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GTA 40-01-001

Army Space Training Strategy

Home Station Training

Reference Guide

February 2016 (v1.2)

U.S. Army Space and Missile Defense Command/
Army Forces Strategic Command
G31 Training, Readiness & Exercise (TREX)
Army Space Training Integration Branch

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Introduction

Operating effectively in space is one of the DoD's top defense mission areas. The Army, evolving from a space-enabled to a space-dependent force, is one of the largest users of space-based capabilities within DoD. Space-based capabilities are critical to planning, preparation and effective execution of the full range of military operations. They are a critical component of an agile, responsive, tailorable force capable of responding to any mission, anywhere, any time.

The Army Space Training Strategy (ASTS) addresses key aspects of space training and education for every Soldier, at every grade and echelon. Space education and training fostered in the institution must be applied and reinforced in the operational training domain to train as the Army fights, ensuring the Army is a decisive force of action, trained and ready to Prevent, Shape, and Win future conflicts.

ASTS Objective: Improve the Army's understanding and use of space capabilities, products, force enhancements and protection to enable unified land operations, especially in contested operational environments.

ASTS Key Tasks/Lines of Effort:

- ***Institutional***: Increase Space knowledge across the force by incorporating it into institutional training.
- ***Operational***: Train units at home station and CTCs on how to exploit space capabilities and respond in a contested environment.
- ***Personnel Development***: Continue to train Army space professionals.

Operational training in contested space operational environments progressively moves Soldiers and units from **exposure to competence to confidence** in leveraging space-enabled capabilities. Army leaders and Soldiers will be able to initiate and maintain access to space capabilities and mitigate attempts to deny, degrade, and disrupt that access.

Incorporating realistic impacts of using space-based capabilities through all operating environments, including degraded, disrupted, or denied space operating environments meets the Army Vision to provide experiences that better reflect the complex challenges Soldiers will face in future conflicts.

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Army Space Operations Integration

Army Space Support Elements (SSEs)

- Located at Division and above, with varying rank structures and size of the element
- Provide direct support to the Warfighter in support of the Combatant Commander's objectives
- Integrates across all staff sections
- May be assisted by an Army Space Support Team (ARSST)

S/G2

- ✓ Coordinate Collection Management (e.g. imagery requests)
- ✓ Provide updated imagery (Commercial and National)
- ✓ Assist with expertise on National Systems
- ✓ Space Threat Awareness/ Insurgent Use of Space

S/G3

- ✓ Space Mission Analysis
- ✓ Imagery: Key Terrain, Change Detection
- ✓ Current Space Weather Impacts
- ✓ Operational Planning
- ✓ Assistance with Special Access Programs

S/G4

- ✓ Imagery: Sea/Air Port of Debarkation (SPOD/APOD), Main/Alternate Supply Route (MSR/ASR) Fly Thrus
- ✓ Navigation Accuracy (Nav/Acc) for convoys & LOG Assets

S/G6

- ✓ Space Weather impacts on comms
- ✓ Space-based architecture support
- ✓ Communications satellites health/ status & details

Air Defense/TMD

- ✓ Missile Profiles and Analysis
- ✓ Early Warning Architecture
- ✓ Theater Event System (TES) Health/Status

Fires/Targeting

- ✓ GPS Accuracy for Deep Attack
- ✓ Pre-fires Imagery
- ✓ Assist w/Detect/Assess planning

Information Operations

- ✓ Computer Network Attack/ Computer Network Defense/ Computer Network Operation (CNA/CND/CNO) Nominations
- ✓ Satellite Reconnaissance Advanced Notice (SATRAN) support for deception/ denial/essential elements of friendly information (EEFI)
- ✓ Imagery to confirm/deny compliance w/accords
- ✓ Shutter Control Requests of Grey systems
- ✓ Space Control Effects

Army Space Cadre and Personnel Development Skill Identifier (PDSI) S1A "Unit Space Trainer"

Army Space Cadre

A force of Soldiers and Civilians who have documented training and experience in the space domain.

Unit Space Trainer

- Identifies Soldiers who have the training background necessary to enable them to be used as organizational trainers in support of the Army Space Training Strategy.
- To qualify, Soldiers must meet the following criteria:
  - ✓ Complete the Army Space Cadre Basic Course or higher-level residential space professional development course (such as Space 200).
  - ✓ Compete the Foundation Instructor Facilitator Course or equivalent.
  - ✓ Complete at least 8-hours of Tactical Space Training as determined by the USASMDC/ARSTRAT G31 TREX, Army Space Training Integration Branch (ASTIB).

See page 50 for information on available space training.

Stryker Brigade Combat Team (BCT) Space Enabled Equipment (*Examples*)

AN/PRC-150(C)
High Frequency Manpack (HFMP)

Over 2500 pieces of equipment in a Stryker Brigade Combat Team (BCT) are Space Enabled!

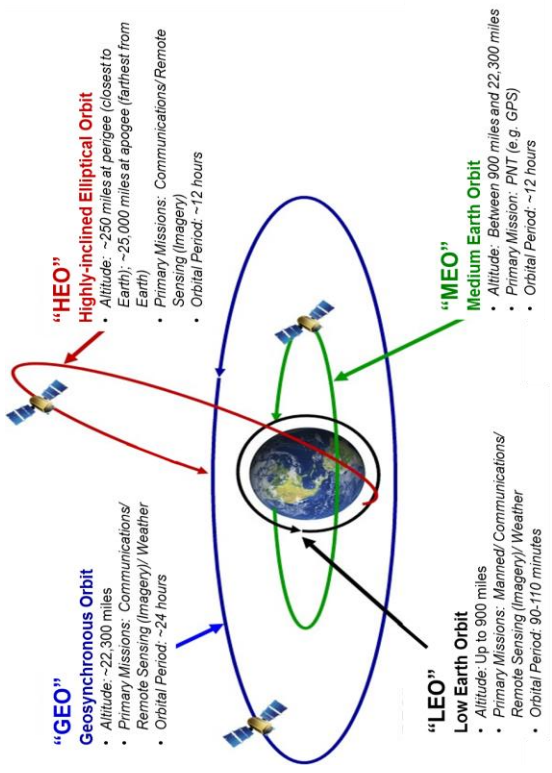
Defense Advanced GPS Receiver (DAGR)

M982
EXCALIBUR
(155mm Extended Range GPS Guided Artillery Shell)

AN/UYK-128(V)1
Joint Battle Command – Platform (JBC-P)
[*Formerly FBCB2 / BFT*]

AN/TTC-59
Joint Network Node (JNN)
(*Provides Basic Communications and Networking Control*)

Space Fundamentals – Orbits & Common Missions



Space Fundamentals – Space Environment

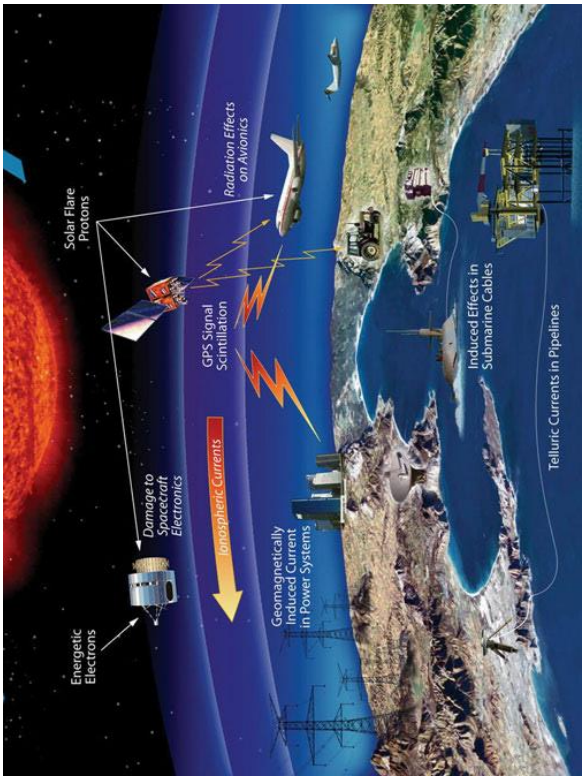
The Sun constantly emits charged particles and solar radiation (energy)

- Creates ever present ionospheric "disturbances" ("space weather")
- Geomagnetic storms severely "disturb" the ionosphere

