SPACE DEVELOPMENT AGENCY

Delivering Capabilities

8 March 2021

Dr. Derek Tournear
Director, SDA
OUSD (R&E)

SDA
SPACE DEVELOPMENT AGENCY

SDA's Initial Products

Beyond-Line-Of-Sight (BLOS) targeting for time-sensitive ground and maritime targets

Hypersonic and advanced missile threat warning and tracking

SDA's architecture endeavors to perform the following functions from space:

- ➢ Detect threat systems
- ➢ Track threat systems
- ➢ Identify threat systems
- ➢ Develop targeting solutions
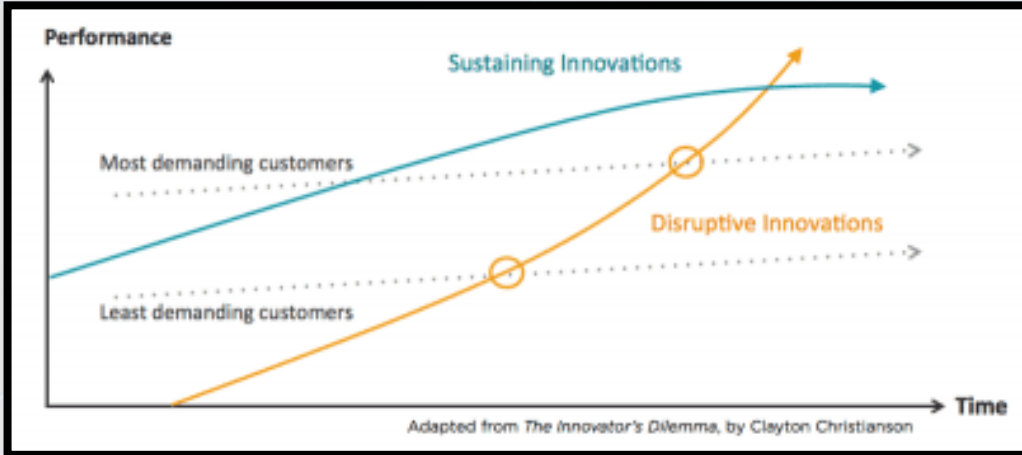- ➢ Distribute targeting data directly to warfighters

...to close kill chains precisely and at a currently unattainable pace

Define and monitor the Department's future, **threat-driven space architecture** and **accelerate** the development and fielding of **next-generation space capabilities**

