I-S-R

Lessons of Iraq

Defense News ISR Integration Conference

Loren B. Thompson, Ph.D.
Chief Operating Officer / Lexington Institute
Adjunct Professor of Emerging Technology / Georgetown University

November 18, 2003

Hard to See Lessons Clearly

- **The war isn't over.**

  - Conventional phase seemed fast & decisive
  - Unconventional phase looks slow & difficult
  - ISR needs vary greatly between phases

- **Many of the most significant lessons are secret.**

  - ISR capabilities tend to be classified
  - U.S. not interested in advertising shortfalls to terrorists
  - Bush Adm. less open than predecessors

- **Review process distorted by transformation bias.**

  - Exaggerates role of jointness & special ops
  - Neglects traditional virtues like air superiority
  - Some recent setbacks traceable to subjective analysis

- **Lessons will look a lot different if America loses.**

Pentagon's First Look at Iraq

- In August, Joint Forces Command completed a "quick look" at lessons of the Iraq campaign.

FIRST-TIER ISSUES		
"Capabilities that reached new levels of performance"	"Capabilities that demonstrated effectiveness but need enhancement"	"Capabilities that fell short of expectations or needs"
1. Joint integration/ adaptive planning 2. Joint force synergy 3. Special ops/ conventional integration	1. Urban operations 2. Psychological operations 3. Intelligence, surveillance & reconnaissance	1. Fratricide prevention 2. Deployment planning & execution 3. Reserve mobilization

- Second-tier issues: joint fires, time-sensitive targeting, training, overmatching strike, theater logistics, media integration, inter-agency involvement.

- Five classified findings not disclosed.

The Conventional Enemy

- **Recent U.S. adversaries have been weak & incompetent.**
  - **Noriega (1990)**
  - **Saddam (1991)**
  - **Milosevic (1999)**
  - **Taliban (2001)**

- **Iraqi conventional forces were no exception in 2003.**
  - **Failed to preempt allied buildup in Kuwait**
  - **Failed to torch oilfields**
  - **Failed to blow up dams & bridges**
  - **Failed to get any aircraft into the sky**
  - **Failed to disrupt extended supply lines**
  - **Failed to employ weapons of mass destruction**
  - **Failed to exploit absence of northern front**
  - **Failed to leverage entrenched urban defenses**

- **Combination of an inept enemy with favorable terrain, nearby allies and 12 years of intensive U.S. reconnaissance makes any "lessons" suspect.**

The Unconventional Enemy

- **Since conventional combat ended, U.S. forces have faced growing guerrilla resistance.**
  - **Attacks up 500% in five months (6 per day to 30)**
  - **Increasingly diverse & deadly**
  - **5,000 insurgents operating mostly in Sunni triangle**

- **Enemy consists mainly of Baathist sympathizers.**
  - **Former Republican Guard & security services**
  - **Some foreign elements, especially in suicide attacks outside triangle (Hamas, Hezbollah, Qaeda)**

- **Loosely coordinated campaign aims to prevent consolidation of U.S. control.**
  - **Kill or coerce collaborators**
  - **Discourage broader foreign presence**
  - **Influence U.S. election cycle**

- **To date, lessons from fighting insurgents mostly negative.**

Integration of Space Capabilities

- **Iraq campaign has seen unprecedented integration of space systems with other ISR assets.**
  - "Space tasking order" appended to daily ATO
  - Heavy use of national assets to support tactical ops

- **All five types of orbital constellation played important roles in supporting or exploiting ISR efforts.**
  - Intelligence collection
  - Communications
  - Early warning
  - Navigation
  - Meteorological

- **Barriers to sharing information eroding rapidly.**
  - Strategic/tactical distinction gone
  - National/joint/organic distinctions fading

- **Impressive progress in fusing information from space sensors with other sources to provide timely knowledge.**

Space-Based Communications

- **Viability of emerging ISR architecture depends on high-capacity, secure communications via orbital relays.**

- **Four DSCS satellites dedicated to support of Iraq campaign.**
  - **80% of military space traffic generated by Iraq ops**
  - **45% of in-theater wideband communications**

- **But the real star in supporting/exploiting ISR was Milstar II -- high data rate, antijam, encrypted & 100% available.**
  - **Transmission of NRO/CIA processed intel to theater**
  - **Remote tasking of Global Hawk**
  - **Critical comms support of special operations**
  - **Rapid retargeting of Tomahawk missiles**

- **Milstar II space crosslinks facilitate secure comms & increased data rate allows transmission of ATO in six seconds (versus one hour on Milstar I).**

- **Advanced EHF satellite will provide 500% more capacity, 600% greater terminal coverage & similar security features.**

Space-Based SIGINT

- **GEO & other orbital platforms played key role in collecting electronic intelligence before & during Iraq campaign.**

- **NRO & NSA have been struggling since 1990s to maintain an adequate space-based SIGINT architecture.**
  - **Changing collection requirements**
  - **Launch delays & failures**
  - **Spacecraft design deficiencies**

- **Space-based SIGINT collectors are losing ground as adversary assets evolve & diversify.**
  - **Terrestrial fiber**
  - **Packet switching**
  - **Encryption software**

- **Orbital collectors still capture open emitters (radar, radio, satellite phones, etc.).**

- **But faster migration to terrestrial & unmanned aerial collectors needed to slow erosion in SIGINT performance.**

Space-Based Imagery

- **NRO & NIMA used six imagery satellites before & during the Iraqi campaign.**
  - **Three "Advanced KH-11" spacecraft with daytime optical & night-time infrared cameras**
  - **Three "Lacrosse" (or "Onyx") spacecraft with all-weather radar imaging capabilities**