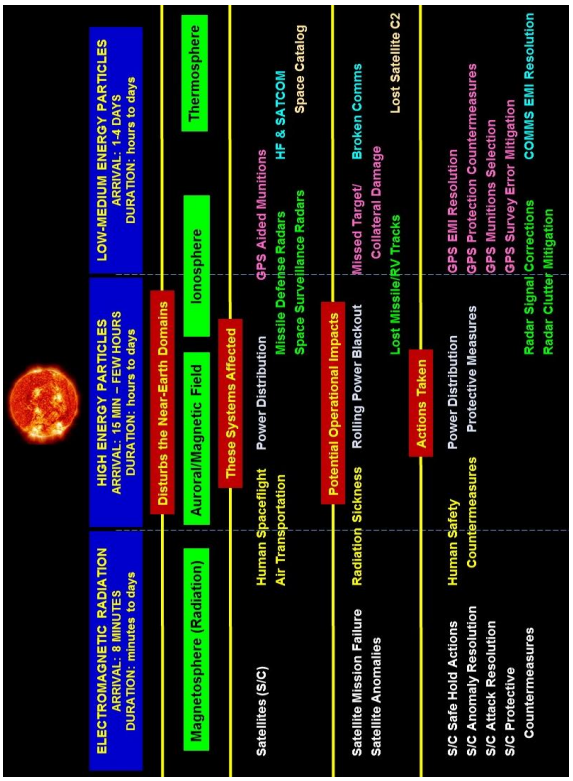
IMPACTS

- **GPS:**
  - ✓ The ionosphere is the largest source of error in GPS positioning and navigation – errors in excess of 100 feet, loss of lock
  - ✓ Signal must pass from satellite thru charged ionosphere to receiver, affecting signal propagation and timing … affects accuracy
  - ✓ Impacts on GPS systems; occur any time of day or night, but increased effects seen at night
- **SATELLITE OPERATIONS** (Communications, television/radio, national defense, meteorology, and more)
  - ✓ Radiation exposure (interaction of charged particles and radiation) – satellite orientation problems, damage to electronic devices and other hardware
  - ✓ Geomagnetic storms – space vehicle charging with electrostatic discharge; atmospheric heating increases drag on the satellite; vehicle failure; signal propagation is delayed or completely lost
- **MANNED SPACE OPERATIONS** (Astronauts)
  - ✓ Tissue and cell damage
- **AVIATION**
  - ✓ High Frequency (HF) "black out" on dayside of the Earth – loss of contact with ground control over oceans and poles
- **POWER GRIDS**
  - ✓ Geomagnetic storms create electric current in the magnetosphere and ionosphere, which compresses and disturbs the Earth's magnetic field
  - ✓ Disturbed conditions create additional currents in conductors on the ground (e.g. overhead transmission lines); can cause voltage instability and damage to unshielded power system components

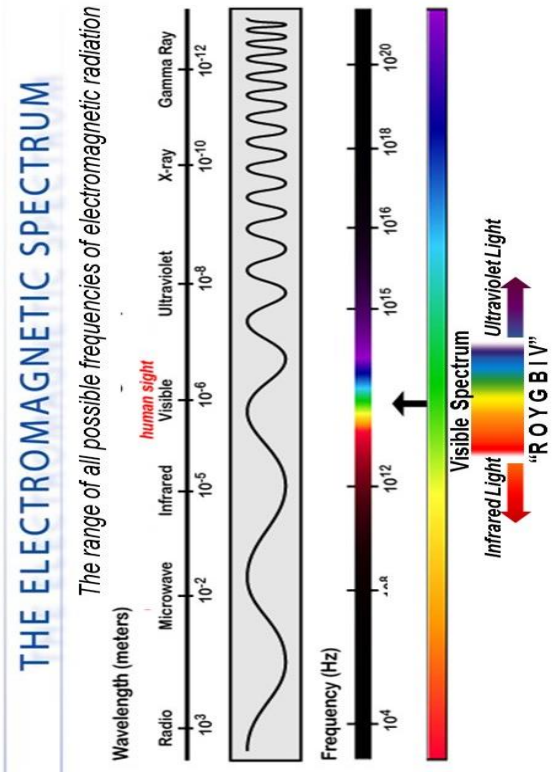
Space Fundamentals – Space Environment



Space Fundamentals – Space Environment



Space Fundamentals – Electromagnetic Spectrum.



Space Fundamentals – Electromagnetic Interference (EMI)

- EMI, or Radio Frequency Interference (RFI), occurs when a device's performance is disturbed or interrupted by electromagnetic radiation/conduction
  - ✓ Can affect virtually anything with some form of electrical current passing through it
- Natural or artificial in origin, unintentional or intentional – **MOST IS UNINTENTIONAL**
- GPS enabled receivers are highly susceptible to EMI - very weak signal when it arrives at the receiver
- Can vary greatly, change rapidly, and affect similar systems differently

RECOGNIZING EMI

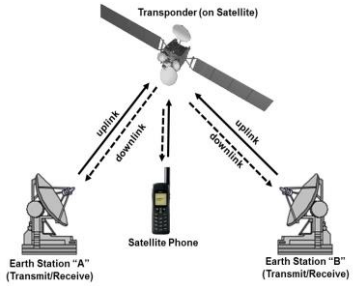
- First indications of possible EMI often appear as equipment malfunctions, user reports of communications loss (partial or complete), or a reduction in bandwidth ("the network is slow")
- Certain devices provide a visual indication of EMI
  - ✓ For example, the DAGR displays a warning message on the screen when a jamming (EMI) environment is detected
- Must first troubleshoot the device to ensure it is operating properly before suspecting EMI
  - ✓ Ensure nothing obstructing receiver's view of the satellites
  - ✓ Increased solar activity has potential to affect communications in the Ultra High Frequency (UHF) portion of the spectrum
  - ✓ Adverse terrestrial weather may impact communications in the Extremely High Frequency (EHF) portion of the spectrum

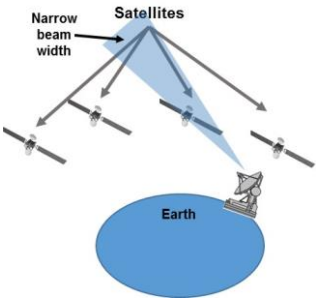
ALL SUSPECTED EMI MUST BE REPORTED!

See report format on page 47 and CJCSM 3320.02C and D for additional information – submit report in accordance with local unit SOP. Classify report IAW system specific security classification guide.

Space Fundamentals – Satellite Communications

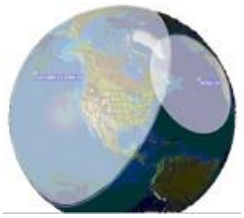
- Communications satellites relay and amplify signals through the use of a transponder between a transmitter and a receiver
  - ✓ Communications satellites are used for television, telephone, radio, internet, and military applications
- The signal traveling from the ground to the satellite is referred to as the uplink
- The signal traveling from the satellite to the ground is referred to as the downlink





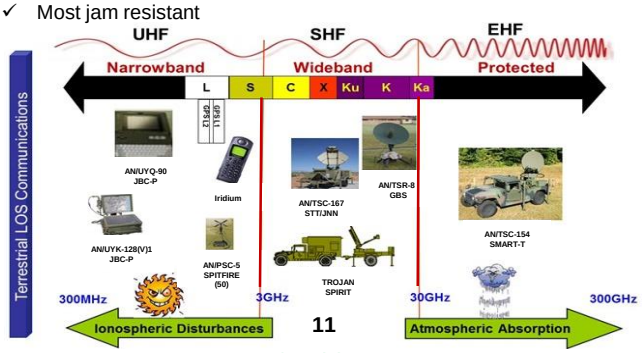
- The uplink is sufficiently narrow in width to ensure it is received by the desired satellite and not an adjacent satellite

- The downlink signal creates a "footprint" on the surface of the Earth, within which the transmitting and receiving stations can "see" the satellite if there are no obstructions, and can obtain access to the satellite if an authorized user

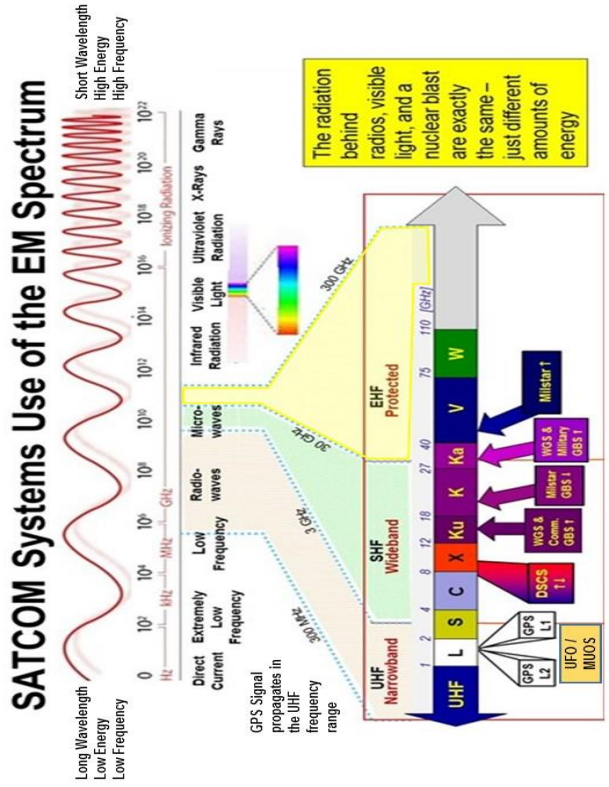


Space Fundamentals – Satellite Communications

- All satellite communications currently in use operate within one of three ranges of frequencies
  - ✓ These ranges of frequencies are further grouped into bands
- **Ultra High Frequency (Narrowband Communications)**
  - ✓ Frequency range: 300 MHZ to 3 GHZ
  - ✓ Includes Mobile User Objective System (MUOS), and UHF Follow On (UFO)
  - ✓ More susceptible to ionospheric disturbances (“space weather”)
  - ✓ Least jam resistant
- **Super High Frequency (Wideband Communications)**
  - ✓ Frequency range: 3 GHZ to 30 GHZ
  - ✓ Include Wideband Global SATCOM (WGS) and Defense Satellite Communications System (DSCS)
- **Extremely High Frequency (Protected Communications)**
  - ✓ Frequency range: 30 GHZ to 300 GHZ
  - ✓ Includes Advanced EHF (AEHF) and MILSTAR
  - ✓ More susceptible to terrestrial weather
  - ✓ Most jam resistant



