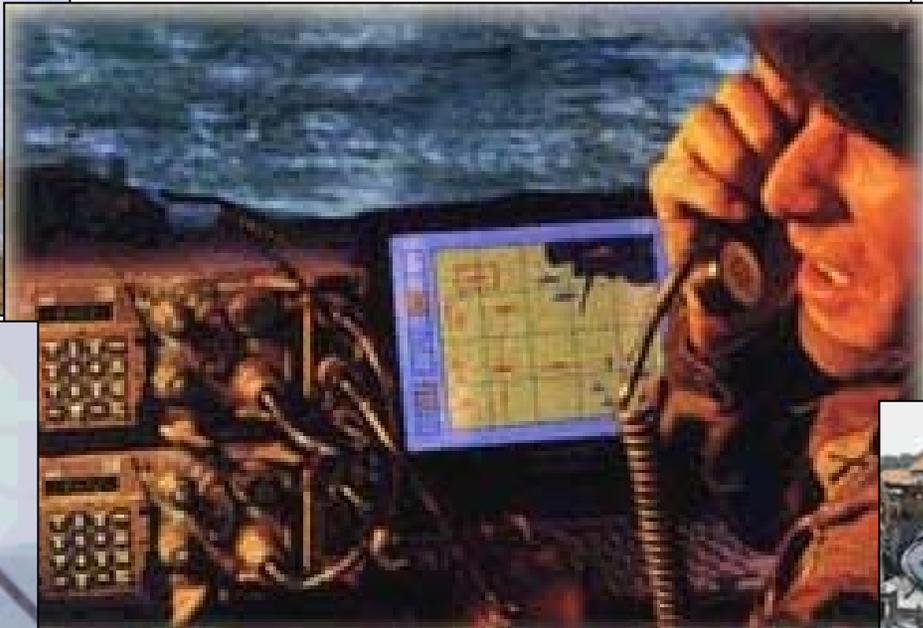




# Army Satellite Communications

## SATCOM Briefing to the RC Signal Symposium



2 December 2002

**LTC Mark Ernyei**  
Deputy TSM SATCOM





# Purpose

- **To provide an overview of TSM SATCOM**
- **To provide an overview of the satellite communications architecture –**
  - Satellite Overview**
  - Terminal Program Overview**
  - Future SATCOM**



# Agenda

- **What we do and who we are**
- **Space Segment**
- **Ground Segment**
- **Global Broadcast Service**
- **GPS**
- **Future SATCOM**



# **TRADOC System Manager (TSM))**

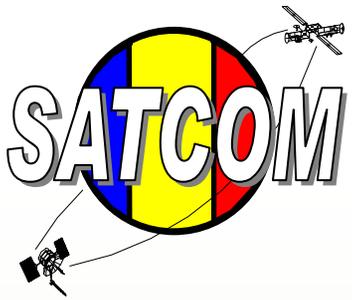
## **Roles and Missions**

### **THE TSM:**

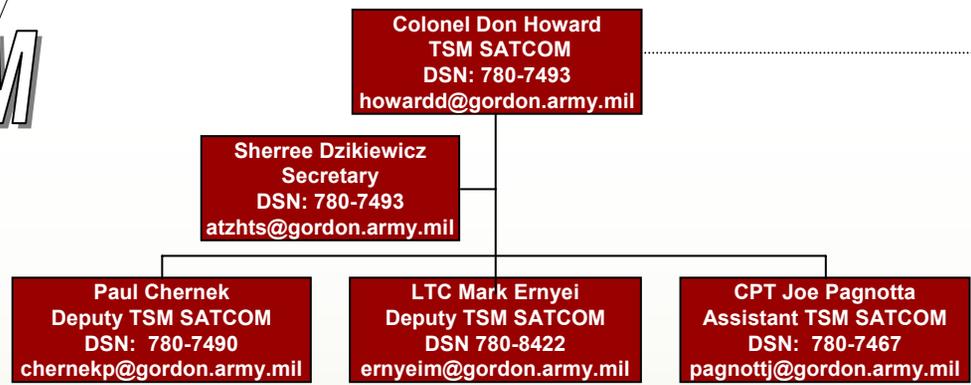
- IS THE COMBAT DEVELOPER/USER REPRESENTATIVE IN THE DEVELOPMENT OF SPECIFIC ARMY SYSTEMS**
- IS THE ENERGIZER, ORGANIZER, INTEGRATOR, AND EXPEDITER; TRADOC COUNTERPART TO THE PROGRAM MANAGERS (PM)**
- IS RESPONSIBLE FOR THE INTENSE MANAGEMENT AND COORDINATION OF ALL USER ASPECTS OF THE PROGRAM**
- WILL ENSURE THAT THE USER'S REQUIREMENTS ARE DEVELOPED AND INTEGRATED THROUGHOUT THE LIFE CYCLE OF A SPECIFIC SYSTEM**
- WILL CONDUCT TOTAL SYSTEM MANAGEMENT**



# TSM-SATCOM Organizational Structure



## TRADOC SYSTEM MANAGER SATELLITE COMMUNICATIONS



**Matrix Support**  
SIGCEN DCD/Tng Dept  
Other Center DCDs  
BCBL (G)  
NSTD, SIGCEN  
CECOM

TDA			
Grade	Branch	Auth	ODP
06	25	1	1
05	51	1	1
04	51	1	
03	51	1	1
GS-14	Civ	1	NA
GS-06	Civ	1	NA

## Contractors Funded by PM

PEO-IEW  
CONTRACTOR SUPPORT  
*SYTEX*

Scott Long  
IEW Com Systems  
DSN: 780-7892  
longs@gordon.army.mil

PM WIN-T  
CONTRACTOR SUPPORT  
*Boeing Aerospace Engineering (BAE)*

Bill Campbell  
SHF & Tri-Band Programs  
DSN: 780-7886  
campbelw@gordon.army.mil

PM WIN-T  
CONTRACTOR SUPPORT  
*Femme Comp Inc. (FCI)*

Lynn Epperson  
Wideband Systems  
DSN: 780-2352  
eppersol@gordon.army.mil

PM WIN-T/TRCS/GPS  
CONTRACTOR SUPPORT  
*Information Technology & Applications Corporation (ITAC)*

Steve Churm  
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churms@gordon.army.mil

PM DCATS  
CONTRACTOR SUPPORT  
*TAMSCO*

Frank Stein  
DSCS and Strategic SHF  
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PM DCATS  
CONTRACTOR SUPPORT  
*Janus Research Group (JRG)*

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C4I ARCHITECT/PLANNER  
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Russell Gambrell  
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gambrelr@gordon.army.mil



