

# AEROSPACE COMMUNICATION OPPORTUNITY & CHALLENGES

# MILITARY & AEROSPACE COMMUNICATION

- **SATELLITE COMMUNICATION A STRATEGIC ASSET FOR GLOBAL REACH**
- **RAPID DEPLOYMENT AND RELOCATION**
- **MODERN SATELLITE COMMUNICATION CAPABLE OF SUPPORTING HIGH BANDWIDTH SERVICES**
- **IDEAL FOR OUT OF AREA CONTINGENCIES**
- **EXTENSIVELY USED FOR AIR DEFENSE OPS**
- **HADR – OP MAITRI**

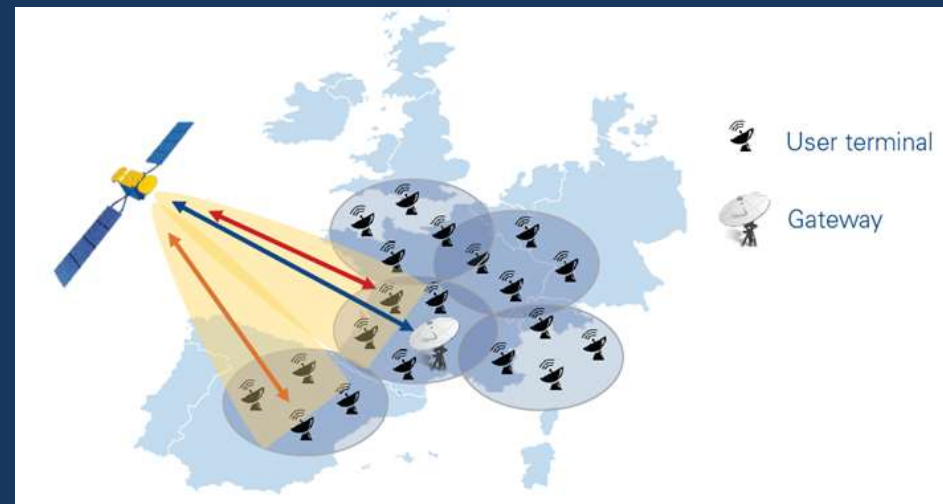
# OPPORTUNITIES

# LEO CONSTELLATION

- INCREASINGLY BEING HARNESSSED – ESPECIALLY BY PRIVATE ENTITIES, VIZ. STARLINK, AIRTEL ONEWEB
- **SATELLITE CONSTELLATIONS BEING DEPLOYED IN LEO**
- EXPECTED DOWNLINK SPEED OF 500 MBPS & UPLINK SPEED OF 40 MBPS
- **LOW LATENCY OF 40 MS**
- PROVIDE GLOBAL COVERAGE
- **JAM RESISTANT AS CONSTELLATION AVAILABLE**
- COMPLEXITY AND COST

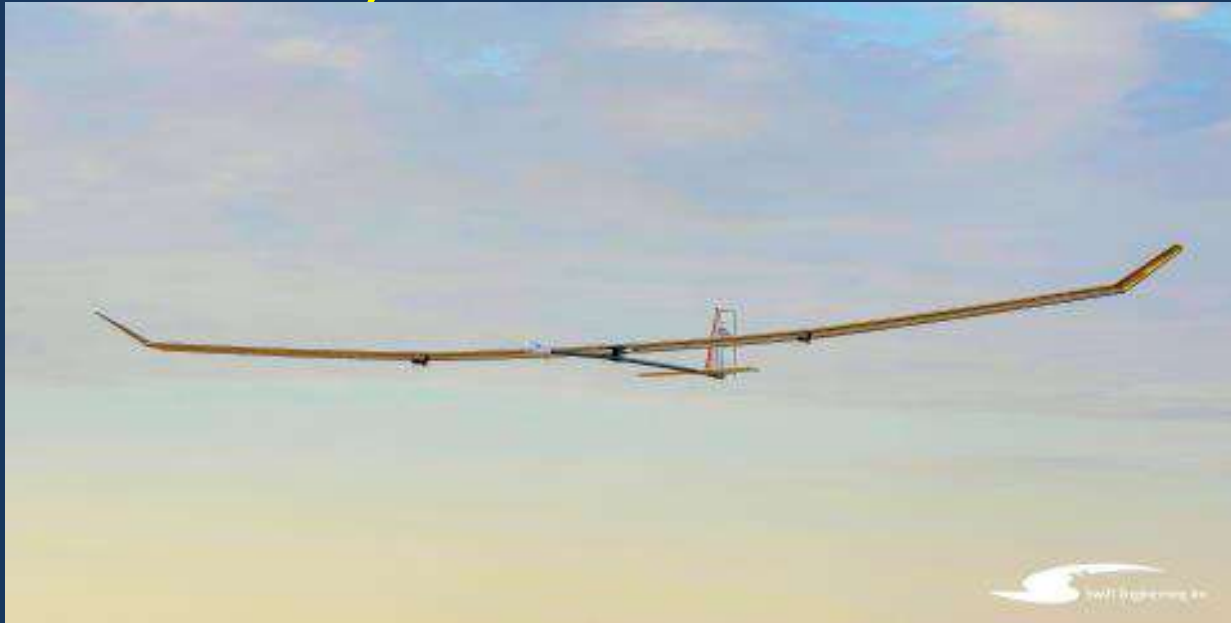
# HIGH THROUGHPUT SATELLITES

- PROVIDES MORE THROUGHPUT BY A FACTOR OF TWO TO 100 (SPECTRAL EFFICIENCY). VIASAT CAPACITY 140 Gbps
- **TARGETED SPOT BEAMS**
- FREQUENCY REUSE
- **NARROW BEAMS MAKE JAMMING DIFFICULT**
- **GSAT 19 AND GSAT 29**