Space Fundamentals – Satellite Communications



Basic Communications Bands

Name	Frequency Range	Usage
HF	3-30 MHz	HF Comms
VHF	30-300 MHz	SINCGARS, **Weather, FAA [PRC-117F/PSC-5/PRC-148]**
UHF	300 M-1GHz	LOS Radios, **UFO, MUOS [PRC-117F/PSC-5/PRC-148]**
L	1-2 GHz	LOS Radios, **FFT, Iridium, INMARSAT, THURAYA [GPS/JBC-P (FBCB2)]**
S	2-4 GHz	**Commercial**
C	4-8 GHz	Tropo, **Commercial**
X	8-12 GHz	**DSCS, WGS [WIN-T]**
Ku	12-18 GHz	**Commercial**
K	18-27 GHz	**Milstar, AEHF, UFO/E/EE, IPS, WGS, GBS** (Downlink)
Ka	27-40 GHz	**WGS, GBS** (Uplink)
Q & V	40-75 GHz	**Milstar, AEHF, UFO/E/EE, IPS** (Uplink) **[SMART-T/SCAMP]**

Space Fundamentals – Satellite Communications

ULTRA HIGH FREQUENCY (UHF) – NARROWBAND COMMUNICATIONS		
Capabilities	**Limitations**	**Vulnerabilities**
GEO Orbit: "Sees" 1/3 earth coverage Mobile terminals Easy signal acquisition All terrestrial weather Foliage penetration	Older Legacy Equipment = degradation Channels limited Narrow bandwidth Access limitations	Easily jammed Pirated signals Space weather – ionospheric disturbances
SUPER HIGH FREQUENCY (SHF) – WIDEBAND COMMUNICATIONS		
Capabilities	**Limitations**	**Vulnerabilities**
GEO Orbit: "Sees" 1/3 earth coverage High data rates & throughput "Sweet spot" More channels Footprint tightly focused (protection)	Large antennas Higher Antenna Accuracy Footprint tightly focused (access) More expensive Limited mobility	Jamming* *SHF is more resistant than UHF, but less resistant than EHF, to jamming
EXTREMELY HIGH FREQUENCY (EHF) – PROTECTED COMMUNICATIONS		
Capabilities	**Limitations**	**Vulnerabilities**
Various Orbits Extensive bandwidth Cross banding on satellite Uncrowded spectrum Jam resistant (MILSTAR)	Expensive Data rates Highest Antenna Accuracy	Terrestrial weather (rain/snow) – atmospheric disturbances

Space Fundamentals – Satellite Communications

Space Fundamentals – Global Positioning System (GPS)
"Positioning, Navigation, and Timing"

Missions: Position, Timing and Nuclear Detonation Detection

Characteristics:

- ✓ Always available globally ("24/7")
- ✓ Signal not usually affected by terrestrial weather conditions
- ✓ Continually broadcasts specially coded satellite signals that can be processed in a GPS receiver, enabling the receiver to compute position, velocity, and time, and military receivers to receive the secure signal
- ✓ Uses Common grid (WGS-84) as base reference (Datum)

Enables:

- ✓ Positioning information (e.g. DAGR)
- ✓ Navigational information (e.g. JBC-P/JBC-Log)
- ✓ Network synchronization and timing (NIPR/SIPR/SATCOM)
- ✓ GPS aided munitions (JDAM/ATACM/Excalibur)
- ✓ Timing for Intelligence, Surveillance, Reconnaissance Missions (e.g. timestamp of overhead imagery collection product)
- ✓ Unmanned Aircraft Systems (UAS)

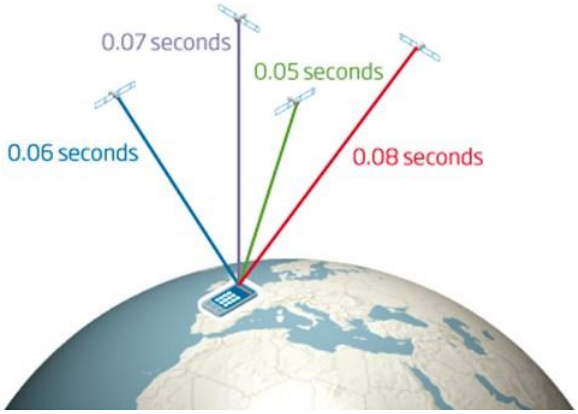
Limitations:

- ✓ Need unobstructed view to a minimum of four (4) satellites
- ✓ Multi-Path Interference - causes timing errors resulting in accuracy errors
- ✓ Satellite proximity to each other affects accuracy; closer together the satellites in view, the worse the accuracy
- ✓ Multiple Datums and Grid References available can result in positioning and navigational accuracy errors
- ✓ Operates in "L Band" (L1: 1575 MHz; L2: 1227 MHz) within the UHF frequency range at a very low signal strength – susceptible to ionospheric disturbances and easily jammed

Space Fundamentals – Global Positioning System (GPS)

"Positioning, Navigation, and Timing"

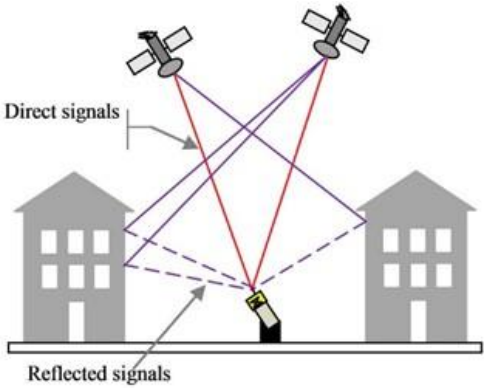
How GPS Works



- Each GPS satellite is continually sending out weak radio signals with its position and the exact time
- On Earth, a receiver, such as a DAGR, compares the time the signal was sent to the time it was received
  - ✓ This is used to calculate the receiver's distance from the satellite (d=v*t, where v = the speed of light)
- After correcting for errors, the receiver uses the signals from four or more satellites to calculate its position in 3D
  - ✓ This is called trilateration.

Space Fundamentals – Global Positioning System (GPS)
"Positioning, Navigation, and Timing"

Multi-Path Interference



- Caused by GPS signals reflecting off surfaces near the GPS receiver that can either interfere with, or be mistaken for, the "true" signal that follows a direct path from the satellite to the receiver
- Common sources of multi-path include rock outcroppings, base of a valley, buildings, and vehicles
- The reflected signal is delayed in arriving at the receiver (longer path), causing timing errors
- 1 nano-second (1 billionth of a second) of timing error equals 1 foot of error
  - ✓ *1 second of timing error equals 189,394 miles of error!*

Space Fundamentals – Intelligence, Surveillance, and Reconnaissance (ISR)

- Intelligence, surveillance, and reconnaissance (ISR) provides improved situational and battlespace awareness to Commanders, staffs, operational units, and individual operators
- The Army executes ISR through the operations and intelligence processes and information collection

Think of it in reverse order…

First, we conduct a RECONNAISSANCE

Second, we SURVEIL (observe)

Finally, we collect & produce INTELLIGENCE

Battlespace Awareness:

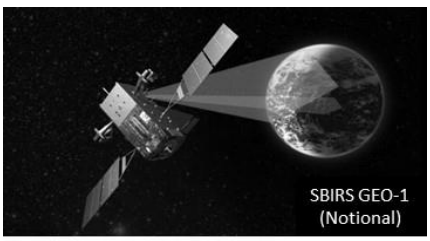
- Know the enemy and the environment
- Understand the Operating Environment
  - ✓ Understand threat dispositions, centers of gravity, and courses of actions within the context of the operational environment
  - ✓ Understand and predict adversary capabilities, tactics, techniques, and procedures (TTPs)
- Fuse Essential Combat Information
  - ✓ Provides indications and warning, identifies potential vulnerabilities to our forces and identifies opportunities to achieve our combat objectives
- Enable Informed Decisive Action
- Enable Safe Operations

Overhead Persistent Infrared and Overhead Imagery Capabilities are two tools supporting the ISR mission.

Space Fundamentals – Overhead Persistent Infrared (OPIR)

What is OPIR?