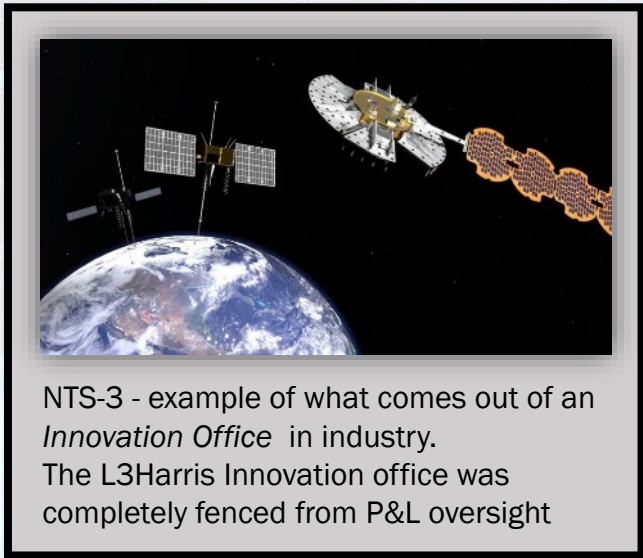TIME-SENSITIVE GROUND & MARITIME TARGETS

HYPERSONIC & ADVANCED MISSILE THREATS
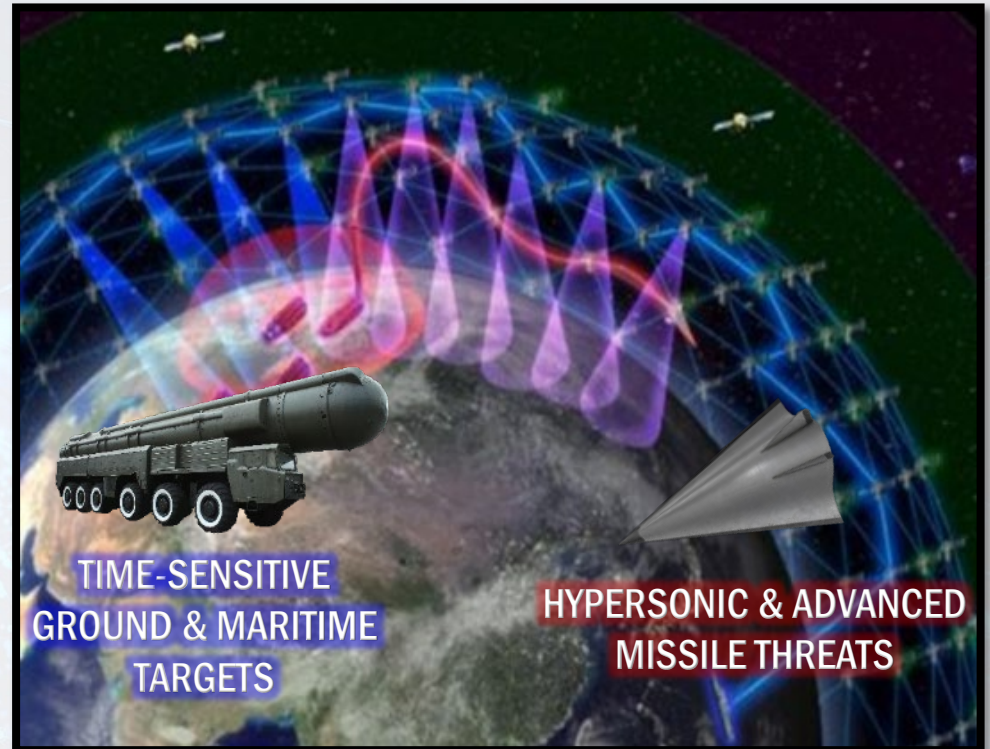
Resilient military sensing and low-latency data transport by means of a proliferated low-earth orbit space architecture

Distribution A: Approved for public release. Distribution unlimited.

2

INNOVATOR'S DILEMMA – SDA THE *CONSTRUCTIVE DISRUPTOR*

Performance — Sustaining Innovations — Most demanding customers — Disruptive Innovations — Least demanding customers — Time

Adapted from *The Innovator's Dilemma, by Clayton Christianson*

"I won't support the development any further of large, big, fat, juicy targets. … We are going to go down a different path. And we have to go down that path quickly."
- Gen. John Hyten, November 2017

NTS-3 - example of what comes out of an *Innovation Office* in industry.
The L3Harris Innovation office was completely fenced from P&L oversight

The 5 Laws of Disruptive Technology

READINGRAPHICS
ACTIONABLE INSIGHTS IN ONE PAGE

Resources are controlled by customers & investors.

Big companies need big markets for growth.

Markets that don't exist can't be analyzed.

An organization's capabilities define its disabilities.

Technologies can progress faster than market demand

Distribution A: Approved for public release. Distribution unlimited.

3

SDA's National Defense Space Architecture (NDSA): Layered Architecture Approach
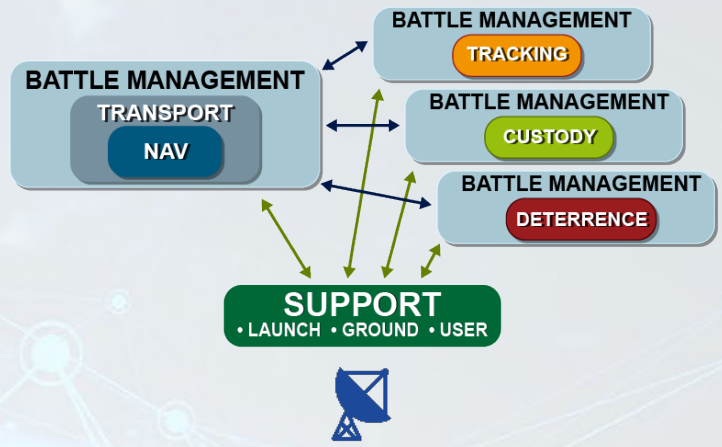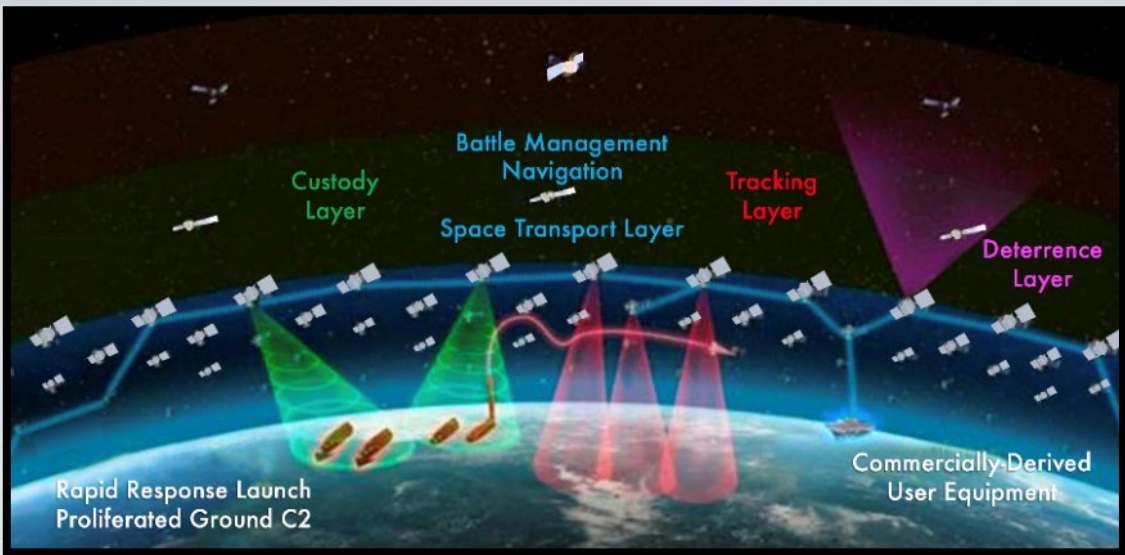
A global, persistent, low-latency data and communications transport layer

