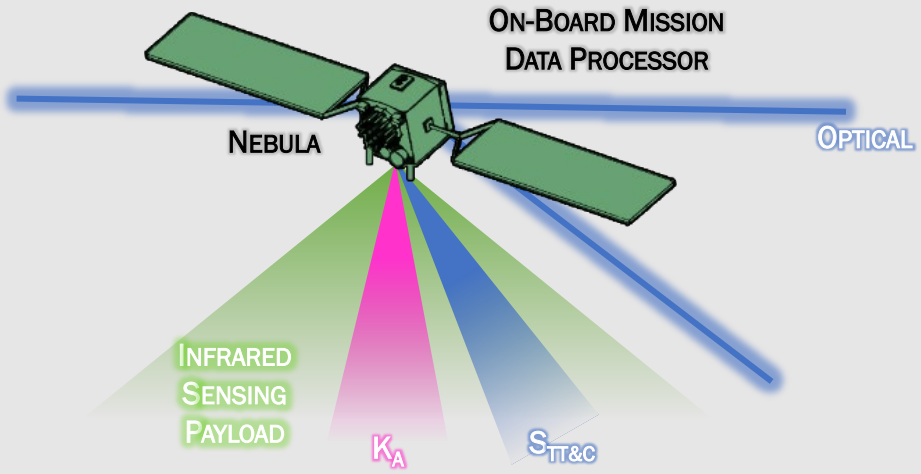
Capability Provided by the Tracking Layer to the Warfighter

The Tracking SVs are equipped with an infrared (IR) payload as well as communications payloads that enable high data-rate connectivity between the SVs, other layers of the PWSA, ground segment, in-theater user terminals, and external mission partners.

- **Ka**-band uplink/downlink capability for direct downlink of mission data and command and control
- **S_{TTC}** for S-Band backup Telemetry, Tracking, and Command (TT&C) commanding
- On-board **Mission Data Processing** for 2D track formation
- IR-**sensing payload** operating in the shortwave infrared (SWIR) spectral band that images over the full visible Earth disk
- **Optical communication terminals (OCTs),** compliant with the SDA OCT Standard, to provide in-plane connectivity of processed and unprocessed Tracking mission data to other SVs in the PWSA constellation and to optical ground terminal (OGTs)
- SDA network interfaces compliant with current SDA **Network Established Beyond the Upper Limits of the Atmosphere (NEBULA)** Standard
- Tracking Layer leverages **existing message formats** (OPGA-79) and **existing architectures** (Realtime Transfer Service) to deliver data to the MW/MT/MD enterprise.



A Look Ahead

Tranche 2: Near Global Stereo Coverage Delivered to the Warfighter

Set to begin launching in 2027, the Tranche 2 Tracking layer will both enhance and replenish the capability provided by Tranche 1 by increasing the overall number of SVs to enable complete near global stereo coverage for missile warning, missile tracking (MW/MT) capability and provide preliminary fire control (FC) capability for missile defense (MD).

Fire Control Demonstrations, FOO Fighter (F2)

Separate from the PWSA operational constellation, the PWSA's Fire-control On Orbit-support-to-the-war Fighter (FOO Fighter) program will demonstrate advanced missile defense capability by incorporating fire control-quality sensors into a prototype constellation.

Technical Areas of Interest

Each PWSA Tranche provides an opportunity to implement targeted enhancements to the Tracking Layer. SDA is interested in exploring technical areas such as :

- Integrated, hybrid architectures including existing and planned MW/MD capabilities.
- Identification and exploration of novel MW/MD sensing concepts or design.
- High dynamic range focal plane arrays
- Resiliency technologies for sensor and SV protection
- Significant reductions in size, weight, power, and cost (SWaP-C) of MW/MD hardware and subsystem components
- Significant performance improvements over traditional MW/MD hardware, software, algorithms, subsystem, component concepts or designs