- Near continuous coverage of broad or specified areas on the surface of the Earth
- Sensors detect high energy events
  - ✓ Think missile launches
- OPIR is not imagery but can be used in conjunction with it
- Space Based Infrared System (SBIRS) satellites are in GEO and HEO to provide global OPIR capabilities

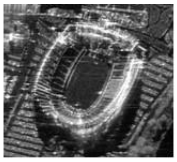


How does OPIR assist the Warfighter?

- Mission planning
  - ✓ Surveillance of Named Areas of Interest (NAIs), targets, etc. for trend analysis and event correlation
  - ✓ Weather
- Operations
  - ✓ OPIR "Watch Boxes" – focused surveillance areas
  - ✓ Missile Warning/Defense
- Post Mission Assessment (Battle Damage Assessment [BDA])

Space Fundamentals – Imagery

- Imagery is collected via “remote sensing”
- Imagery from Government owned systems have limited release
- Imagery from Commercial owned systems is more easily released to civilian and coalition partners
- Enhanced View Web Hosting Service (EVWHS) provides personnel with a “.mil” email address for direct access to commercial imagery at no cost
- **Types of Imagery**
  - ✓ ***Electro-optical (EO)***: collects what it “sees;” daylight; limited by cloud coverage/smoke
  - ✓ ***Infrared (IR)***: collects indications of IR (heat); best done at night when surrounding area is cooler; limited by high clouds
  - ✓ ***Synthetic Aperture RADAR (SAR)***: collects energy (RADAR) the satellite payload transmits and “pings” off target to create an image; very granular images; can collect any time of day/night and in all weather conditions



SAR image of Ohio State Horseshoe Stadium

- **Imagery Collection Formats/Processing Technique**
  - ✓ ***Panchromatic*** (gray scale): very sharp image, “crisp”
  - ✓ ***Multispectral (color):*** image resolution not as sharp; can distinguish what objects are based on multispectral signatures (e.g. pine tree from a maple tree).
  - ✓ ***Pan-Sharpened***: overlay a multispectral image over its matching panchromatic image; easier to interpret the image

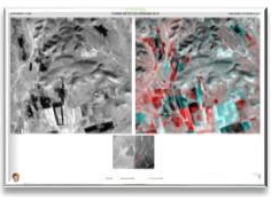
Panchromatic 0.50m resolution | **Multispectral 2.0m resolution** | **Pan-Sharpen 0.50m resolution**

Space Fundamentals – Imagery
Military Applications

- **Operational Planning**
  - ✓ Terrain Analysis
  - ✓ Helicopter Landing Zones (HLZs)
  - ✓ Intelligence
  - ✓ Change Detection
  - ✓ Choke Point Identification

- **Counternarcotic Support**
  - ✓ Crop Analysis
  - ✓ Pattern of Life

- **Disaster Response**
  - ✓ Short Wave Infrared (SWIR) / Long Wave Infrared (LWIR) - aids in firefighting
  - ✓ Change Detection

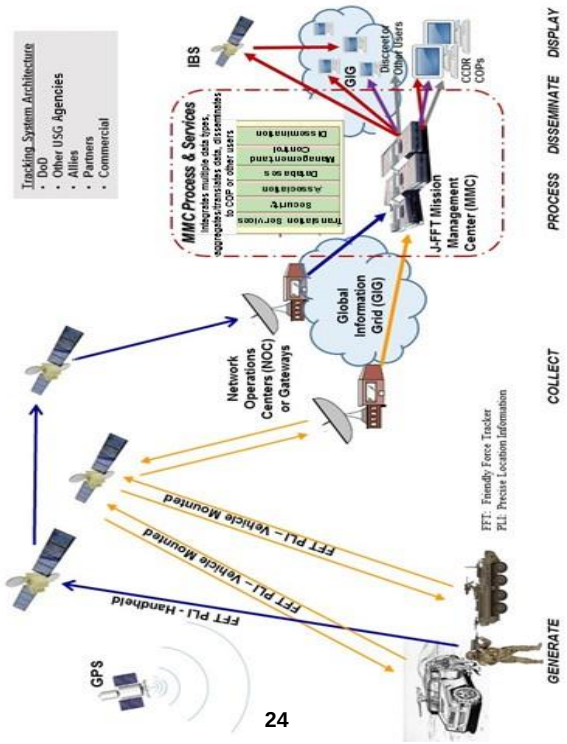


Space Fundamentals –
Joint Friendly Force Tracking (JFFT)
Generic Data Processing

- *Note: Process is graphically depicted on page 24
- GPS continuously transmits signal to GPS enabled Joint Friendly Force Tracking (JFFT) devices
- JFFT device either actively or passively uplinks its precise location information (PLI) to an overhead communications satellite
  - ✓ Most handheld JFFT devices only transmit to the overhead asset
  - ✓ Most vehicle mounted JFFT devices may both transmit and receive data with the communications satellite
- In select situations a brevity code or text message may be added to the message being uplinked to the communications satellite
- The communications satellite downlinks the data to a ground station that transmits the data to the Mission Management Center (MMC) or Blue Force Tracking (BFT) Global Network (BGN) via the Global Information Grid (GIG)
- The MMC processes the data and disseminates the JFFT information to various command and control display systems, where the JFFT icon is displayed
- Display systems include:
  - ✓ Command Post of the Future (CPOF)
  - ✓ Maneuver Control System – Light (MCS-L)
  - ✓ Battle Command Sustainment Support System (BCS3)
  - ✓ Joint Battle Command – Platform (JBC-P) terminals
  - ✓ *Note: JFFT device must be registered with the MMC and BGN or the data is not disseminated
- JFFT data dissemination is determined by the Data Owner Guidance, (DOG) which is pre-coordinated between the US Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) MMC and the user

Space Fundamentals – Joint Friendly Force Tracking (JFFT)

Generic Architecture



Space Fundamentals – Joint Friendly Force Tracking (JFFT)

Technical Details

- JFFT devices use both GPS and Satellite Communications (SATCOM)
  - ✓ GPS provides position data
  - ✓ Communications satellites relay data to the Mission Management Center for processing and dissemination
- Satellite Communications Frequencies:
  - ✓ Uplink: L-Band (UHF) [1-2 GHz]
  - ✓ Downlink: S-Band (UHF) [2-4 GHz]
- GPS:
  - ✓ L1 (UHF): 1575 MHz
  - ✓ L2 (UHF): 1227 MHz

Joint Battlefield Command – Platform - Logistics (JBC-P LOG)
(Formerly Movement Tracking System [MTS] and JCR - LOG)

AN/UYK-128(V)1 - JBC-P
(Formerly FBCB2/BFT and JCR)

EMI can impact GPS signals and SATCOM signals, and therefore impact JFFT devices.

ALL SUSPECTED EMI MUST BE REPORTED!

- Follow your unit SOP – provide detail for a Joint Spectrum Interference Resolution – Online (JSIR-O) Report

Contested Space Operations

Contested space operations are defined by degradation caused by enemy action (e.g. Antisatellite (ASAT) weapons, electronic warfare threats, cyber attacks, and other enemy activities)

Degraded system operations are defined by degradation caused by failed systems or battle damage (e.g., uplink and downlink anomalies, satellite anomalies and malfunctions, ground system malfunction, and other failures)

Operational limitations are defined by reduced mission effectiveness caused by the physical or operational environment (e.g., solar conjunctions, satellite collision avoidance, terrestrial and space weather, classification, decision authorities, policy, and others)

In a contested space operating environment, space enabled capabilities may not perform as expected, mitigation strategies to retain capabilities are not always successful, and operators often become frustrated with their equipment

- Operator loses confidence in their equipment
- Creates vulnerabilities to operations when personnel either create a “work around” to avoid the symptoms being experienced, or simply abandon their equipment for something they believe is more reliable
- Operators do not operate in a secure environment

The adversary only needs to make you lose confidence in your equipment to be effective.