Indications, warning, tracking, and targeting of advances missile threats

24x7, all-weather constant custody of time-sensitive targets

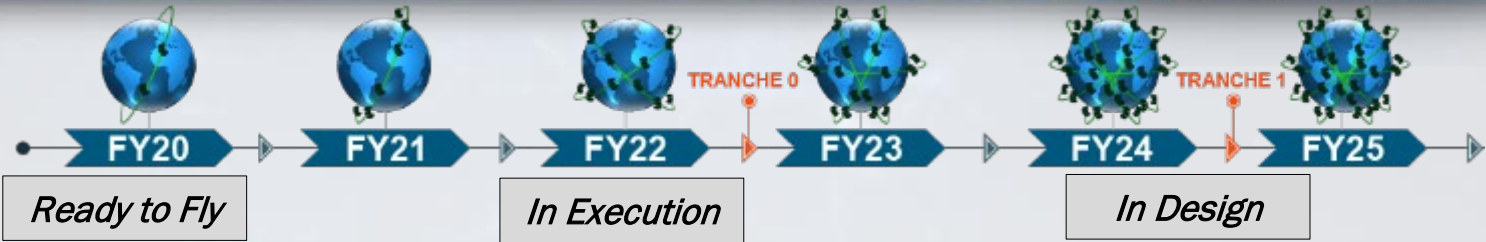**Low-latency battle management to enable time-sensitive kill chain closure**

Emerging capabilities such as space situational awareness and rapid access in cislunar volume

Position, navigation, and timing for GPS-denied environments

GROWING WARFIGHTER CAPABILITY RAPIDLY

FY20 → **FY21** → **FY22** → **FY23** → **FY24** → **FY25**

Ready to Fly — *In Execution* — *In Design*

TRANCHE 0 — TRANCHE 1

NDSA Layer	Risk Reduction Demo (FY20-21)	Tranche 0 Capability (FY22)	Tranche 1 Capability (FY24)
Data & Comm Transport	Demonstrate very low latency data transport, to include optical satellite crosslink and direct downlink	<u>Periodic</u> regional access • Low-latency data connectivity • Study data directly to weapons • Demonstrate data disseminated to theater	<u>Persistent</u> regional access • Low-latency data connectivity • Data directly to weapons • Data disseminated to theater
Advanced Missile Tracking	Flight experiment to collect OPIR tracking data of interest from LEO	<u>Periodic</u> regional access • Detection of HGVs • HBTSS flight for targeting data • Communication directly with C2BMC	<u>Persistent</u> regional access • Detection of HGVs & other advanced missile threats • Targeting quality data • Communication directly with C2BMC
Custody	• Identify / assess candidate multi-phenomenology fusion algorithms for on-orbit use • Test T0 on-orbit processors via commercial data / algorithms	• Demonstrate multi-phenomenology, ground-based sensor fusion • Goal to demonstrate on-orbit fusion capability assisted by ground processing	<u>Periodic</u> regional access • <u>Multiple sensing types</u> using mission partner contributions • Demonstrate multi-phenomenology, on-orbit sensor fusion
Navigation	Demonstrate dissemination of PNT information over TDL	<u>Periodic</u> regional access of alternate PNT	<u>Persistent</u> regional access of alternate PNT

Currently in detailed Warfighter discussions regarding Tranche 1 needs

SPIRAL PRODUCT ROADMAP

Tranche 0 (FY22) – *Warfighter immersion*

The minimum viable product is demonstrating the feasibility of the proliferated architecture in cost, schedule, and scalability towards necessary performance for beyond line of sight (BLOS) firing solutions and advanced missile detection and tracking.

Tranche 1 (FY24) – *Initial warfighting capability*

Regional persistence for tactical datalinks, advanced missile detection, and BLOS targeting.

