Satellite Communications within the Army’s WIN-T Architecture

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Aberdeen Proving Ground, MD
• Project Manager Warfighter Information Network – Tactical (PM WIN-T)
  - Vision & Mission
  - “What we do” and “What we don’t do”
  - Organization
• WIN-T Increments, Evolution & Architecture
• Satellite Communications (SATCOM) Operational Views
• SATCOM Terminals
• Global Tactical Advanced Communications Systems (GTACS)
• Future Challenges
Vision: To be the premier tactical network communications provider for the Army and DoD.

Mission: Design, acquire, field and support fully integrated, easy to operate and cost effective Tactical Networks and Services that meet Warfighter capability needs while sustaining a world class work force.
What We Do & Don't Do

PM WIN-T does do Tactical Communications
PM WIN-T does not do Strategic Communications

6 February 2014
### What We Do & Don’t Do

<table>
<thead>
<tr>
<th>Protected</th>
<th>Protected/Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EHF Q/Ka-Band</strong></td>
<td><strong>L, C, Ku, Ka-Band</strong></td>
</tr>
<tr>
<td>MILSTAR I/II</td>
<td><strong>Growing capability</strong></td>
</tr>
<tr>
<td></td>
<td><strong>High throughput</strong></td>
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<tr>
<td></td>
<td><strong>No protection</strong></td>
</tr>
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<td></td>
<td><strong>Pay for services</strong></td>
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<tr>
<td>AEHF</td>
<td><strong>Improved throughput</strong></td>
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<td></td>
<td><strong>Improved coverage</strong></td>
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<table>
<thead>
<tr>
<th>Wideband</th>
<th>Wideband Broadcast</th>
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<tbody>
<tr>
<td><strong>SHF X/Ka-Band</strong></td>
<td><strong>Ka-Band</strong></td>
</tr>
<tr>
<td>DSCS</td>
<td><strong>GBS Ka payload on UFO satellites</strong></td>
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<tr>
<td></td>
<td><strong>High throughput</strong></td>
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<tr>
<td></td>
<td><strong>Small antennas</strong></td>
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<tr>
<td></td>
<td><strong>Smart push/pull data broadcasts</strong></td>
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<tr>
<td>WGS</td>
<td><strong>WGS – X &amp; Ka bands</strong></td>
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<tr>
<td></td>
<td><strong>Wideband COTM w/Ka band</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Wideband Broadcast</th>
<th>Narrowband</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ka-Band</strong></td>
<td><strong>UHF P/L-Band</strong></td>
</tr>
<tr>
<td>UFO</td>
<td><strong>Lightweight, mobile, COTM</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Low Data Rates/Space segment limited</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Supports Warfighter, INTEL, LOG nets</strong></td>
</tr>
<tr>
<td></td>
<td><strong>No AJ</strong></td>
</tr>
<tr>
<td>WGS</td>
<td><strong>WGS – X &amp; Ka bands</strong></td>
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<tr>
<td></td>
<td><strong>Return Channel potential on Ka band</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Narrowband</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UFO</strong></td>
<td><strong>Improved throughputs</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Improved coverage</strong></td>
</tr>
</tbody>
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<thead>
<tr>
<th>Commercial</th>
<th><strong>WGS</strong></th>
</tr>
</thead>
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<tr>
<td><strong>L, C, Ku, Ka-Band</strong></td>
<td><strong>WGS – X &amp; Ka bands</strong></td>
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<tr>
<td></td>
<td><strong>Wideband COTM w/Ka band</strong></td>
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<tr>
<td></td>
<td><strong>Return Channel potential on Ka band</strong></td>
</tr>
<tr>
<td>MUOS</td>
<td><strong>COTM to Handheld Users</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Increased Channels</strong></td>
</tr>
</tbody>
</table>

**Military Satellite Systems Are Essential to Provide Critical Communications for the Deployed Warfighter, with Augmentation from Commercial Systems to Meet Near Term Requirements**
**WIN - T Increments**