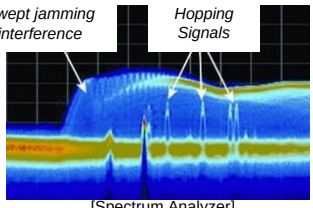
Contested Space Operations Indicators

Most indications of a contested space operational environment are not as obvious as an enemy using an ASAT weapon to damage a space asset

- ➢ They often appear as electromagnetic interference (EMI)

The following are examples of possible contested space operations indications:

- **Audible indicators**. Primarily with SATCOM and voice transmissions. Interferes with transmission/reception of the signal
- Indicators may appear as:
  - ✓ Static (noise)
  - ✓ Bleed over (voices/"power hum")
  - ✓ Loss of communications (permanent or intermittent silence)
    - ▪ May be due to the loss of timing to maintain link.
- **Visual indicators:**
  - ✓ Spectrum analyzer shows an increase in signal power above the normal carrier wave, in any variety of wave forms (spike, pulse, swept)
  - ✓ Joint Friendly Force Tracking:
    - ▪ Display icon becomes stale (changes from dark blue to light blue)
    - ▪ Location displayed significantly different than your map
    - ▪ DAGR displays warning/caution message
  - ✓ "Gumball"//Stoplight indicators change to red or amber
  - ✓ Munitions do not land where expected



[Spectrum Analyzer]

[DAGR Jamming Caution Screen]

Planning Considerations for Contested Space Operations

- Space enables many operations across the military
- Space enabled capabilities are quickly becoming enemy targets
  - ✓ Space enables extended operational ranges and increased OPTEMPO
- Units must be ready to operate in denied, degraded, and disrupted space operating environments
- To do this effectively, units must:
  - ✓ Prepare – train in normal and contested environments, with and without the use of space enabled assets
  - ✓ Recognize – know what a contested environment looks like
  - ✓ React – take all appropriate steps to mitigate the effects of a contested environment
  - ✓ Report – inform interested parties of suspected contested environments to maintain situational awareness at all levels
- The following planning considerations provide mitigation strategies battle staffs can use when planning and executing operations in a suspected contested environment
  - ✓ **Many will apply to multiple Warfighter functions (WfF), but appear here only once.**

Mission Command / Movement and Maneuver

- **PNT**
  - ✓ Manual population of the Common Operating Picture (COP) (e.g. Command Post of the Future-CPOF) may be required
  - ✓ Use a map board to track battles
  - ✓ Use of map and compass when GPS enabled devices are unavailable
  - ✓ Increase use of Inertial Navigation Systems (INS)
  - ✓ Increase use of Graphic Control Measures such as boundaries and phase lines

Planning Considerations for Contested Space Operations

Mission Command / Movement and Maneuver, continued

- **SATCOM**
  - ✓ Use line of sight (LOS) communications in lieu of SATCOM
  - ✓ Prioritize communications traffic
  - ✓ Identify alternate methods of communicating with higher headquarters, adjacent, and supported units
  - ✓ Transfer data/information manually or verbally
  - ✓ Master Control Station needs to transmit timing at regular intervals to keep unit radios time synchronized
  - ✓ If applicable, practice configuring and receiving timing via non-automated methods (e.g. other than the automated "boot" file)
  - ✓ Repurpose available assets:
    - Use line of sight UASs to conduct retransmission operations
      - Fewer ISR platforms available for other missions
    - Emplace physical retransmission sites
      - Requires additional security measures (e.g. infantry squad)
      - Decreases available firepower supporting parent platoon
  - ✓ Deploy Alternate Command Posts
    - May require additional personnel and equipment

Intelligence:

- **SATCOM**
  - ✓ Use line of sight UAS
  - ✓ Request repurposing of fixed and rotary wing assets
  - ✓ Repurpose assets to function as scouts
    - Repurposing combat power may change force ratios
    - May require additional forces to achieve an appropriate force ratio throughout the operation

Planning Considerations for Contested Space Operations

Fires:

- **PNT**
  - ✓ Increase use of Fires Brigade/Battalion level survey teams
  - ✓ Increase use of Laser Guided munitions
    - Requires laser round, laser designator and communications
  - ✓ Increase use of conventional rounds
    - Adds requirement for transportation of conventional rounds
  - ✓ Use a DAGR with GPS lock-acquired signal from outside the contested area to share with other GPS equipment
  - ✓ Increase use of GPS/INS systems (ATACMS)
  - ✓ Conventional air drop versus Joint Precision Aerial Delivery System (JPADS)

Sustainment/ Logistical

- **SATCOM**
  - ✓ Change to the push versus pull philosophy for logistic support.
  - ✓ Use manual procedures and hard copy documents
    - Track equipment/parts
    - Request equipment and parts

ALL WfF

- Allow more time to execute operations
- Train on reporting procedures – JSIR/JSIR-O, SPOT, MIJI*

**MIJI reporting is used by some combat arms units. Follow local SOP on reporting formats*

Defense Advanced GPS Receiver (DAGR) Basics

- **Frequencies:**
  - ✓ L1/L2 dual frequency tracking
    - ▪ L1 – military and civilian receivers
    - ▪ L2 – military only
- **Codes:**
  - ✓ C/A and P(Y)
    - ✓ C/A – L1; unencrypted; military and civilian receivers
    - ✓ P(Y) – L1; encrypted; military only
    - ✓ P(Y) – L2; encrypted; military only
- **Encrypted DAGR is less susceptible to jamming and is more accurate**
  - ✓ Selective Availability Anti-Spoofing Module (SAASM) security enabled
- **Unclassified-when-keyed operation**
  - ✓ A keyed DAGR is not automatically classified when encrypted!
    - ▪ DAGR becomes classified when mission data/classified waypoints are stored
    - ▪ Can store up to 999 waypoints

Limitations:

- Need to be in line of sight of four (4) satellites minimum
- Multi-Path Interference – although more resistant than civilian receivers
- Datums and Grid Reference – more than 230 Datums available so coordination of common reference is critical
- Low signal strength – receiver is susceptible to jamming

Acquisition time of GPS signal: 10 – 100 seconds

GPS Time Accuracy: 52 nanoseconds (individual satellite)

Defense Advanced GPS Receiver (DAGR) Preparation

1. Load DAGR with current crypto <u>PRIOR TO MISSION</u>

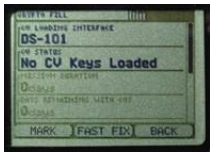
- ✓ *Requires a special fill cable (NSN 5995-01-521-3185)*
- ✓ **Do not** connect the crypto key fill cable to the fill device until instructed by these procedures

a. Power DAGR on

b. Push “menu” twice to access main menu

c. Select “Receiver Setup,” push “enter”

d. Select “Crypto Fill,” push “enter” - *Crypto Fill page is displayed*

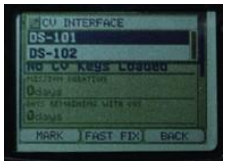


e. Push “enter” to highlight a field

f. Using arrows. select “CV Loading Interface,” push “enter”

g. Select “DS-101,” push “enter”

h. Connect crypto key fill cable to the J1 connector located on the back of the DAGR



i. Prepare Simple Key Loader (SKL) to transfer COMSEC (*see next page*) - *When completed preparing SKL return to this page and continue with Step “j”*

j. Once “Ready to Send Key” screen displays on the SKL continue to load DAGR

k. Connect fill device (SKL) to the crypto key fill cable

l. Press “OK” on the SKL “Ready to Send” Screen

m. Acknowledge any DAGR messages and observe the “CV Status” field on the Crypto Fill page

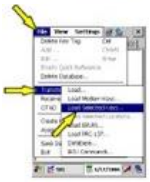
n. After key is loaded, disconnect crypto key fill cable from both devices

Defense Advanced GPS Receiver (DAGR) Preparation

2. Prepare Simple Key Loader (SKL) for COMSEC Transfer

- Turn on SKL
- Enter user id and password in required fields, User Application Software (UAS)
- From main menu, select “Keys” tab
- From “Keys” tab, select key to load – short title
- From “Key Load Select Keys/Selected Keys” screen, select key(s) to load to target equipment
  - ✓ At least one key MUST be selected
- Use scroll bar on bottom of screen to view additional key information
  - ✓ Information includes: Short Title, Edition, Seg.No. (Segment Number), and Expires After.
- “Key Load Select Keys/Selected Keys” screen options
  - ✓ To deselect all keys, select “Deselect All”
  - ✓ To select all keys, select “Select All”
  - ✓ To continue after keys are selected, select “OK”
  - ✓ To cancel and return to the main menu, select “Ca
- After desired keys are selected, select “OK”
- From main menu, select

  “**File**” >> “**Transmit**” >> “**Load**”



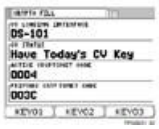
Defense Advanced GPS Receiver (DAGR) Preparation

2. Prepare Simple Key Loader (SKL) for COMSEC Transfer, cont.

- From “Key Load Settings” screen, select “OK”
- “Ready to Send Key” screen displays
  - ✓ Connect to Receive Equipment
  - ✓ Short Title
  - ✓ Edition
  - ✓ Segment
  - ✓ Text ID
  - ✓ Display for Every Key – when checked (default), the “Ready to Send Key” screen will be displayed for every key assigned

- Connect the fill device to the J1 connector on the back of the DAGR using the crypto key fill cable
- Press “OK” on SKL “Ready to Send Screen”

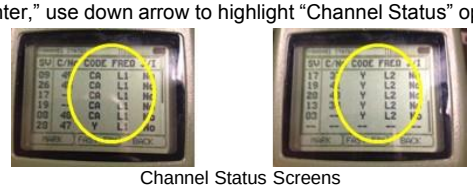
- Acknowledge any DAGR messages, observe the “CV Status” field on the “Crypto Fill page”
- After key is loaded, disconnect crypto key fill cable from the SKL and the DAGR