Tranche 2 (FY26) - *Global persistence for all in Tranche 1*

This will incorporate lessons learned from operating gen 0 for at least two years.

Tranche 3 (FY28) – *Advanced improvements over Tranche 2*

This includes better sensitivity for missile tracking, better targeting capabilities for BLOS, additional PNT capabilities in GPS-denied environments, advanced tactical data links for weapons and platforms, and built-in resilience to enable broad spectrum threat mitigation.

Tranche 4 (FY30) – *Continual advances to the layers TBD.*

Distribution A: Approved for public release. Distribution unlimited.

6

SDA Warfighter Council (WFC)

- The Warfighter Council is chaired by the Deputy Director, SDA:
    - Membership include individuals at the SES or 1-star level from each of the member organizations.
    - The council meets twice each year

- The Warfighter Council employs action officer working groups focused on the SDA Tranches:
    - Each active organization in the Warfighter Council membership is offered attendance at the working groups
    - Each working groups meets monthly, which creating a consistent battle rhythm for warfighter engagement
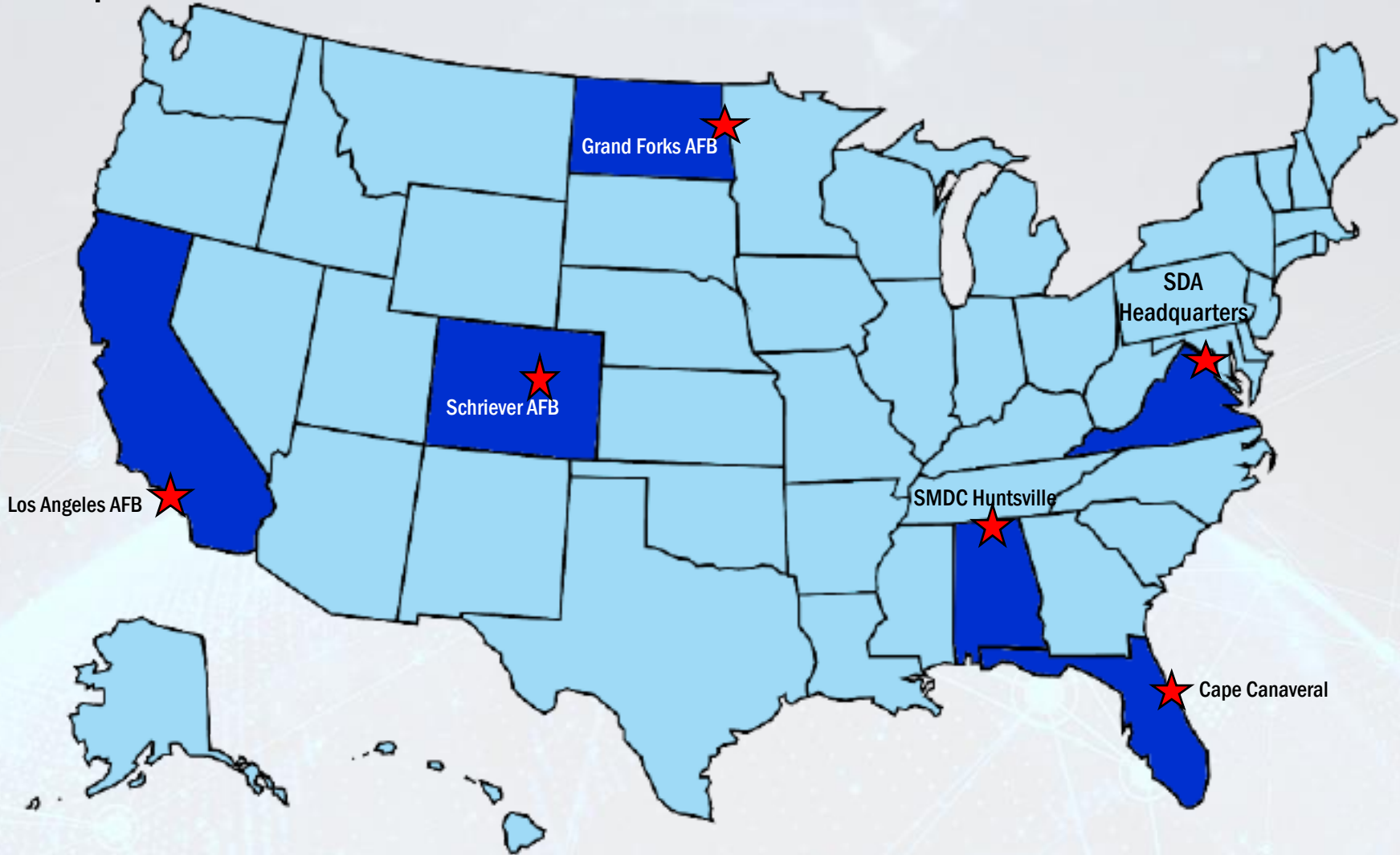
WFC MEMBERSHIP