# Types of SATCOM

## PROTECTED

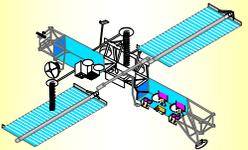
## WIDEBAND

## WIDEBAND BROADCAST

## NARROWBAND

## COMMERCIAL

### MILSTAR/AEHF



#### EHF

- ❑ LDR/MDR/XDR
- ❑ C2 range extension
- ❑ Well protected comm for the Warfighter [AJ, LPI, LPD, EMP]
- ❑ Crosslinks - (No ground relay stations)
- ❑ Survivable



### DSCS/WGS



#### SHF X/Ka-Band

- ❑ DSCS – X-band only
- ❑ WGS – X & Ka Band
- ❑ High Data rates for tactical and enterprise users
- ❑ User data requirements increasing
  - Imagery
  - Video
  - Split-based Ops
- ❑ Limited AJ protection



### UFO/WGS

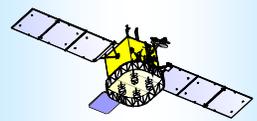


#### Ka-Band

- ❑ Ka payload on UFO and WGS satellites
- ❑ High throughput
- ❑ Small antennas
- ❑ Smart push/pull data broadcasts



### UFO/MUOS

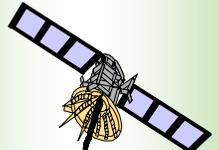


#### UHF

- ❑ Lightweight, mobile users
- ❑ LDR, Space segment limited
- ❑ Users increasing
  - Warfighter nets
  - INTEL dissemination
- ❑ No AJ
- ❑ DAMA increases user access



### Commercial



#### C, KU, Ka-Band

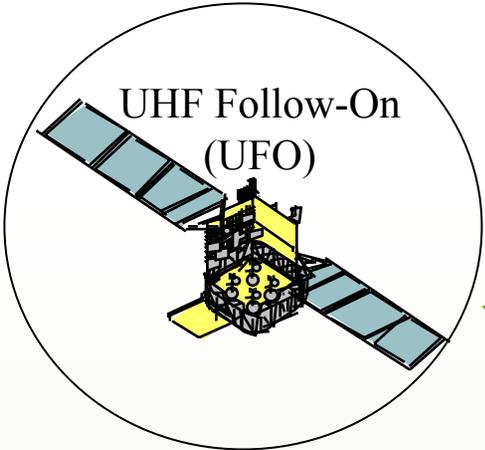
- ❑ Growing capability
- ❑ High throughput
  - Telemedicine
  - CSS
  - Split-based Ops
  - Video
- ❑ No protection
- ❑ Pay for services
- ❑ Mobile Satellite System
- ❑ Possibility for GBS PhaseIII



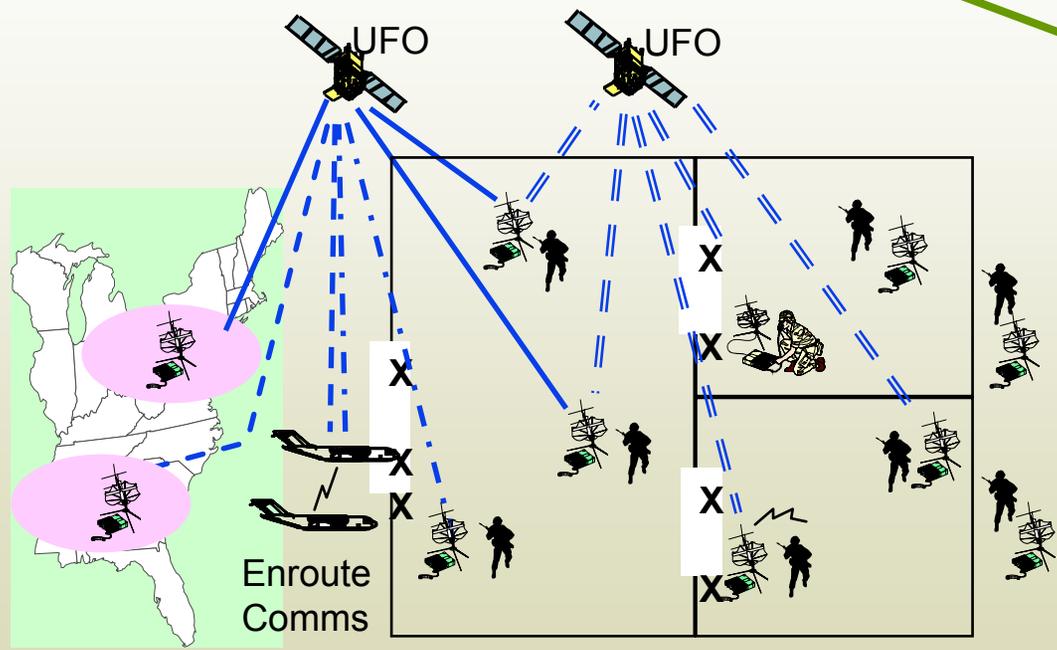
**Military Satellite Systems Are Essential to Provide Assured Communications for the Deployed Warfighter, with Augmentation from Commercial Systems to Meet Surge Requirements**



# UHF Follow On (UFO) System



UFO satellites provide mobile users with single channel SATCOM. (Selected UFO's have EHF and GBS packages on board for testing and interoperability.)



AN/PSC-5, Spitfire

Spitfire's Are Widely Distributed on the Battlefield



# SPITFIRE

## MISSION

- Provides Command and Control (C2) communications for the Corps and Division War Fighter Nets (WFN) and Supports Army Special Operations Forces (SOF) C2, in War, and Operations Other-Than-War (OOTW).
- Complies With JCS Mandates for All Users to Be Demand Assigned Multiple Access (DAMA) & Advanced Narrow Band Digital Voice Terminal (ANDVT) Capable.
- Supports Army digitization and transformation requirements.

## CHARACTERISTICS/DESCRIPTION

- Manpack Radio
- Embedded Narrow/Wideband Secure Voice & Data
- Embedded 5-/25-kHz DAMA
- Non-DAMA Backward Compatibility
- GO/NO-GO Built-In-Test (BIT) Capability
- SATCOM / LOS Comm (30-400 MHz)
- Receiver Transmitter (RT)
  - Small (447 cu. In.)
  - Lightweight (11.7 lbs less batteries)
  - Embedded COMSEC & DAMA Orderwire Encryption
- Capable of SATCOM-On-The-Move (SOTM)