**2010 - 2018**
*Initial OTM SATCOM and LOS;*
Commercial Modems and Radios leveraging objective NCW and HNW waveforms;
Mobile Infrastructure enables OTM data sync and voice calls down to Company;
Reduces Operations & Organizations (O&O) via advanced NetOps, self-forming/self-healing networks

**2017 – 2028**
*Provides Full Networking OTM;*
Greater robust connectivity with increased network access via Air Tier; Higher BW SATCOM and LOS waveforms;
Fully Integrated NetOps

**2017 – 2028**
*Initial Networking On-The-Move*

**2004 - 2025**
*Urgently Fielded to OEF/OIF Military/Commercial SATCOM ATH*
Provides Wideband Connectivity - Bn to Div
Enables Asymmetric Warfare

**Acronyms:**
- ATH – At-the-Halt
- AJ – Anti Jam
- BCT – Brigade Combat Team
- BFBS – Battlefield Surveillance Brigade
- Co – Company
- CABs – Combat Aviation Brigades
- Div – Division
- ESB – Enhanced Signal Battalion
- FiB – Fires Brigade
- HNW – Highband Networking Waveform
- LOS – Line-of-Sight
- LPI – Low probability of interception
- LPD – Low probability of detection
- MEB – Maneuver Enhancement Brigade
- NCW – Netcentric Waveform
- NetOps – Network Operations
- OEF – Operation Enduring Freedom
- OIF – Operation Iraqi Freedom
- OTM – On-the-Move
- SOCOM – Special Operations Command
- Sust Bdes – Sustainment Brigades
- WIN-T – Warfighter Information Network - Tactical

*Indicates first procurement year through last year fielded.*
**WIN - T Evolution**

**OIF/OEF & Reset (2009-2012)**

**WIN-T Inc 1a**
Initial Networking At-The-Halt

- Adds Military Satellite (Ka) capability to previous JNN capability. Now fielded to 100% of tactical units.
- Maintains the capability of the JNN network
- Adds access to Military (Ka) Satellite

**Joint Network Node (JNN) - Network**

- Immediate and interim capability to support operations in Iraq and Afghanistan. Met the need to provide Beyond Line of Sight connectivity using Commercial Satellite (Ku) capability.
- Beyond Line of Sight (BLOS) to Battalion level At-The-Halt
- Internet Protocol Network
- Designed for voice and data communications

**Pre-Force XXI (1987 – 2008)**

**Mobile Subscriber Equipment**

- Operation Desert Shield/Storm and later Operations Enduring Freedom and Iraqi Freedom revealed the inability of the Army’s tactical network to support highly mobile and dispersed forces.
- Static at-the-halt
- Designed primarily for voice communications
- Little to no support below Brigade level


**Dramatic, Incremental Improvement in Warfighter communications at all echelons**
WIN-T Evolution (cont’d)

**Reset & Tactical Network Modernization (2019-2028)**

**WIN-T Inc 3**
Full Networking On-The-Move

- Full mobile network that introduces an airborne communications node as an additional Line of Sight link, and 3-4 x the capacity and throughput of WIN-T Inc 2.

**WIN-T Inc 2**
Initial Networking On-The-Move

- Mobile network with higher throughput (secure voice, video, and data) and automated network management and 2-4x the capacity and throughput of WIN-T Inc 1.

**WIN-T Inc 1b**
Enhanced Networking At-The-Halt

- WIN-T Inc 1a capability, plus enhanced capabilities for interoperability with WIN-T Increment 2:

**OIF/OEF Reset (2012-2016)**

Dramatic, Incremental Improvement in Warfighter communications at all echelons
WIN - T Tiered Architecture

Transmission Subsystems

Features

• Bandwidth on-the-move
• CP LAN management
• Converged IP Infrastructure for Voice, Data & Video
• Current Force Interoperability
• Leverages COTS technology and standard interfaces
• IPv4 & IPv6 Core Network
• Self-healing
• Scalable