- Joint Chiefs of Staff
- U.S. Africa Command
- U.S. Central Command
- U.S. Cyber Command
- U.S. European Command
- U.S. Indo-Pacific Command
- U.S. Northern Command
- U.S. Southern Command
- U.S. Space Command
- U.S. Special Operations Command
- U.S. Strategic Command
- U.S. Transportation Command
- U.S. Army (G3 and/or G8 staff)
- U.S. Navy (N3 and/or N8 staff)
- U.S. Air Force (A3 and/or A8)
- U.S. Marine Corps (Combat Development and Integration (CD&I))
- U.S. Space Force (J8 staff and/or Space and Missile Center)
- National Reconnaissance Office
- National Geospatial-Intelligence Agency
- National Security Agency
- Missile Defense Agency
- Defense Advanced Research Projects Agency
- Defense Intelligence Agency
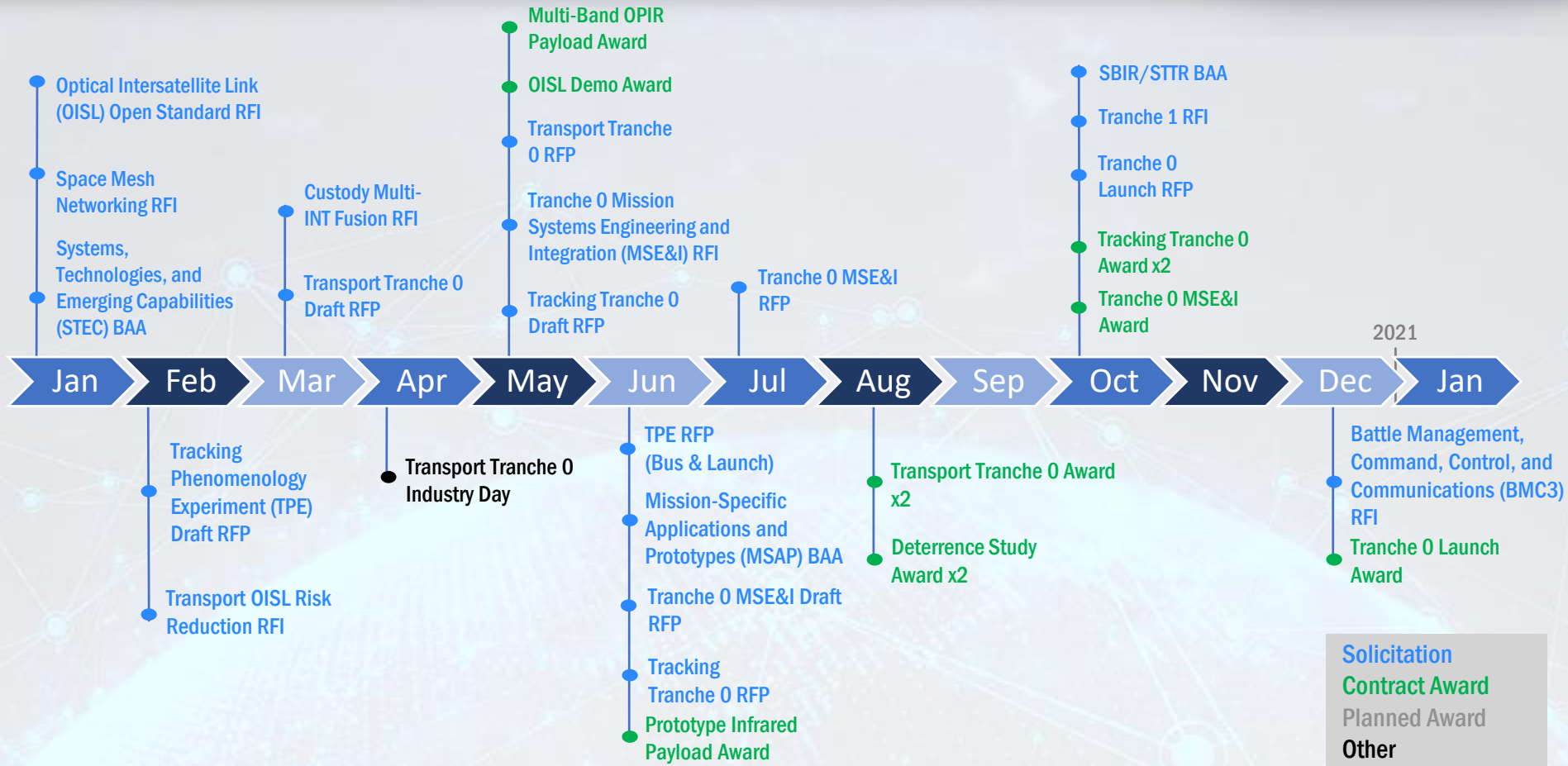- Office of Under Secretary of Defense for Intelligence

Current and planned SDA locations

Grand Forks AFB

SDA Headquarters

Schriever AFB

Los Angeles AFB

SMDC Huntsville

Cape Canaveral

ACQUIRING CAPABILITIES AT SPEED

A timeline chart showing months from Jan through Jan (2021).