## CAPABILITY/IMPROVEMENTS:

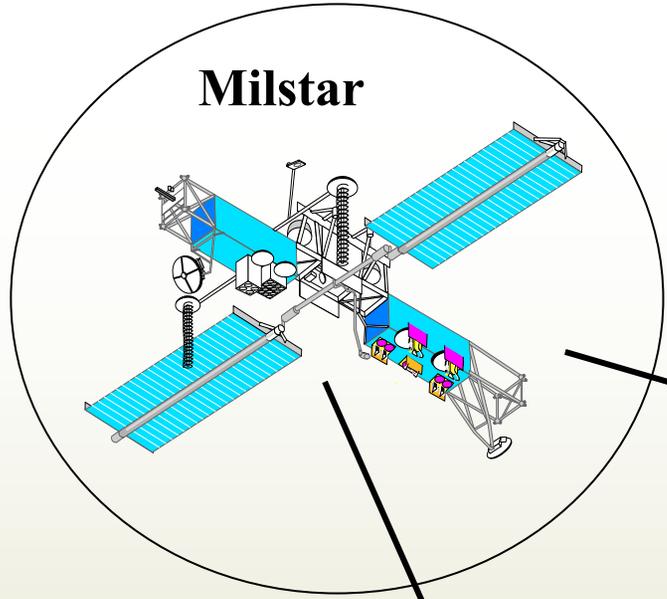
- ECP-32 MWO (planned):
- Improved Voice Recognition (MELP)
- Higher Data Rates (Up to 48 Kbps)
- Embedded ADC and IP Functionality
- Have Quick II
- SINGARS (SIP)
- OTAR Transmit Capability
- P3I Upgrades
- Embedded GPS
- Paging



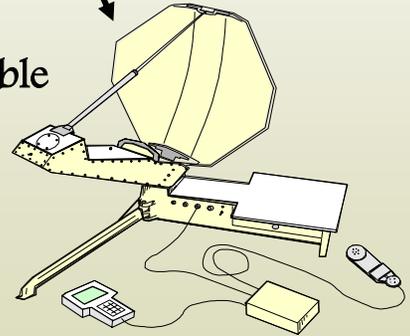


# Milstar – The DoD’s Newest Constellation

Milstar satellites provide the warfighter with worldwide communications capability that is resistant to jamming and interference from threats.

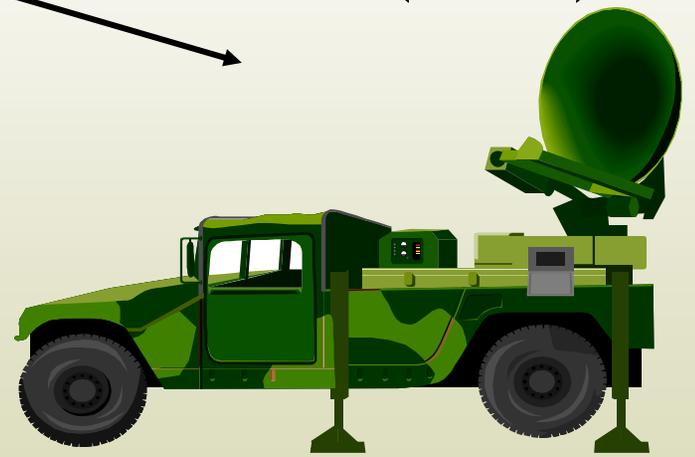


Single Channel,  
Anti-jam, Manportable  
Terminal (SCAMP)



SCAMP receives and processes single channel communications using Milstar

Secure, Multichannel,  
Anti-jam Reliable Tactical  
Terminal (SMART-T)



SMART-T receives and processes multichannel communications using Milstar satellites



# SCAMP BLOCK I - System Overview

**SCAMP (Block I) is a single channel terminal designed to interface with the Milstar LDR payload. The terminal will operate in point-to-point and broadcast modes providing voice and data service for critical command and control communications between headquarters elements and their major subordinate commands.**



## Block I

- Interoperable with all Milstar Terminals (Low Data Rate)
- Embedded COMSEC/TRANSEC
- STU III voice quality
- Full Duplex Data/Half Duplex Voice
- 4 Simultaneous Channels
- AJ LPI/LPD capabilities
- EMP Protected

## Advanced EHF Upgrades

- All Existing LDR Capability
  - Embedded encrypted KY-99 compatible Voice
  - Embedded KG-84 compatible data encryption up to 2.4 Kbps
  - 3 add'l Black RS-232 Ports (limited to 2.4 Kbps)
- Two additional RED Ports on RT
  - Ethernet with ACTS VPC link encryption
  - RS-422 with ACTS VPC link encryption
  - Allows SCAMP SEP to SCAMP SEP AEHF Narrowband PTP/NET at up to 115 Kbps



# SMART-T

- Provides range extension (up to MDR) capability to MSE systems at Extremely High Frequencies (EHF) through Milstar satellites (primarily for Corps and below). Corps get 15 terminals, Divisions get 12, SBCTs get 5 (3 initially), USASOC (112<sup>th</sup> Sig Bn) gets 14.
- Single vehicle provides worldwide (w/cross linked satellites), anti-jam, low probability of intercept, secure voice, data and video.



## System Characteristics

- Supports data rates from 2.4 kbps up to 1024 kbps as well as 1544 kbps commercial rate
- Simultaneous voice and data transmission LDR/MDR capabilities
- Interoperable with Milstar, UFO, and MIL-STD 1582C compatible payloads
- Crew size: 1 dedicated 31F (Complements Switch Crew)
  - 30 minutes Set-up/Tear-down in benign environment (w/assistance from support soldier)
  - Self powered from 1500 watt DC generator
  - Unmanned remoted operation after set-up
- Configured on HMMWV, w/dismountable terminal

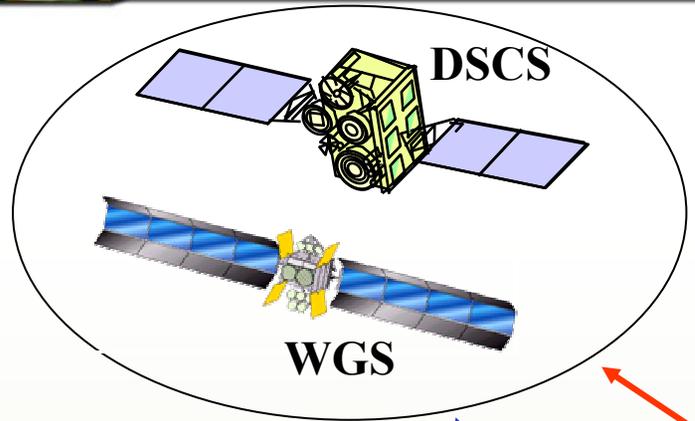
## Advanced EHF Upgrade to existing terminals

- Interoperable with future AEHF constellation
- Upgrade functionality synchronized with satellite payload availability est. 4QTR FY 07
- Provides est. data rates up to 8.192 Mbps
- Enhanced Base Band system Interfaces
- Higher power RF transmitter
- New AEHF TRANSEC algorithms
- AEHF control/protocol software upgrades
- Processor upgrades to handle new software
- Power generation/distribution upgrades

Secure, Mobile, Anti-Jam,  
Reliable, Tactical Terminal  
AN/TSC-154

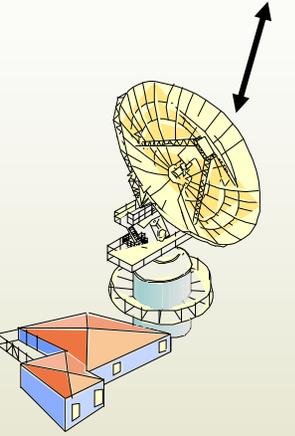


# DSCS and WGS



- The **Defense Satellite Communications System (DSCS)** is a constellation of ten satellites providing worldwide tactical and strategic multichannel satellite communications.
- The **Wideband Gapfiller System (WGS)** is a constellation of three satellites providing worldwide tactical and strategic multichannel satellite communications.