Space Layer
Utilizes available MILSATCOM
NCW – Network Centric Waveform
Ka/Ku-band Commercial

Airborne Layer
WCP - WIN-T Communications Payload
Air-to-Ground
HNW – Highband Networking Waveform

Ground Layer
TCN - Tactical Communications Node
NOSC - Network Operations and Security Center
MCN-B - Modular Communications Node - Basic
JGN - Joint Gateway Node
PoP - Point of Presence
TR-T - Tactical Relay-Tower
PCD - Personal Communications Device
SNE - Soldier Network Extension
Wideband SATCOM Operational View
(STT, Phoenix, SNAP, DKET & MicroVSAT)
Protected SATCOM Operational View
(SMART-T & SCAMP)
Combined SATCOM Operational View
## WIN - T SATCOM Terminal Mix

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Frequency Bands</th>
<th>Aperture Size / # Apertures</th>
<th>Approx. Terminal Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMART-T (AEHF)</td>
<td>Q</td>
<td>1.3m / 1</td>
<td>420</td>
</tr>
<tr>
<td>Phoenix “D” Model</td>
<td>C, X, Ku, Ka</td>
<td>2.4m / 1</td>
<td>180</td>
</tr>
<tr>
<td>DKET</td>
<td>X, Ku, Ka</td>
<td>4.8 m / 1 or 6.3 m / 1</td>
<td>60</td>
</tr>
<tr>
<td>TGRS (GBS)</td>
<td>Ku, Ka</td>
<td>1m / 1</td>
<td>1070</td>
</tr>
<tr>
<td>Regional Hub Node</td>
<td>Ku, Ka</td>
<td>9m / 3</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Tactical Hub Node</td>
<td>Ku, Ka</td>
<td>3.9m / 2</td>
<td>40</td>
</tr>
<tr>
<td>STT</td>
<td>Ku, Ka</td>
<td>2.4m / 1</td>
<td>1800</td>
</tr>
<tr>
<td>TCN and PoP</td>
<td>Ku, Ka</td>
<td>.5m / 1</td>
<td>1700</td>
</tr>
<tr>
<td>SNE</td>
<td>Ku, Ka</td>
<td>.45m / 1</td>
<td>2800</td>
</tr>
<tr>
<td>SNAP</td>
<td>Ku, with X &amp; Ka options</td>
<td>1.2m / 1 or 2.0m / 1</td>
<td>600</td>
</tr>
</tbody>
</table>

- SATCOM Frequencies
  - X band  7.9 – 8.4 GHz
  - Ku band 13.75 - 14.5 GHz
  - Ka band 30.0 - 31.0 GHz
  - Q band  43.5 - 45.5 GHz
### WIN - T SATCOM Terminal Specs at a Glance