Above timeline (left to right):

- Optical Intersatellite Link (OISL) Open Standard RFI
- Space Mesh Networking RFI
- Systems, Technologies, and Emerging Capabilities (STEC) BAA
- Custody Multi-INT Fusion RFI
- Transport Tranche 0 Draft RFP
- Multi-Band OPIR Payload Award
- OISL Demo Award
- Transport Tranche 0 RFP
- Tranche 0 Mission Systems Engineering and Integration (MSE&I) RFI
- Tracking Tranche 0 Draft RFP
- Tranche 0 MSE&I RFP
- SBIR/STTR BAA
- Tranche 1 RFI
- Tranche 0 Launch RFP
- Tracking Tranche 0 Award x2
- Tranche 0 MSE&I Award

Timeline: Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan

2021

Below timeline (left to right):

- Tracking Phenomenology Experiment (TPE) Draft RFP
- Transport OISL Risk Reduction RFI
- Transport Tranche 0 Industry Day
- TPE RFP (Bus & Launch)
- Mission-Specific Applications and Prototypes (MSAP) BAA
- Tranche 0 MSE&I Draft RFP
- Tracking Tranche 0 RFP
- Prototype Infrared Payload Award
- Transport Tranche 0 Award x2
- Deterrence Study Award x2
- Battle Management, Command, Control, and Communications (BMC3) RFI
- Tranche 0 Launch Award

Legend:
- Solicitation
- Contract Award
- Planned Award
- Other

SDA IS ACCELERATING DEFENSE SPACE CAPABILITY DEVELOPMENT BY NAVIGATING ACQUISITION PROCESSES AT SPEED

Distribution A: Approved for public release. Distribution unlimited.

9

SDA's Tranche 0 Team
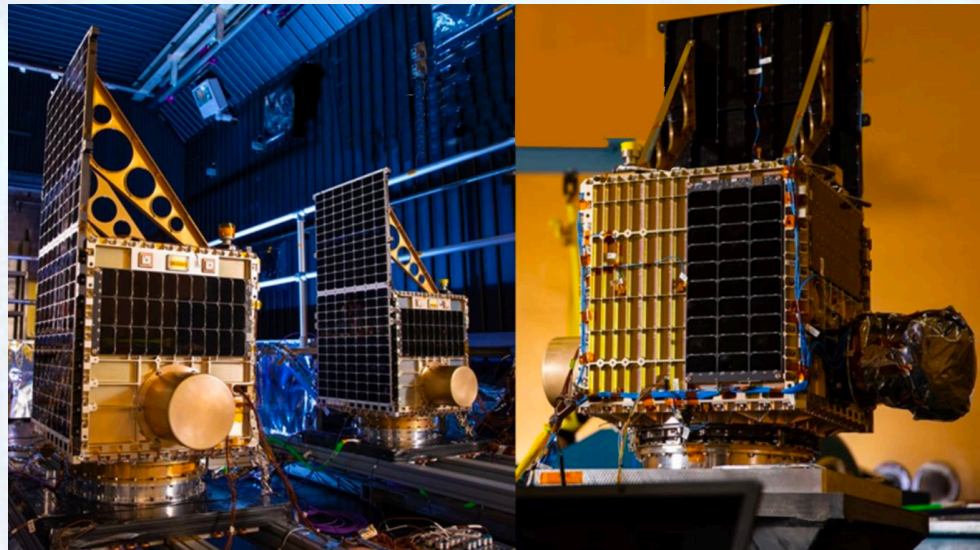
ACCOMPLISHMENTS

✓ Delivered 2 satellites for launch 9 months after receiving funding

✓ Awarded contracts for all four Tranche 0 NDSA industry-developed segments – Transport, Tracking, Mission Systems Engineering & Integration, and Launch Services

- Tranche 0 will place 30 space vehicles on orbit and demonstrate initial data transfer and missile tracking capabilities in LEO

✓ "Space Development Agency praised as change agent in Pentagon procurement"

- *https://spacenews.us10.list-manage.com/track/click?u=75806695e6f086874391c9624&id=c094eb7e82&e=a3e38d0320*

Distribution A: Approved for public release. Distribution unlimited.