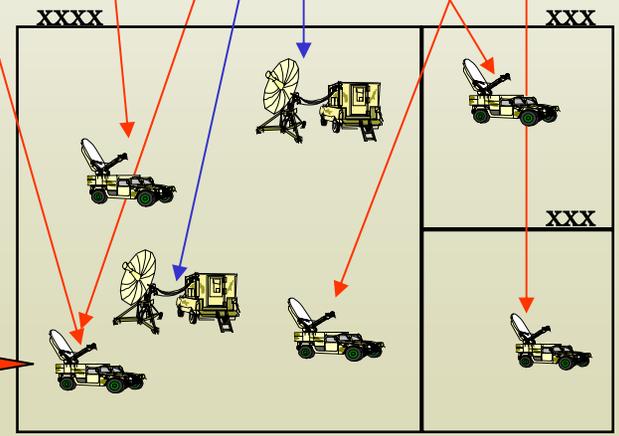
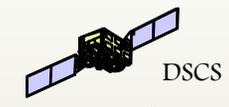
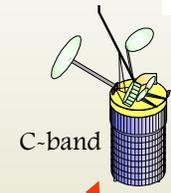
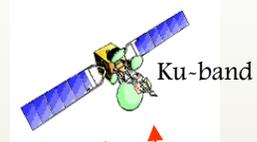
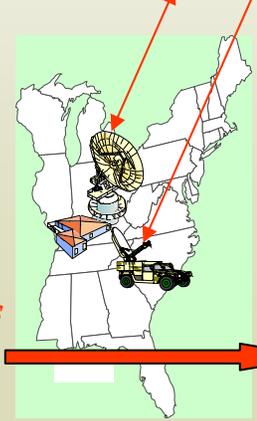
Has tri-band capabilities and uses X-band on DSCS as one of the 3 SHF bands it can process.



Strategic Fixed Sites Use DSCS



These legacy terminals use only DSCS for their communications



*Tri-Band terminals have the capacity to send large amounts of information between the theater and the sustaining base using both military and commercial SATCOM.*



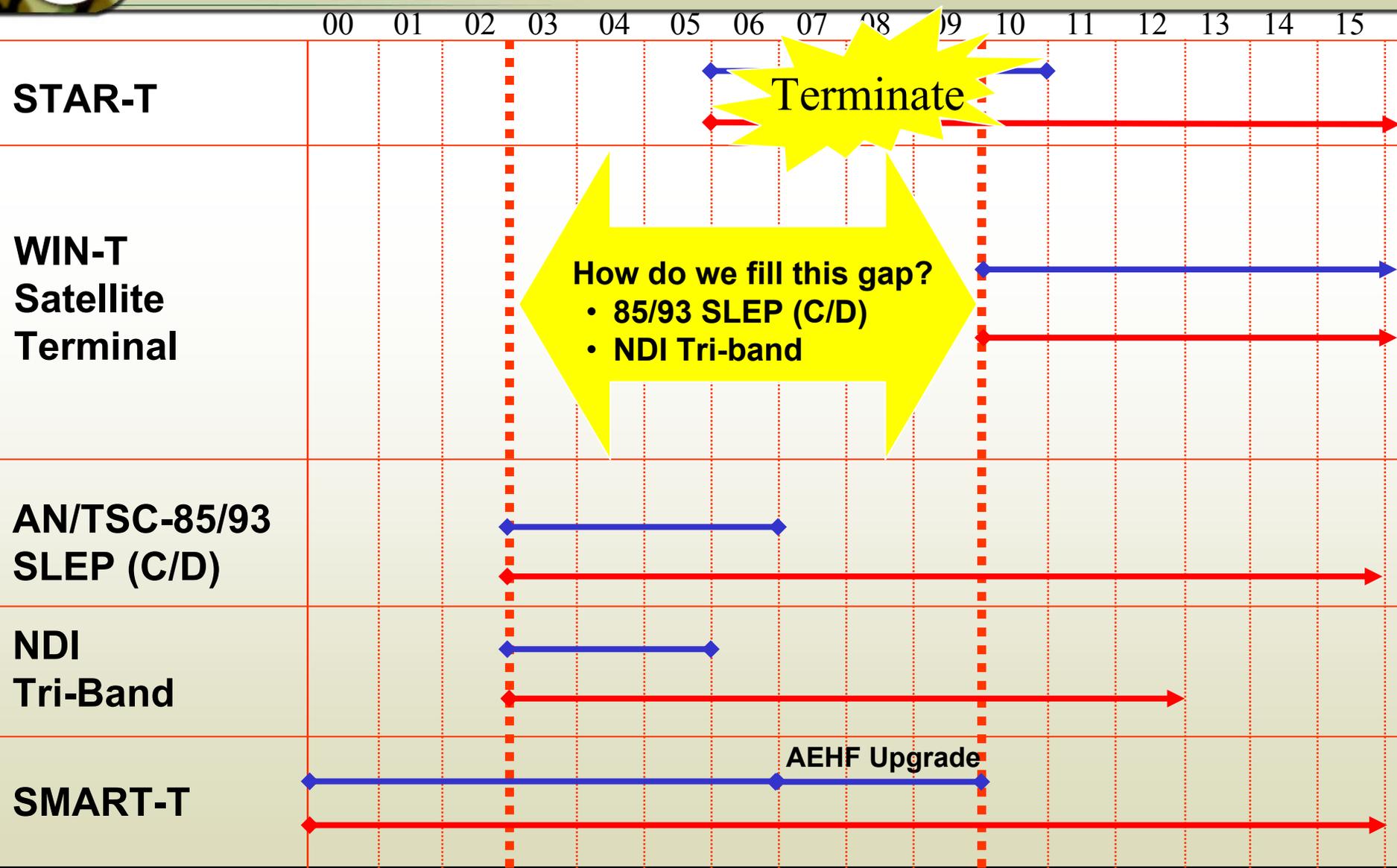
# STAR-T

- **Current Status**

- **Contract with Raytheon Terminated for Default – Jun 01**
- **Requirements for Multi-channel SATCOM terminal being rolled up into WIN-T ORD.**