Defense Advanced GPS Receiver (DAGR) Preparation

3. DAGR Channel Status View To Check For Encryption

- Ensure DAGR is powered on
  - ✓ Push “menu” twice to access main menu
  - ✓ Use down arrow to highlight “Satellite option”
  - ✓ Push “enter,” use down arrow to highlight “Channel Status” option



Channel Status Screens

4.a. DAGR SET UP (MOUNTED) PREPARATION

- Ensure DAGR is powered on
  - ✓ Push “menu” twice to access main menu
  - ✓ Highlight “Receiver Setup,” push “enter”
  - ✓ Highlight “GPS Setup,” push “enter”
  - ✓ Use down arrow to highlight “Operating Mode”
  - ✓ Push “enter,” select “Continuous” as the operation mode, push “enter”
  - ✓ Use down arrow to highlight “Power-On Operating Mode”
  - ✓ Push “enter,” select “Continuous” as the On Operating Mode,” push “enter”

  - ✓ Use down arrow, highlight the Frequency
  - ✓ Push “enter,” select “L2 Primary,” push “enter”
  - ✓ Use “right” arrow, highlight “SV Code”
  - ✓ Push “enter,” select “All-Y” as the “SV Code,” push “enter”

Defense Advanced GPS Receiver (DAGR) Preparation

4.b. DAGR SET UP (DISMOUNTED – CONSERVE POWER)

- Ensure DAGR is powered on
  - ✓ Push “menu” twice to access the main menu
  - ✓ Highlight Receiver Setup, then push the enter key
  - ✓ Use the arrow down to highlight the “**Power Saver Mode”**
  - ✓ Push “enter,” highlights “Off Mode”
  - ✓ Push “enter,” use arrow up to select “Off” option
  - ✓ Arrow down, highlight “Auto Standby” mode, push “enter”
  - ✓ Push “enter,” use arrow up, select “Off” option
  - ✓ Push “enter,” use arrow down, highlight “Auto Standby Timer”
  - ✓ Use arrow keys to set correct time, push “enter” when complete
  - ✓ Use arrow down, highlight the “Off Mode Display Heater”
  - ✓ Push “enter,” use arrow up to select “Disabled” option
  - ✓ Push “enter”

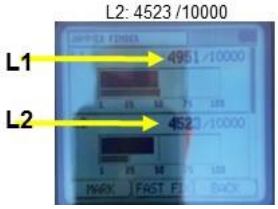
*Note – batteries may still rapidly drain but this configuration permits operations in a contested space operational environment

Defense Advanced GPS Receiver (DAGR) Preparation

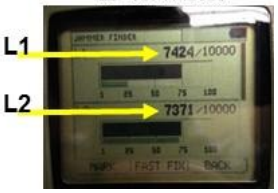
5. DAGR Jammer Finder

- Ensure DAGR is powered on
- Take a baseline reading using the DAGR Jammer Finder application **prior to departing the Forward Operating Base (FOB), and prior to SP/LD crossing** to use as a baseline for comparison if EMI (jamming) is encountered. If EMI is encountered:
  - ✓ Push “menu” twice to access main menu
  - ✓ Use arrow down, highlight “Applications” option
  - ✓ Push “enter,” arrow down, highlight “Jammer Finder” option
  - ✓ Push “enter,” *Jammer Finder screen will be displayed*
    - Signal Power reading of the received GPS signals is displayed
  - ✓ Use body masking technique (see page 42) to locate jammer
  - ✓ Use a compass to shoot an azimuth in the same direction of the highest signal reading
  - ✓ Add azimuth in SPOT report or report format directed in unit SOP

Baseline
L1: 4951 /10000
L2: 4523 /10000



Contested
L1: 7424 /10000
L2: 7371 /10000



Note: Values will vary based on location and proximity to jammer

Tactics, Techniques, and Procedures – Satellite Communications (SATCOM)

- Prior to employing communications equipment, ensure a copy of the Satellite Access Authority (SAA) is on hand, not just a "cut sheet"
- Familiarize yourself with unit reporting procedures
- Review Joint Spectrum Interference Resolution Reporting Format
- Know frequencies the equipment is operating on, as it affects reporting procedures
  - ✓ **Ultra High Frequency (UHF) (Narrowband Communications)** operate between 300 MHZ and 3 GHZ. Systems include the Mobile User Objective System (MUOS), and the UHF Follow On (UFO). Note: the Global Positioning System (GPS) signals are in the UHF portion of the spectrum and are susceptible to the same environmental impacts as any UHF system. UHF is more susceptible to ionospheric disturbances ("space weather") and is the least jam resistant of the SATCOM frequency bands to EMI
  - ✓ **Super High Frequency (SHF) (Wideband Communications)** operate between 3 GHZ and 30 GHZ. Systems include the Wideband Global SATCOM (WGS) and the Defense Satellite Communications System (DSCS)
  - ✓ **Extremely High Frequency (EHF) (Protected Communications)** operate between 30 GHZ to 300 GHZ. Systems include the Advanced EHF (AEHF) and MILSTAR. EHF is more susceptible to terrestrial weather and is the most jam resistant

Tactics, Techniques, and Procedures – Satellite Communications (SATCOM)

Procedures When Indications of EMI Are Present

- If still transmitting, continue to transmit and do not change frequency, power, or azimuth until directed to do so
- Follow the troubleshooting procedures for your specific equipment to verify there are no ground equipment issues
- If possible, verify there is no increase in space weather or no spacecraft malfunctions impacting your local region
- If working as part of a team, ensure there were no operator errors which caused problems with the communications
- If the previous steps did not resolve the issue, you must immediately report via a Joint Spectrum Interference Resolution (JSIR) Report in accordance with the following guidelines. (*Note: The JSIR preferred reporting method is via online on SIPR using the JSIR-Online (JSIR-O). ALWAYS FOLLOW UNIT SOP REPORTING PROCEDURES.)

  1. If you suspect this is an issue with your downlink, contact the local regional theater frequency manager and make your report
  2. If you are on a commercial satellite, contact the Network Operations Center (NOC) for the owner/operator or vendor and make your report
  3. If you are on a Wideband Communications system, contact your regional Wideband Satellite Operations Center (WSOC) and make your report

Tactics, Techniques, and Procedures – Satellite Communications (SATCOM)

Procedures When Indications of EMI Are Present, continued

4. If you are on a Protected Communications System, contact 4 Space Operations Squadron (4SOPS)
5. If 1 thru 4 do not apply, call 1-855-SATC0M1 (1-855-728-2061). This is an unofficial reporting mechanism and a means to request assistance. A response is normally received within 30 minutes to identify if this is actual interference. Select the appropriate prompt and make your report when connected:
   - For Wideband issues, select 1.
   - For Narrowband issues, select 2. You will be connected to the SMDC Global Narrowband Watch Officer.
   - For Protected issues, select 3.
   - For Commercial issues, select 4.
   - For Gateway issues, select 5. You will be connected to DISA.
   - For EMI issues, select 6.
   - For Site issues, select 7. You will select the appropriate Regional Satellite Communications Support Center (RSSC) from the next series of prompts.
6. Follow all directions provided by the office you contact
7. Document all guidance and outcomes in your local operational log
8. If you have not previously contacted your higher (TOC, HQ), ensure you make notifications as required by your unit SOP

Tactics, Techniques, and Procedures – Satellite Communications (SATCOM)

Long Haul:

P _____

A _____

C _____

E _____

Short Haul:

P _____

A _____

C _____

E _____

Iridium

Headquarters – to – Headquarters

P _____

A _____

C _____

E _____

SINCGARS

Sample: General Pace Plan (1st Squad/Communications)

Pre-Deployment / Deployment	**Unified Land Operations**	**Transfer of Authority / Recover in Place**
Phase 1 – Higher ***P*** BFT ***A*** TACSAT ***C*** Iridium ***E*** Cell Phones	Phase 2 – Higher ***P*** NIPR/SIPR VOIP ***A*** NIPR/SIPR E-MAIL ***C*** BFT ***E*** TACSAT	Phase 3 – Higher ***P*** BFT ***A*** FM ***C*** TACSAT ***E*** Cell Phones
Phase 1 – Lower ***P*** BFT ***A*** FM ***C*** Iridium ***E*** Cell Phones	Phase 2 – Lower ***P*** FM ***A*** BFT ***C*** Iridium ***E*** Cell Phones	Phase 3 – Lower ***P*** FM ***A*** BFT ***C*** Iridium ***E*** Cell Phones

Tactics, Techniques, and Procedures – Positioning, Navigation, and Timing

- **Encrypt DAGR to ensure protection against jamming**
  - ✓ While DAGRs will function with no encryption loaded in them, leaders must ensure that Soldiers are loading the proper encryption to allow the receiver the best chance of resisting EMI (jamming) activity – intentional and unintentional
  - ✓ Refer to pages 31-33 for details on loading your DAGR