11

DELIVERING CAPABILITY AT AN AFFORDABLE COST

$100s of Millions	Historical costs per satellite of traditional space development programs
$15-25M	Price per Transport satellite published in SDA's original budget
$14.1 M	Average price per satellite for SDA's 20-satellite Tranche 0 Transport Layer *including non-recurring engineering costs*
<$14 M	Average price per satellite quoted in RFI responses for Tranche 1

SDA IS ON PACE TO DELIVER INITIAL SPACE TRANSPORT CAPABILITIES ON THE AGENCY'S ORIGINAL ADVERTISED SCHEDULE AT A PRICE POINT ONCE DEEMED UNACHIEVABLE

MARCHING TOWARD PRODUCT RELEASE

	Program / Demo Name	Principal USG Organization	Principal Vendor(s)	2019	2020	2021	2022	2023	2024	2025
Experiments and Prototypes	Blackjack Demos	DARPA	SEAKR, SA Photonics, Lockheed Martin			2x		8x		
	PIRPL	SDA	Northrop Grumman		1x					
	Mandrake II	SDA / DARPA / AFRL	Astro Digital, SA Photonics		2x					
	LINCS	SDA	General Atomics		2x					
	XVI	SDA / AFRL	Viasat		1x					
Ground Support Capabilities	CASINO/MDP	SMC	MSFT, Ball Aerospace		←————————————→					
	HBTSS/Ground	MDA	In Source Selection		←———→					
Tranche 0 *Limited Operational Capability / Architecture Demonstration*	Transport Layer	SDA	Lockheed Martin, York Space Systems				20x			
	Tracking Layer	SDA	SpaceX, L3Harris				8x WFOV			
		MDA	L3Harris, Northrop				2x MFOV (HBTSS)			
	MSE&I	SDA	Perspecta		←————————————→					
	Launch	SDA	SpaceX				⬆	⬆		
	Architecture Adoption									
Tranche 1 *Initial Capabilities / Regional Persistence*	Transport Layer	SDA	TBD					100-150x		
	Tracking Layer	SDA	TBD					~42x		

CASINO = Commercially Augmented Space Inter Network Operations
HBTSS = Hypersonic and Ballistic Tracking Space Sensor
LINCS = Laser Interconnect and Networking Communication System
MDP = Mission Data Processor
MFOV = Medium Field of View

MSE&I = Mission Systems Engineering & Integration
PED = Processing, Exploitation, and Dissemination
PIRPL = Prototype Infrared Payload
WFOV = Wide Field of View

Distribution A: Approved for public release. Distribution unlimited.

Space Segment
Ground Segment
Currently Unfunded

13

WHAT'S NEXT?

- Planning to launch SDA's first satellites, as part of our demonstration efforts on the way to Tranche 0.

- Finalizing all segment designs for an integrated and interoperable Tranche 0 system.

- Defining Tranche 1 minimum viable product and releasing one or more relevant requests for proposal (RFP).