<table>
<thead>
<tr>
<th></th>
<th>Inc 1a</th>
<th>Inc 1b</th>
<th>Inc 2</th>
<th>Inc 3</th>
<th>Inc 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fielding timeframe</td>
<td>CS 9/10, 11/12</td>
<td>CS 13/14, 15/16</td>
<td>CS 13/14, 15/16</td>
<td>CS 17/18</td>
<td>TBD</td>
</tr>
<tr>
<td>Transportable and mobile apertures</td>
<td>2.4m 3.9m (1)</td>
<td>2.4m 3.9m (1)</td>
<td>0.4m, 0.5m 2.4m 3.9m (1)</td>
<td>0.4m, 0.5m 2.4m 3.9m (1)</td>
<td>0.4m, 0.5m 2.4m 3.9m (1)</td>
</tr>
<tr>
<td>Regional Hub Node apertures</td>
<td>9m</td>
<td>9m</td>
<td>9m</td>
<td>9m</td>
<td>9m</td>
</tr>
<tr>
<td>FDMA SATCOM rate (Radyne modem)</td>
<td>Up to 8.192 Mbps (2)</td>
<td>Up to 8.192 Mbps (2)</td>
<td>Up to 8.192 Mbps (2)</td>
<td>Up to 8.192 Mbps (2)</td>
<td>Up to 8.192 Mbps (2)</td>
</tr>
<tr>
<td>SMART-T</td>
<td>Up to 8.192 Mbps</td>
<td>Up to 8.192 Mbps</td>
<td>Up to 8.192 Mbps</td>
<td>Up to 8.192 Mbps</td>
<td>Up to 8.192 Mbps</td>
</tr>
<tr>
<td>TDMA SATCOM burst rate (Linkway modem)</td>
<td>Up to 25.7 Mbps</td>
<td>Up to 25.7 Mbps</td>
<td>Up to 25.7 Mbps</td>
<td>Up to 25.7 Mbps</td>
<td>Up to 25.7 Mbps</td>
</tr>
<tr>
<td>SATCOM on-the-move burst rate</td>
<td>N/A</td>
<td>N/A</td>
<td>6.1 Mbps (Tx) 12.3 Mbps (Rx)</td>
<td>6.1 Mbps (Tx) 12.3 Mbps (Rx)</td>
<td>TBD</td>
</tr>
<tr>
<td>NCW Modem</td>
<td>N/A</td>
<td>MPM-1000</td>
<td>MPM-1000</td>
<td>MPM-1000</td>
<td>TBD</td>
</tr>
<tr>
<td>#STTs/BCT (2.4 m)</td>
<td>6-8</td>
<td>6-8</td>
<td>8-9</td>
<td>8-9</td>
<td>8-9</td>
</tr>
<tr>
<td>#COTMs/BCT (0.4/0.5 m)</td>
<td>0</td>
<td>0</td>
<td>48-62</td>
<td>48-62</td>
<td>48-62</td>
</tr>
<tr>
<td>HNW LOS</td>
<td>N/A</td>
<td>N/A</td>
<td>30 Mbps (Terrestrial)</td>
<td>110 Mbps (Terrestrial, Aerial)</td>
<td>110 Mbps (Terrestrial, Aerial)</td>
</tr>
<tr>
<td>GBS receive capability</td>
<td>TGRS</td>
<td>TGRS with JIPM</td>
<td>TGRS with JIPM</td>
<td>TGRS with JIPM JC4ISR</td>
<td>TGRS with JIPM JC4ISR</td>
</tr>
</tbody>
</table>

(1) Tactical Hub provided by the WIN-T Inc 1 program
(2) FDMA rate is limited by serial interface rate supportable on router.
(3) Number indicates number of nodes/modems.
Global Tactical Advanced Communication Systems (GTACS)

- GTACS is in the second year of a five (5) year multiple award indefinite delivery/indefinite quantity (IDIQ) contract
- Intended for the rapid acquisition of a wide range of tactical Command, Control and Communications systems (C3T):
  - Predominantly Hardware
  - Incidental Services – Engineering, Logistics Support, Test and System related Support, etc.
- The program contract ceiling is $10 Billion
- Structured to facilitate Small Business as well as Unrestricted Business awards
  - 20 Prime contractors were selected (6 were Small Business)
  - Small Business set aside under $4.5M
- Contract types are Fixed Price and Cost Reimbursement
## Awardees