- **To protect your Soldiers and your mission, use only military-grade receivers** (*DoDI 4650.08*)
  - ✓ Largely due to shortages in military-grade GPS receivers, the practice of using civilian GPS receivers in a combat environment, remains fairly common today
  - ✓ Individuals should not use civilian GPS receivers in a combat zone (or in training, for that matter)
    - Civilian GPS receivers only receive one frequency, do not support encryption and are not secure
    - Making matters worse, some civilian GPS receivers actually transmit a signal
    - An enemy can use the same model of receiver to monitor your channel and determine your location
  - ✓ The risk of endangering your Soldiers and your mission could very well outweigh any benefit gained from the additional situational awareness offered by using commercial receivers

Tactics, Techniques, and Procedures – Positioning, Navigation, and Timing

EMI Mitigation Strategy – Body Mass Shielding

- Use the human body to block radio waves by placing your body between the offending signal transmitter (e.g. jammer) and the receiver (e.g. DAGR)
- Effective shielding requires placing the receiver very close to body
- Rotate body slowly (approximately 90 degrees every two minutes) until receiver is no longer affected by the EMI. Results may be seen under two minutes
- Requires sufficient time for receiver to acquire or lose signal from each position tested, approximately two minutes
- Other materials suitable for shielding include metal, cement, brick, armored vehicles, rock or soil

Tactics, Techniques, and Procedures – Positioning, Navigation, and Timing

EMI Mitigation Strategy – Terrain Masking

- Use natural terrain features or create a barrier to block the offending signal
- For larger GPS enabled devices, such as a Stryker vehicle, use terrain such as a hill to block the EMI signal from reaching the receivers
  - ✓ Device needs to be close to the terrain feature in order to be effective, as natural wave propagation will reestablish the offending signal the further away from the feature you move
- Smaller devices, such as a DAGR, can be placed in a hole to block electromagnetic waves – METT-C permitting
  - ✓ The hole masks the jamming signal on the horizontal plane allowing the GPS signal to be received from the satellites
  - ✓ The hole should be six inches deep allowing sufficient view to the satellites
  - ✓ Requires sufficient time for the receiver to acquire the satellite signal, approximately two minutes

- Alternatively, any vehicle with a hatch can be a simulated “hole.” Open the hatch, place the device within the vehicle and with no obstruction to the sky. Accuracy may be impacted, but the vehicle skin will act as a shield to the offending signal.

NOTE: Do not obstruct the signal from the satellite to the receiver.

Tactics, Techniques, and Procedures – Navigation

Primary – Alternate – Contingency – Emergency (P.A.C.E.) Plan

Long Haul:

P _____

A _____

C _____

E _____

Short Haul:

P _____

A _____

C _____

E _____

Headquarters – to – Headquarters

P_____

A_____

C _____

E _____

JBC-P

Sample P.A.C.E.

P: *DAGR with COMSEC Loaded*

A: *FBCB2 (JBC-P or JBC-P LOG)*

C: *Map and Compass*

E: *Terrain Association (with and without map)*

DAGR

Tactics, Techniques, and Procedures – Joint Friendly Force Tracking (JFFT)

- **Prepare TOC and JBC-P (FBCB2) Vehicle Configuration for Contested Environment**
  - ✓ Icon refresh rates need to be modified
  - ✓ Refresh times are how long the icon stays a color before changing as the icon gets older.
  - ✓ Reducing refresh times allows leaders to recognize Jamming and Spoofing via the JBC-P (FBCB2)
  - ✓ Leaving the OLD ICON refresh time higher will allow the TOC to have the last known location of an affected unit
- **Technical Manual for JBC-P (FBCB2) recommends:**
  - ✓ STALE: 40 minutes
  - ✓ OLD: 8 hours
  - ✓ PURGE: 8 hours
- **Change refresh times as follows:**
  - ✓ STALE (changes from dark blue to light blue): 5-15 minutes
  - ✓ OLD (light blue to black): 1-2 hours
  - ✓ PURGED (icon removed): 8 hours (no change)
- **Technical Manual for JBC-P (FBCB2) recommends Situation Awareness (SA) position reports transmitted to an overhead asset as follows:**
  - ✓ Stationary unit: 5 minutes for stationary units
  - ✓ Mobile unit: 5 minutes or approximately every 100 meters of travel
- **Change SA update time to every 100 meters when GPS threat is known or possible**

Report Formats

ALL SUSPECTED ELECTROMAGNETIC INTERFERENCE MUST BE REPORTED!

- Unit SOP will dictate in what format the information is to reported to the Tactical Operations Center (TOC)
- Example:
  - ✓ Tactical unit submits a SPOT Report to the TOC
  - ✓ TOC submits to BDE/BN S6, S2 and Electronic Warfare for troubleshooting and intelligence request for information (RFI) process
  - ✓ S6 notifies theater/regional SATCOM support facility within 10 minutes of receiving the report
  - ✓ S2 or S6 submits a Joint Spectrum Interference Resolution Online (JSIR-O) Report
- Remember to FOLLOW YOUR UNIT SOP when selecting the reporting format you will use
- Sample Report Formats included in this reference:
  - ✓ Joint Spectrum Interference Resolution - Online (JSIR-O)
  - ✓ SPOT Report
  - ✓ Meaconing, Intrusion, Jamming, and Interface (MIJI)

Refer to FM 6-99, *U.S. Army Report and Message Formats*, August 2013, for additional Army reporting formats

Refer to CJCSM 3320.02D, *Joint Spectrum Interference Resolution (JSIR) Procedures*, 3 June 2013, for additional information on JSIR procedures

Joint Spectrum Interference Resolution (JSIR) Format

CLASSIFICATION* (TS/S/C/U) (when filled in)

WHEN STARTED, ZULU* _____

(Format must be a valid date in the spreadsheet "date format", e.g., 1/1/2010 not 012233ZJAN10)

AFFECTED SYSTEM*_____

AFFECTED FREQ MHZ** _____

(Format must be numeric, e.g., 1234.234 not M1234.234)

CHANNEL**_____

LOCATION OF AFFECTED RECEIVER*_____

COUNTRY OF AFFECTED RECEIVER_____

DESCRIPTION OF EMI EVENT_____

_____

(Include what it sounds like, actions taken so far, suspected cause, and other comments)

VICTIM POC NAME_____

VICTIM UNIT_____

COCOM/SERVICE/AGENCY_____

*Required item

**At least one of these items is required

MHZ: megahertz

Preferred method of submission is online via JSIR-Online (JSIR-O), http://intelshare.intelink.sgov.gov/sites/jsir/default.aspx

See CJCSM 3320.02C and D for additional information – submit report in accordance with local unit SOP. Classify report IAW system specific security classification guide

CLASSIFICATION* (TS/S/C/U) (when filled in)

SPOT Report

GENERAL INSTRUCTIONS: Use to report intelligence or status regarding events that could have an immediate and significant effect on current and future operations. This is the initial means for reporting troops in contact and event information. Reference: FM 3-20.98, FM 3-90.5, and FM 3-90.6.

LINE 1 – DATE AND TIME_____
(DTG)

LINE 2 – UNIT_____
(unit making report)

LINE 3 – SIZE _____
(size of detected element)

LINE 4 – ACTIVITY _____
(detected element activity at DTG of report)

LINE 5 – LOCATION _____
(UTM or grid coordinate with MGRS grid zone designator of detected element activity or event)

LINE 6 – UNIT _____
(detected element unit, organization, or facility)

LINE 7 – TIME _____
(DTG of observation)

LINE 8 – EQUIPMENT_____
(equipment of element observed)

LINE 9 – ASSESSMENT _____
(apparent reason or purpose of the activity observed)

LINE 10 – NARRATIVE _____
(free text for additional information required for report clarification)

LINE 11 – AUTHENTICATION_____
(report authentication)

DTG: date-time group
MGRS: military grid reference system
UTM: universal transverse mercator

Meaconing, Intrusion, Jamming, and Interface (MIJI) Report

GENERAL INSTRUCTIONS: Use to share MIJI incidents in a timely manner and to provide for joint exchange of tactical MIJI information including electro-optic interference.

LINE 1 – DATE AND TIME_____
(DTG)

LINE 2 – UNIT _____
(unit making report)

LINE 3 – INTERFERENCE _____
(strength and characteristics)

LINE 4 – LOCATION _____
(UTM or six-digit grid coordinate with MGRS grid zone designator of incident)

LINE 5 – ON TIME _____
(start DTG)

LINE 6 – OFF TIME _____
(end DTG)

LINE 7 – EFFECTS _____
(operations or equipment affected)

LINE 8 – FREQUENCY _____
(frequency or frequency range affected)

LINE 9 – NARRATIVE _____
(free text for additional information required for report clarification)

LINE 10 – AUTHENTICATION _____
(report authentication)

DTG: date-time group
MGRS: military grid reference system
UTM: universal transverse mercator

Available Space Education and Training

Army Space Cadre Basic Course (ASCBC)

ASCBC provides a fundamental understanding of space concepts and capabilities for members of the Army Space Cadre. This course is offered in residence and through mobile training teams.