Capstone Tranche 0 Demonstration

HGV Detection | Tracking, Custody Data over Transport | Transport Interoperability | Targeting Soln via TDL
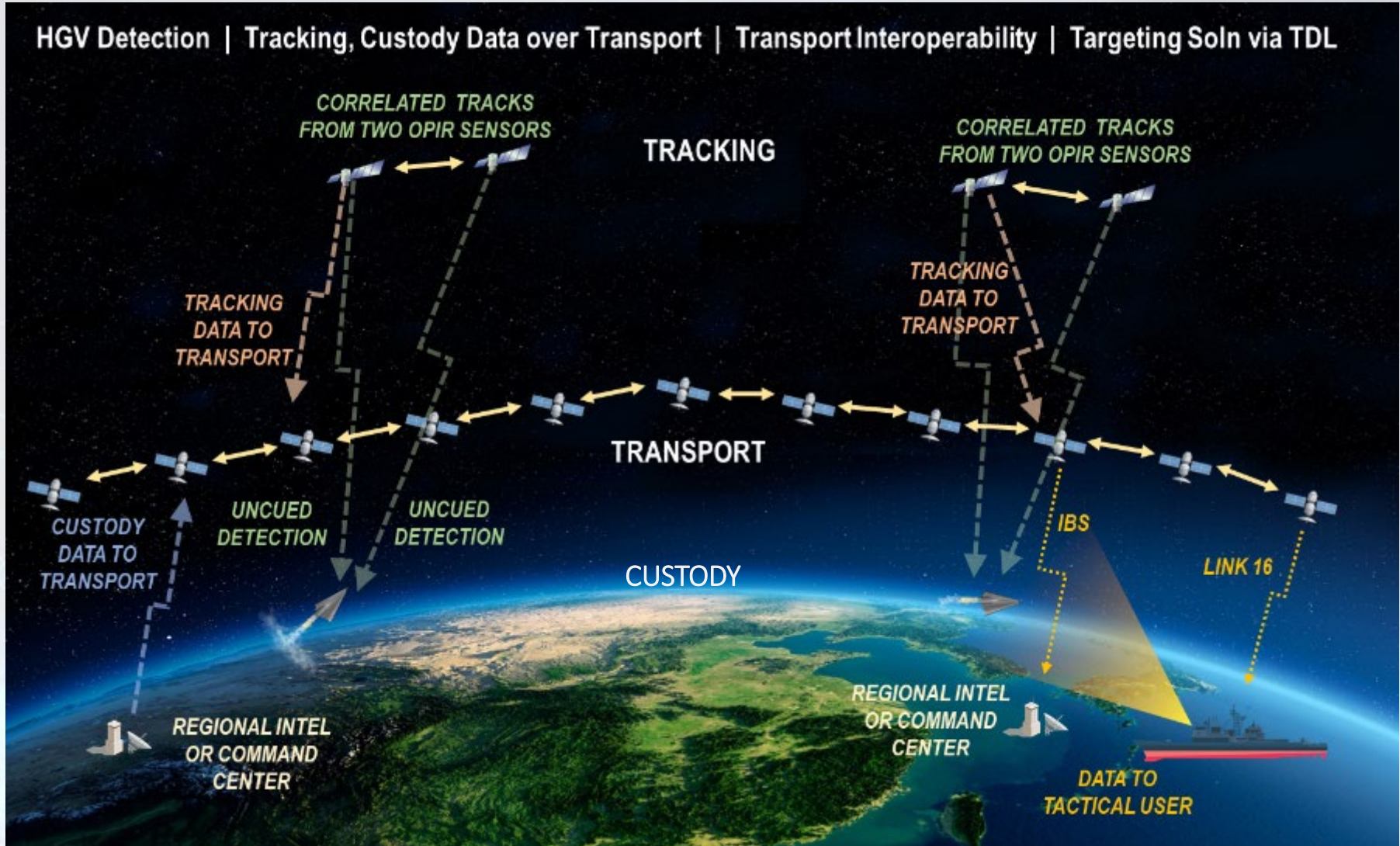
CAPABILITY ROADMAP

REAL-TIME GLOBAL AWARENESS AND CONNECTIVITY

TRANSPORT / NAVIGATION

TRANSPORT

COMPREHENSIVE SPACE-BASED SENSING

TRACKING / CUSTODY / EMERGING CAPABILITIES

SENSING

CAPABILITY VECTOR
ALIGNED TECHNICAL CELLS

OPTIMIZED CONTROL OF MODULATION TECHNIQUES

NOVEL REMOTE SENSING PHENOMENOLOGIES

OMNISCIENT COMMAND, CONTROL & EXECUTION

BATTLE MANAGEMENT / INTEGRATION & SUPPORT

INTEGRATION AND BATTLE MANAGEMENT

AUTO NAVIGATION

ADVANCED MODEMS AND NETWORKING

ELECTRONICALLY SCANNED ARRAY ANTENNAS

ADVANCED COMMUNICATIONS ENCRYPTION

MISSILE TRACKING GLOBAL

ONBOARD AUTOMATIC TARGET RECOGNITION

SEAMLESS MULTI-LEVEL SECURITY OPERATIONS

DIRECT-TO-WEAPON DATA LINKS

GPS-DENIED PNT

SPACE-BASED SENSORS IN COMPLEMENTARY MISSIONS

RAD-HARD ADVANCED PROCESSORS

COOPERATIVE MANEUVER

SPACE-BASED MULTI-INT FUSION

DISTRIBUTED PROCESSING

AUTOMATED OPTIMIZATION AND TASKING

RANGING VIA CROSSLINKS

MISSILE TRACKING REGIONAL

AUTOMATED DYNAMIC NETWORKING

DISTRIBUTED C2 IN CONTESTED ENVIRONMENTS

TACTICAL DATA LINKS

CJADC2

SOFTWARE FRAMEWORKS ENABLING ON-ORBIT REPROGRAMMING

ARCHITECTURE-WIDE DIGITAL ENGINEERING

OPTICAL LINKS

MISSILE TRACKING DEMO

GROUND-BASED MULTI-INT FUSION

OPEN INTERFACES AND STANDARDS

CYBER DEFENSE

| TRANCHE 0 | TRANCHE 1-2 | TRANCHE 3-4 | TRANCHE 5+ |

Distribution A: Approved for public release. Distribution unlimited.

16

SPACE DEVELOPMENT AGENCY

SEMPER CITIUS

SDA
SPACE DEVELOPMENT AGENCY