# HIGH ALTITUDE LONG RANGE UAV

- LONG RANGE UAVS AS MICROWAVE REPEATER LIKE SATELLITE
- **ADVANTAGE OF LOW LATENCY**
- HALE OPERATES ABOVE 60,000 FEET (STRATOSPHERE)
- **ZEPHYR: ON STATION TIME OF 25 DAYS (HIGH ALTITUDE PSEUDO SATELLITE)**



# HIGH ALTITUDE PLATFORM STATION

- PLACED BETWEEN 20 TO 50 KM (ITU DEFINITION)
- **LOW ALTITUDE: LOW LATENCY**
- LOW COST: RECOVERABLE
- **COVERAGE: 400KM (THEATRE OF OPERATIONS)**
- HIGH DATA RATES: LIKE WI-MAX
- **DISASTER RELIEF**

# QUANTUM SATELLITES

- PROOF OF CONCEPT BY CHINA UNDER MISSION QUESS YEAR 2017 (JIAN WEI PAN – SATELLITE MICIUS)
- FIRST SPACE BASED LONG DISTANCE SUCCESSFUL DEMONSTRATION OF QUANTUM OPTICS
- OPENED GATES TO QUANTUM ENCRYPTION
- QUANTUM KEY DISTRIBUTION ACHIEVED OVER 4200 KM
- ISRO DEMONSTRATED THE FIRST FREE SPACE QUANTUM SECURE VIDEO CONFERENCING ON 19 MAR 21
- ON 27 JAN 22, ISRO DEMONSTRATED QUANTUM KEY DISTRIBUTION SYSTEM

# CHALLENGES

# VULNERABILITIES IN SATELLITE COMMUNICATION

- **CONCERN:** SATCOM EQPT REPORTED TO HAVE INSECURE TECHNOLOGIES VIZ HARDCODED CREDENTIALS, INSECURE PROTOCOLS, UNDOCUMENTED PROTOCOLS ETC
- **POSSIBILITIES:** COMPROMISE OF COMPLETE SATCOM NETWORK EXISTS IF ENEMIES GET PHYSICAL ACCESS TO OUR TERMINALS
- **SOLUTION:** MAKE IN INDIA PRODUCTS, DEVELOPING IN HOUSE CAPABILITY TO CONDUCT VULNERABILITY ASSESSMENT OF SATCOM EQPT

# SATCOM: PRONE TO JAMMING

- **CONCERN:** GEO-TRACKING OF ROGUE (ATTACKER'S) SATELLITE TERMINALS
- **POSSIBILITIES:** IN CASE OF INTRUSION INTO SATCOM NETWORK BY ENEMY STATES/ ROGUE TERMINALS, TRACING/ TRACKING THEM POSES DIFFICULTY
- **SOLUTION:** SATCOM BASED TRIANGULATION TECHNOLOGY WITH AUTOMATIC MAP UPDATION FEATURE – SPECTRUM MONITORING AND GEOLOCATION SYSTEMS

# SPACE SITUATIONAL AWARENESS

- DETECT SPACE OBJECTS, DETERMINE INTENT & IDENTIFY POTENTIAL HIGH-RISK CONJUNCTIONS
- **ESSENTIAL FOR PROTECTING & DEFENDING SPACE BASED ASSETS, REGULATE SPECTRUM, DECONFLICT SPACE TRAFFIC**
- MONITORING OF LOCAL RF ENVIRONMENT NEAR GROUND STATIONS
- **ANALYSIS OF PARAMETERS OF THE SATELLITES**
- DETECT MANEUVERS AND ANOMALIES 24 X 7 IN ALL WEATHER
- **MONITORING OF LINKS & ANALYSIS OF DEGRADATION**
- PROFILING SATELLITE ASSETS

# FUTURE TECHNOLOGIES FOR IAF

- HIGH THROUGHPUT SATELLITES
- ONBOARD ANTI JAMMING FACILITY
- ASAT CAPABILITIES
- SOFTWARE DEFINED SATCOM NETWORK
  - TRANSMITTING WITH SINGLE-HOP EFFICIENCY
  - FLEXIBILITY OF FITTING ALL TOPOLOGIES
  - SIMPLIFIED LOGISTICS- ONE ROUTER DOES ALL FUNCTIONS
  - LOW COST OF OWNERSHIP
  - HIGHER EFFICIENCY AND PERFORMANCE FOR TRAFFIC CARRIERS

**JAI HIND**