# Projected Terminal Program Fielding and Lifecycle



Terminate

How do we fill this gap?  
• 85/93 SLEP (C/D)  
• NDI Tri-band

AEHF Upgrade

Fielding   
Lifecycle



# 85/93 Service Life Extension Program (SLEP)

## “C” model upgrade:

- Modem
- Upconverter
- Downconverter



**AN/TSC-85**

## “D” model upgrade:

- Enhanced Tactical Satellite Signal Processor (ETSSP)
- High Voltage Power Supply (HVPS)
- AS-3036 "A" antenna upgrade kit
- Terminal FM Orderwire



**AN/TSC-93**



# Multi-Channel NDI Terminal

**HQDA Directed Procurement based on approved ONS's**

## **Capabilities being pursued:**

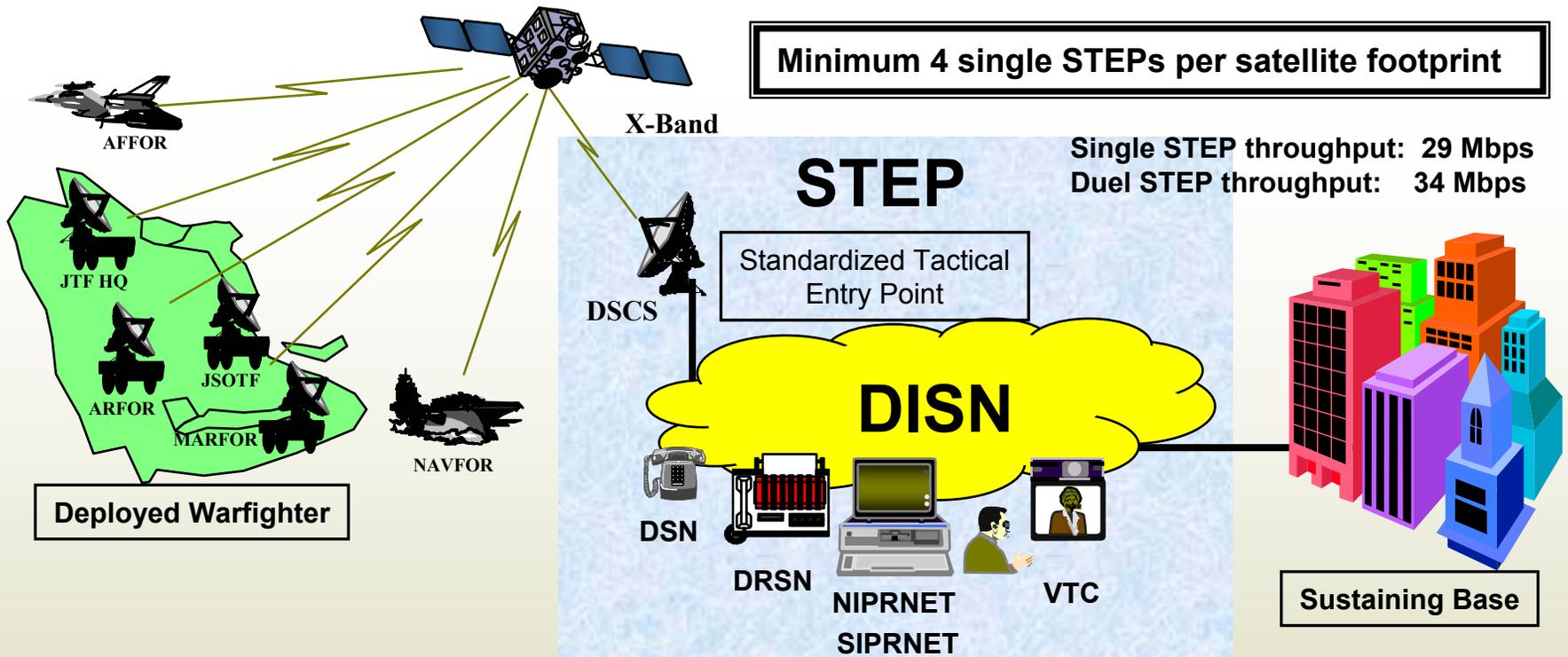
- **C, X, Ku bands required; Ka upgrade highly desired**
- **Simple frequency band changes (antenna feed, not RF suite)**
- **Operate over DSCS, Commercial, WGS Satellites**
- **Compatible w/current GMF; 4 links (mesh/hub/spoke/pt to pt)**
- **Terminal modem must operate up to 20 Mbps**
- **2 ECV's; 1 Primary and 1 Support vehicle w/ integrated generator**
- **Operated by MOS 31S in military environments; must meet military transportability & mobility requirements.**
- **Software network management tool desired**
- **Tri-band Satellite Emulator for maintenance and training required**





# Standardized Tactical Entry Point (STEP)

**Provide Seamless Interface into the DISN for the Warfighter**



Minimum 4 single STEPs per satellite footprint

Single STEP throughput: 29 Mbps  
Duel STEP throughput: 34 Mbps

Standardized Tactical Entry Point

DISN  
DSN  
DRSN  
NIPRNET  
SIPRNET  
JWICS  
VTC

Sustaining Base

DISN Deployed

- |                |                                |                 |
|----------------|--------------------------------|-----------------|
| <b>ARMY</b>    | <b>NAVY</b>                    | <b>AIRFORCE</b> |
| ★ CAMP ROBERTS | ★ BAHRAIN                      | CROUGHTON       |
| ★ FT BELVOIR   | ★ LAGO DE PATRIA               | MACDILL         |
| ★ FT BRAGG     | ★ NORTHWEST                    | RAMSTEIN        |
| ★ FT BUCKNER   | ★ WAHIAWA                      | SWA1            |
| ★ FT DETRICK   |                                |                 |
| ★ FT MEADE     | STEP TRAINING SITE: FT GORDON  |                 |
| ★ LANDSTUHL    | STEP TESTING SITE: FT MONMOUTH |                 |

Legend

- Single STEP Sites
- Duel STEP Sites
- ★ STEPs that will evolve into Teleports!