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<tbody>
<tr>
<td>1.</td>
<td>CACI</td>
</tr>
<tr>
<td>2.</td>
<td>*D&amp;S Consultants</td>
</tr>
<tr>
<td>3.</td>
<td>DRS Technical Services</td>
</tr>
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<td>4.</td>
<td>*Envistcom</td>
</tr>
<tr>
<td>5.</td>
<td>General Dynamics</td>
</tr>
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<td>6.</td>
<td>*Globecomm</td>
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<tr>
<td>7.</td>
<td>Harris</td>
</tr>
<tr>
<td>8.</td>
<td>ITT / Exelis Corp</td>
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<tr>
<td>9.</td>
<td>L-3 Services</td>
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<td>10.</td>
<td>Lockheed Martin</td>
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<td>11.</td>
<td>*Morgan Franklin</td>
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<td>12.</td>
<td>*Nexagen</td>
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<tr>
<td>13.</td>
<td>Northrup Grumman Systems</td>
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<td>14.</td>
<td>Raytheon</td>
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<td>15.</td>
<td>Rockwell Collins</td>
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<tr>
<td>16.</td>
<td>Science Applications International</td>
</tr>
<tr>
<td>17.</td>
<td>Scientific Research Corporation</td>
</tr>
<tr>
<td>18.</td>
<td>Telecommunications systems Corp. (TCS)</td>
</tr>
<tr>
<td>19.</td>
<td>*Trace Systems</td>
</tr>
<tr>
<td>20.</td>
<td>Viasat</td>
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</tbody>
</table>

* Small business
The future of PCOTM depends on the outcome of several factors.
Concerns / Topics

• Future Space Segment requirements for support of the WIN-T architecture:

  - Small aperture terminals required for Satellite Communications On The Move (COTM) in addition to all the At The Halt Network Communications.

  - Protected Satellite Communications On the Move that satisfies all the associated security concerns.
Acronyms

- AJ – Anti-Jam
- AoA – Analysis of Alternatives
- ATH – At-The-Halt
- BAA – Broad Agency Announcement
- BCT – Brigade Combat Team
- BGE - Brigade
- BN - Battalion
- BW – Bandwidth
- C3T – Command, Control and Communications Tactical
- COTS – Commercial-Off-The-Shelf
- CP LAN – Command Post Local Area Network
- DISN – Defense Information Systems Network
- DKET – Deployable Ku-Band Earth Terminal
- DoD – Department of Defense
- DSCS – Defense Satellite Communications System
- EHF/AEHF – Extremely High Frequency/Advanced Extremely High Frequency
- EMP – Electromagnetic Pulse
- FDMA – Frequency Division Multiple Access
- GBS RS/TIP – Global Broadcast Satellite Receive Suites/Theater Injection Point
- GRRIP - Global Rapid Response Intelligence Package
- GTACS - Global Tactical Advanced Communications Systems
- HNW – Highband Networking Waveform
- IDIQ – Indefinite Delivery/Indefinite Quantity
- JC4ISR - Joint Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
- JGN - Joint Gateway Node
- JIPM – Joint Internet Protocol Modem
- JNN – Joint Network Node
- LOS/BLOS – Line-of-Sight/Beyond Line-of-Sight
Acronyms (contd)

- LPI/LPD – Low Probability of Intercept/Low Probability of Detection
- MCN-B - Modular Communications Node - Basic
- MILSTAR – Military Strategic Tactical Relay
- MPLS – Multiprotocol Layer Switching
- NCW – Network Centric Waveform
- NOSC - Network Operations and Security Center
- OEF/OIF – Operation Enduring Freedom/Operation Iraqi Freedom
- OTM/COTM – On-The Move/Communications-On-The-Move
- PCD - Personal Communications Device
- PM WIN-T - Program Manager, Warfighter Information Network – Tactical
- PoP - Point of Presence
- SATCOM - Satellite Communications
- SCAMP – Single Channel Anti-Jam Man-Portable Terminal
- SHF – Super High Frequency
- SMART-T - Secure Mobile Anti-Jam Reliable Tactical Terminal
- SNAP – SIPRnet/NIPRnet Access Point
- SNE - Soldier Network Extension
- SNOC - Secure Network Operations Center
- STT - Satellite Transportable Terminal
- TCN -Tactical Communications Node
- TDMA – Time Division Multiple Access
- TGRS - Transportable Ground Receive Suite
- TROPO - Troposphere
- TR-T - Tactical Relay-Tower
- UFO - Ultra High Frequency Follow-On Satellite
- USAF – United States Air Force
- WCP - WIN-T Communications Payload Air-to-Ground