The two-week ASCBC fulfills the education requirements for the Basic Space Badge, Level 1 Civilian Space Professional certification, and the education portion of the ASI/SI 3Y and the Personnel Development Skill Identifier "S1A" requirements.

ASCBC is in the Army Training Requirements and Resource System (ATRRS), school code "129," course number "2G-SI/ASI3Y/043-ASI3Y(MC)". Additional courses are available through the USASMDC/ ARSTRAT Directorate of Training and Doctrine. To review all available courses search school code "129" in ATRRS.

https://www.atrrs.army.mil/atrrs2.aspx

Introduction to Space

Offered by the US Air Force Advanced Space Operations School, the Introduction to Space course is a dynamic web-based familiarization course for all branches of service and government agencies. The course is designed for new space support personnel or those within the space community with little exposure to space operations. Additional courses are available.

Note: This course does NOT satisfy the education portion of the Personnel Development Skill Identifier "S1A" requirements.

To register, or for more information, visit:
https://www2.peterson.af.mil/nssi/CESET/asops/index.htm

Acronyms and Abbreviations

A	
AEHF	Advanced Extremely High Frequency
AJ	Anti Jam
APOD	Air Port of Debarkation
ARSST	Army Space Support Team
ASAT	Anti Satellite
ASCBC	Army Space Cadre Basic Course
ASI	Additional Skill Identifier
ASR	Alternate Supply Route
ASTS	Army Space Training Strategy
ATACM	Army Tactical Missile System
ATRRS	Army Training Requirements and Resource System
B	
BCS3	Battle Command Sustainment Support System
BCT	Brigade Combat Team
BDA	Battle Damage Assessment
BDE	Brigade
BFT	Blue Force Tracking
BGN	Blue Force Tracking (BFT) Global Network
BN	Battalion
C	
C	Confidential
C/A	Coarse/Acquisition
C2	Command and Control
CAN	Computer Network Attack
CCDR	Combatant Commander
CJCSI	Chairman, Joint Chiefs of Staff Instruction

Acronyms and Abbreviations

C	
CJCSM	Chairman, Joint Chiefs of Staff Manual
CNA	Computer Network Attack
CND	Computer Network Defense
CNO	Computer Network Operation
COCOM	Combatant Command
Comms	Communications
COMSEC	Communications Security
COP	Common Operational Picture
COTM	Communications on the Move
CPOF	Command Post of the Future
CSS	Combat Service Support
CTC	Combat Training Center
CV	Crypto variable
D	
D3SOE	Denied Degraded Disrupted Space Operating Environment
d=v*t	distance = velocity x time
DAGR	Defense Advanced GPS Receiver
DAMA	Demand Assigned Multiple Access
DISN	Defense Information Systems Network
DoD	Department of Defense
DoDD	Department of Defense Directive
DOG	Data Owner Guidance
DSCS	Defense Satellite Communications System
DTG	Date Time Group
E	
e.g.	example given
EEFI	Essential Elements of Friendly Information

Acronyms and Abbreviations

E	
EHF	Extremely High Frequency
e-mail	electronic mail
EMP	Electromagnetic Pulse
EO	Electro-optical
etc.	et cetera
EVWHS	Enhanced View Web Hosting Service
F	
FA	Functional Area
FA40	Functional Area - Space Operations
FBCB2	Force XXI Battle Command, Brigade-and-Below
FFT	Friendly Force Tracker
FM	Frequency Modulation
FOB	Forward Operating Base
FREQ	Frequency Modulation
G	
GBS	Global Broadcast Service
GEO	Geosynchronous Orbit
GHZ (GHz)	Gigahertz
GIG	Global Information Grid
GPS	Global Positioning System
H	
HEO	Highly-inclined Elliptical Orbit
HF	High Frequency
HFMP	High Frequency Manpack
HLZ	Helicopter Landing Zone
HQ	Headquarters
Hz	Hertz

Acronyms and Abbreviations

I	
IAW	In Accordance With
IBS	Integrated Broadcast Service
ID	identification
INS	Inertial Navigation System
IR	Infrared
ISR	Intelligence, Surveillance, and Reconnaissance
J	
JBC-LOG	Joint Battle Command – Logistics
JBC-P	Joint Battle Command – Platform
JDAM	Joint Direct Attack Munition
JFFT	Joint Friendly Force Tracking
JNN	Joint Network Node
JPADS	Joint Precision Aerial Delivery System
JSIR	Joint Spectrum Interference Resolution
JSIR-O	Joint Spectrum Interference Resolution - Online
K	
L	
LD	Line of Departure
LEO	Low Earth Orbit
LOG	Logistics
LOS	Line of sight
LPD	Low Probability of Detection
LPI	Low Probability of Intercept
LWIR	Long Wave Infrared

Acronyms and Abbreviations

M	
m	meter
MCS-L	Maneuver Control System - Light
MEO	Medium Earth Orbit
METT-C	Mission, Enemy, Time, Terrain, Civilians
MGRS	Military Grid Reference System
MHZ (MHz)	Megahertz
MIJI	Meaconing, Intrusion, Jamming, and Interface (MIJI)
MILSTAR	Military Strategic Tactical Relay
MMC	Mission Management Center
MSR	Main Supply Route
MTS	Movement Tracking System
MUOS	Mobile User Objective System
N	
NAI	Named Area of Interest
Nav/Acc	Navigation Accuracy
NIPR	Nonsecure Internet Protocol Router
NOC	Network Operations Center
O	
OPIR	Overhead Persistent Infrared
OPTEMPO	Operating/Operations Tempo
P	
P(Y)	Precision Code (encrypted)
PDSI	Personnel Development Skill Identifier
PLI	precise location information
PNT	Position, Navigation, and Timing
Q	

Acronyms and Abbreviations

R	
RADAR	Radio Detection and Ranging
RFI	Radio Frequency Interference
ROYGBIV	Red-Orange-Yellow-Green-Blue-Indigo-Violet (visible spectrum)
RSSC	Regional Satellite Support Center
RV	Reentry Vehicle
S	
S	Secret
S/C	Satellite Control
S/G2	Staff - Intelligence
S/G3	Staff - Operations
S/G4	Staff - Logistics
S/G6	Staff - Signal (Communications)
SAA	Satellite Access Authority
SAASM	Selective Availability Anti-Spoofing Module
SAR	Synthetic Aperture RADAR
SATCOM	Satellite Communications
SATRAN	Satellite Advanced Notice
SBIRS	Space Based Infrared System
SCAMP	Single Channel Anti-jam Man-Portable terminal
Seg. No.	Segment number
SHF	Super High Frequency
SI	Skill Identifier
SIPR	Secure Internet Protocol Router
SKL	Simple Key Loader
SMART-T	Secure Mobile Anti-Jam Reliable Tactical Terminal
SOP	Standard Operating Procedure

Acronyms and Abbreviations

	S
SOPS	Space Operations Squadron
SP	start point
SPOD	Sea Port of Debarkation
SSE	Space Support Element
STT	Satellite Tactical Terminal
SWIR	Short Wave Infrared
	T
TACSAT	Tactical Satellite (communications)
TES	Theater Event System
TMD	Theater Missile Defense
TOC	Tactical Operations Center
TREX	Training, Readiness, and Exercise
TS	Top Secret
TTP	Tactics, Techniques, and Procedures
	U
U	Unclassified
UAS	Unmanned Aircraft System
UAS	User Application Software
UFO	UHF Follow On
UHF	Ultra High Frequency
USASMDC/ ARSTRAT	United States Army Space and Missile Defense Command/Army Forces Strategic Command
USG	United States Government
UTM	Universal Transverse Mercator
	V
VOIP	Voice Over Internet Protocol

Acronyms and Abbreviations

W	
WfF	Warfighter function
WGS	Wideband Global SATCOM
WGS-84	World Geodetic System 1984
WIN-T	Warfighter Information Network-Tactical
WSOC	Wideband Satellite Operations Center
X	
Y	
Z	
ZULU	Universal Time (UT1)
Miscellaneous	
3D	3 dimensional

References

- Army Space Training Strategy 2013
- ATP 3-20.98, *Reconnaissance Platoon*, April 2013 (supersedes FM 3-20.98)
- CJCSM 3320.02C, *Joint Spectrum Interference Resolution (JSIR) Procedures*, 27 January 2006
- CJCSM 3320.02D, *Joint Spectrum Interference Resolution (JSIR) Procedures*, 3 June 2013
- *Defense Advanced GPS Receiver (DAGR) Satellite Signals Navigation Set*, Change 1 01 June 2005 (supersedes 01 March 2005)
- DoDD 3100.10, *Space Policy*, 18 October 2012
- DoDI 4650.08, *Positioning, Navigation, and Timing (PNT) and Navigation Warfare (Navwar)*, February 5, 2015
- FM 3-14, *Army Space Operations*, 19 August 2014
- FM 3-90.5, The Combined Arms Battalion, April 2008
- FM 6-99, *U.S. Army Report and Message Formats*, August 2013
- JP 3-14, *Space Operations*, 29 May 2013

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