# DOD TELEPORT CONFIGURATION

## DESCRIPTION:

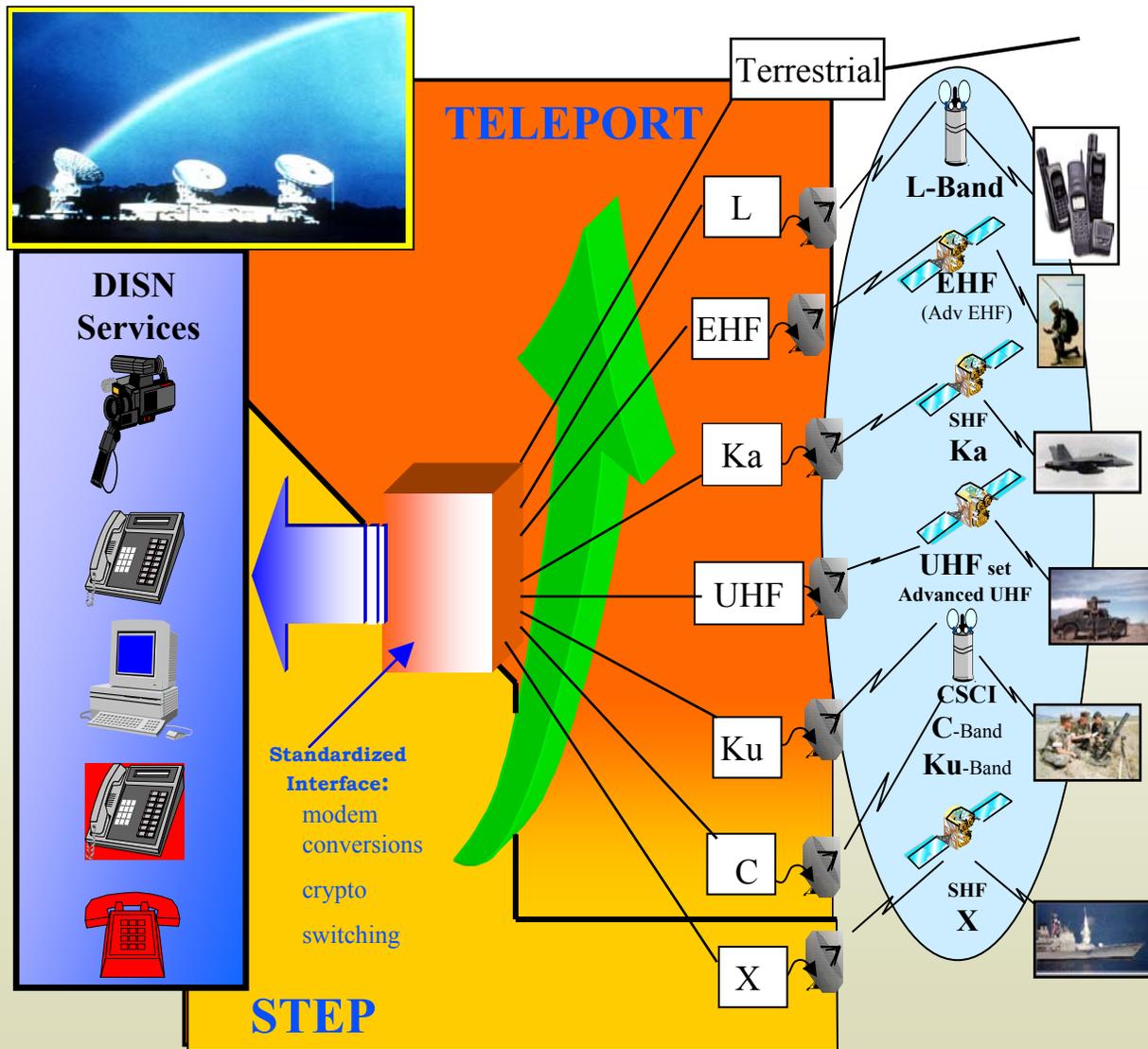
The Department of Defense (DOD) Teleport is an expansion of our existing communications infrastructure that provides greater information throughput and crossbanding capabilities. It will provide the Warfighter with a seamless access into the Defense Information Services Network (DISN) utilizing six different types of ground terminals that have access to C, L, X, Ka, Ku, UHF, and EHF constellations. Six Teleports will be strategically located throughout the Globe ensuring the Warfighter access to at least two of them from any location worldwide. Each proposed Teleport will be comprised of existing and programmed earth terminals, three Multiplexer Integration and DCSS Automation Systems (MIDAS) for baseband data, a Fore Switch for switching and routing, and terrestrial transmission for access into the DISN. The Teleport will be implemented in a phased approach. Generation One (FY02-03) will include the C, X, Ku and UHF capabilities. Generation Two (FY04-05) incorporates Commercial Ka and Military Ka and EHF capabilities. Generation Three (FY06-10) expands to use Advanced EHF, the Advanced Narrowband System, and any improvements with the Advanced Wideband System. The Teleport's initial goal is to provide 100% of required DISN and SATCOM services to support Day-to-Day operations plus one Small Scale Contingency.

## FREQUENCY RANGE:

C, L, HF, X, Ka, Ku, UHF, and EHF

## CHARACTERISTICS:

- Coverage from 65 N and 65 S Latitude
- Interoperable with all existing and programmed C, X, Ku, Ka, UHF and EHF terminals
- Crossbanding for increased flexibility



## STEP



# GLOBAL BROADCAST SERVICE

**Global Broadcast Service (GBS) Phase II** is an Integrated Communications System consisting of Uplink Injection Sites, Broadcast Satellites, Receive Terminals and Management Processing. GBS will Augment MILSATCOM Systems and Provide High-speed, One-way Information Flow of High Volume Data and Multimedia Information Such As Imagery, Maps, Weather, Logistics, Air Tasking Orders, Etc., To Deployed, and Garrisoned Forces Worldwide. The Army Will Procure 504 Transportable Ground Receive Suites (TGRS) and 3 Theater Injection Points (TIPs).

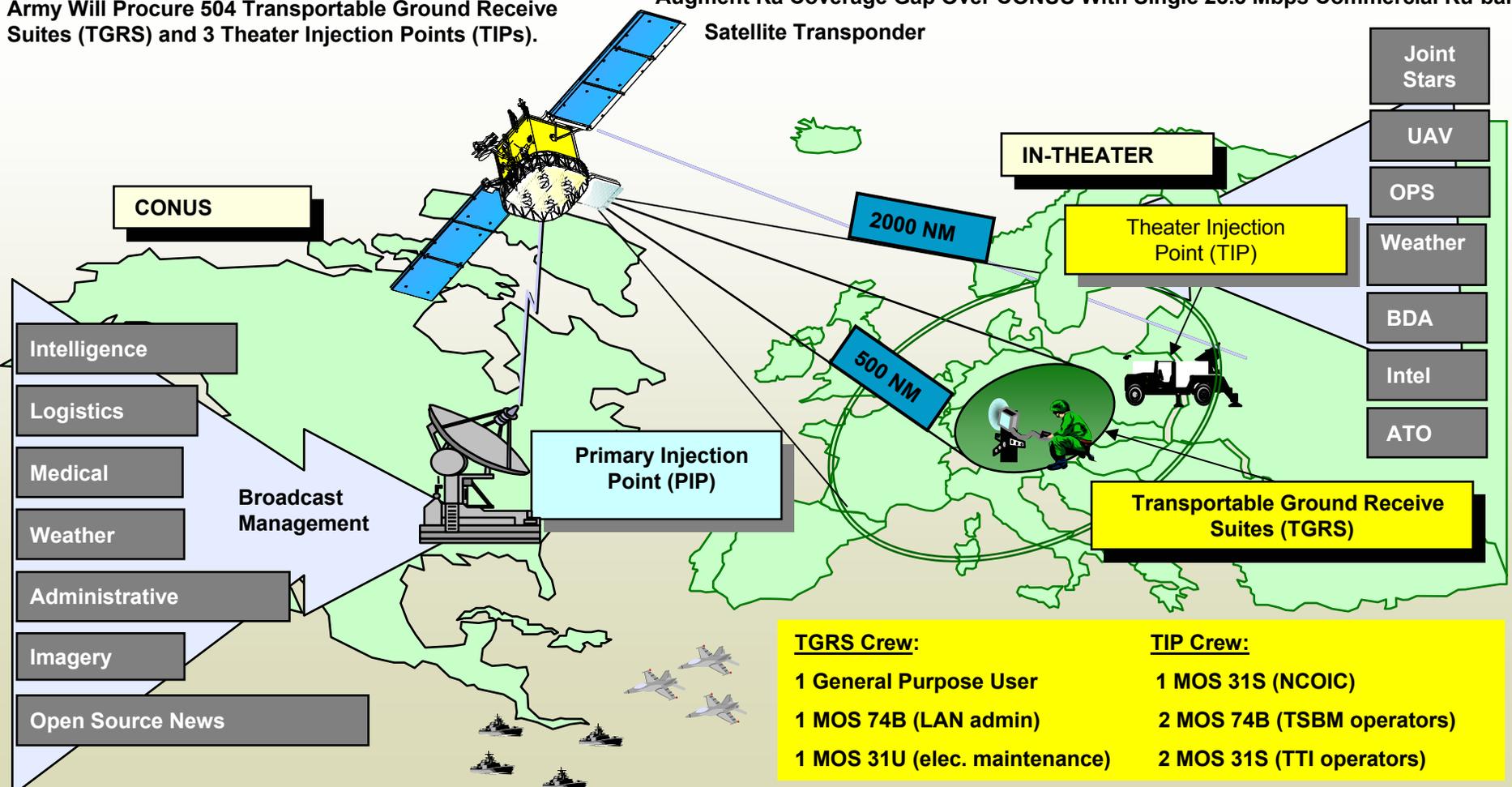
### Theater Injection Point (TIP)

Provide the CINC/CJTF an In-theater 6 Mbps Transmit Uplink Capability  
 Accept, Coordinate, Package and Transmit Vital Theater Generated Large Data Files

### Transportable Ground Receive Suite (TGRS)

Receive Information From 1 of UFO's 4 GBS Ka Transponders (Each is 23.5 Mbps)  
 Downlinks Operate at 20.2 - 21.2 GHz, Ka-band and 10.95 -12.75 GHz Ku-band  
 Augment Ka Coverage Gap Over CONUS With Single 23.5 Mbps Commercial Ku-band

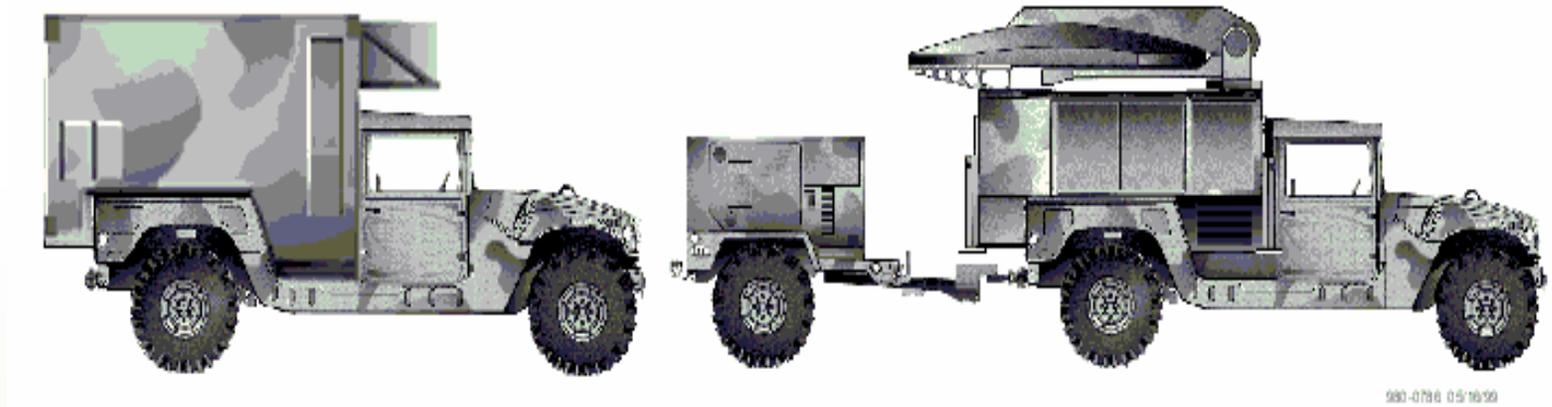
Satellite Transponder



<u>TGRS Crew:</u>	<u>TIP Crew:</u>
1 General Purpose User	1 MOS 31S (NCOIC)
1 MOS 74B (LAN admin)	2 MOS 74B (TSBM operators)
1 MOS 31U (elec. maintenance)	2 MOS 31S (TTI operators)



# GBS Theater Injection Point (TIP)



**Tactical Satellite Broadcast Manager**

**Tactical Terminal Injector**





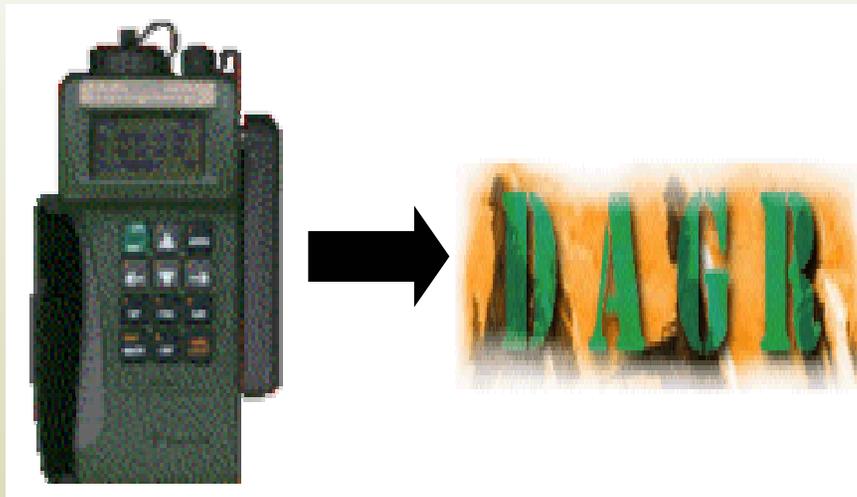
# GBS Transportable Ground Receive Suite (TGRS)





# GLOBAL POSITIONING SYSTEM (GPS)

GPS User equipment provides real time position, velocity, and timing (PVT) information to Army tactical and strategic organizations in standalone and embedded configurations. GPS is used during peacetime, contingency, and wartime across all Battlefield Functional Areas (BFA) to provide worldwide, 24 hour a day, PVT data under adverse climatic and electronic conditions. User equipment will be configurable for use by the individual soldier, vehicles, weapon systems, and Command, Control, Communications, Computer and Intelligence (C4I) systems during ground, air, and water operations.

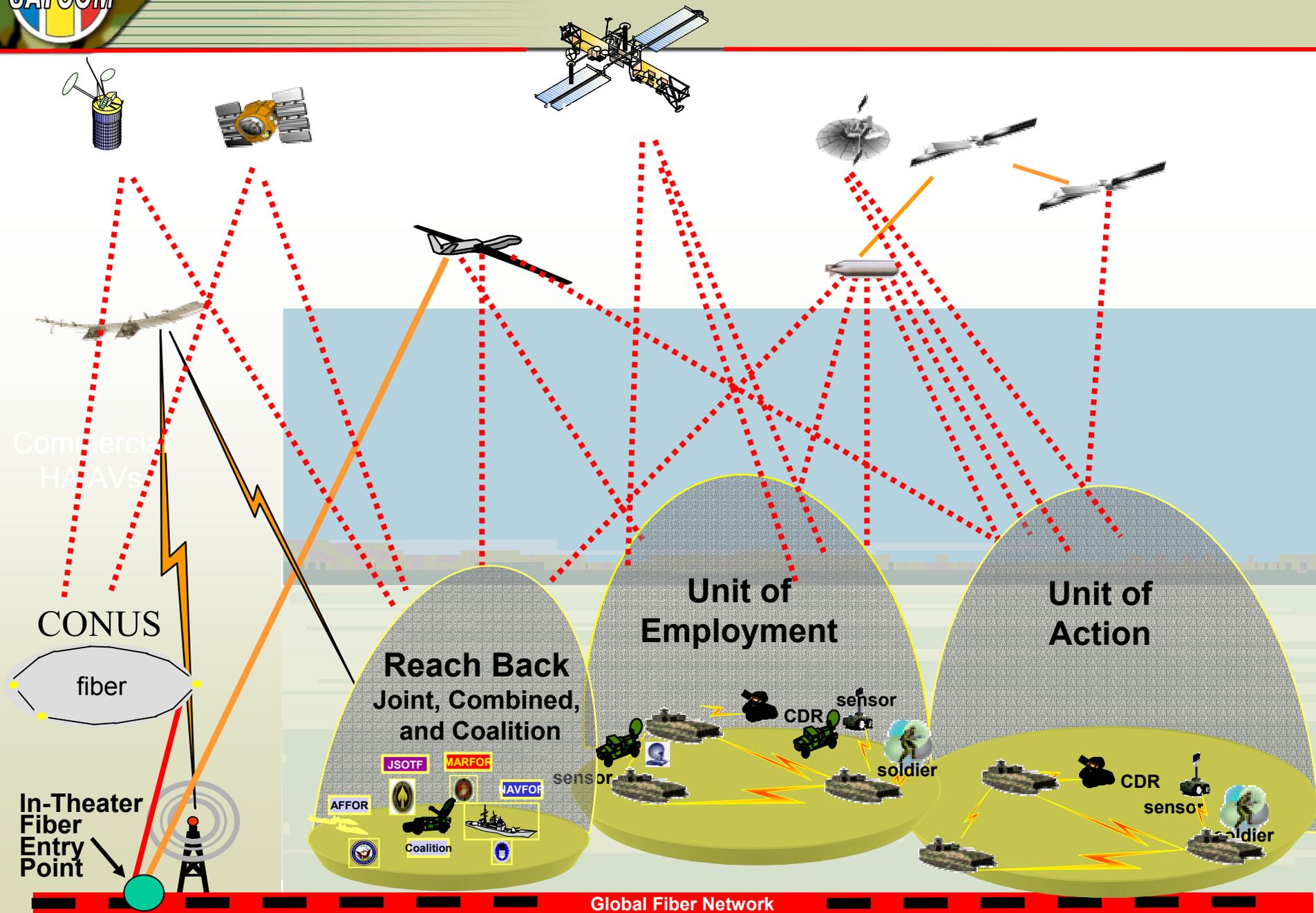


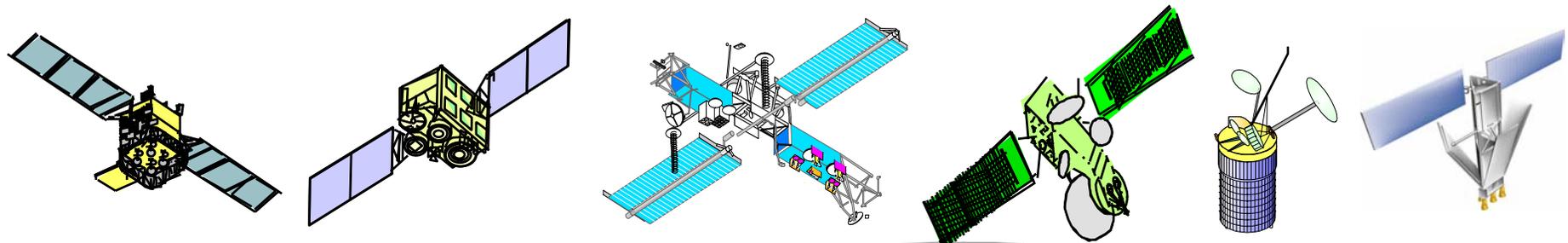
## CHARACTERISTICS/DESCRIPTION

- ❑ System will utilize P(Y) code when providing PNVT
- ❑ Operates on L1 (1575.42 MHz) and L2 (1227.6 MHz)
- ❑ Improved Anti Jam Capability
- ❑ GPS receivers will continuously track signals from all GPS satellites in view
- ❑ Capable of being Integrated with existing navigation, C4I systems, external sensors, and meet security policy requirements of integrated system
- ❑ Capable of operating during periods of denial, degradation, or deception with SAASM
- ❑ Handheld (DAGR) will utilize AA batteries for operation
- ❑ Handheld will operate for 12 hours continuous hours without changing batteries
- ❑ Handheld will not weigh more than 1.9 pounds
- ❑ Over the Air Re-Key with the SAASM module
- ❑ Input and output ports key loading and data transfer with multiple systems.
- ❑ One hand operation
- ❑ Graphical/Windows Based User Interface



# 2010 TIMEFRAME





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