- **Current constellations have major deficiencies in meeting emerging imagery needs.**
  - **Out of range >90% of the time**
  - **Very infrequent revisit rates**
  - **Poor resolution at night & in inclement weather**
  - **Some spacecraft have exceeded design life**

- **Commercial imagery satellites lack timeliness & resolution to provide useful tactical imagery (unless tasked in advance).**

- **Future Imagery Architecture will address some issues (like revisit rates) but schedule & performance of space segment slipping.**
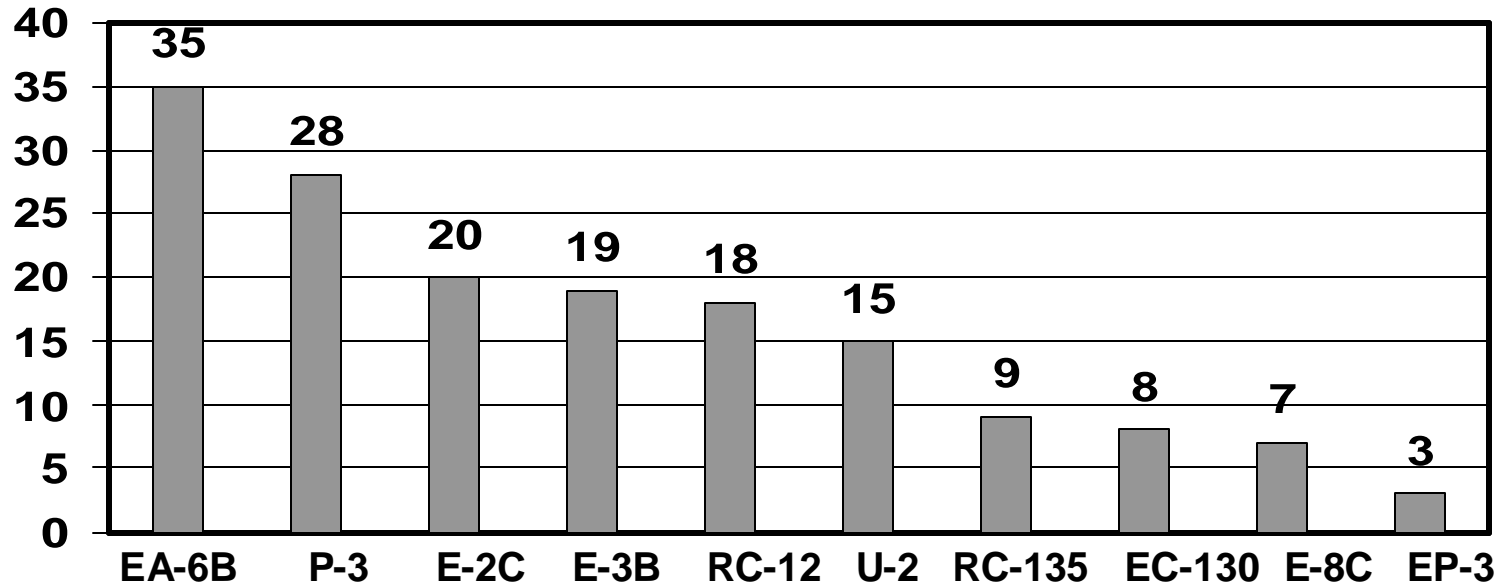
Space-Based Early Warning

- **Defense Support Program geosynchronous satellites & other spacecraft provided continuous warning of launches & explosions during campaign.**

    - **26 missile launches detected**
    - **186 high-explosive events**
    - **1,493 "static IR events"**

- **Early application of technology developed for SBIRS-High replacement of DSP supported better battlespace characterization.**

    - **Faster warnings due to improved system integration**
    - **Greater precision due to fusion with data from other collectors**
    - **Previously undetectable ordnance added to database**

- **First step in effort to fully integrate missile warning mission with other ISR functions.**

- **SBIRS-High program delays depriving operators of critical information concerning enemy moves.**

Emerging Space Lessons

- **Space integration with other joint-force capabilities is progressing rapidly.**
  - Warfighters have unprecedented access to orbital ISR
  - Growing dependence on space could be critical vulnerability in network-centric warfare

- **SATCOM's provide unmatched leverage for fast & reliable transmission of ISR information.**
  - Ground forces may have over-invested in terrestrial communication networks
  - Proliferation of mobile terminals such as Milstar SMART-T essential to Army, Marines & special forces

- **Space may be optimum vantage point for early warning, but it has severe limitations in collecting SIGINT & imagery.**
  - More emphasis on air-breathing & surface collectors seems inevitable
  - Cost of space systems hard to justify given diminishing results

Electronic Aircraft in Iraq (3/19-4/18)

Bar chart showing electronic aircraft counts:
- EA-6B: 35
- P-3: 28
- E-2C: 20
- E-3B: 19
- RC-12: 18
- U-2: 15
- RC-135: 9
- EC-130: 8
- E-8C: 7
- EP-3: 3

- **39 U.S. unmanned aerial vehicles (16 Predator, 16 Pioneer, 6 Hunter, 1 Global Hawk).**

- **About 3,200 coalition electronic sorties (not counting jamming).**
  - **1,656 ISR / 1,601 command & control**
  - **42,000 battlefield images generated**
  - **2,400 hours of SIGINT coverage**
  - **1,700 hours of moving-target coverage**

ISR Integrated Operational Picture

- **Integration of all ISR to generate a "common operating picture" for joint force a key goal of network-centric warfare.**
  - **All orbital/air-breathing terrestrial collectors**
  - **Fused & available to all joint-component commanders**

- **Iraqi campaign suggests integrated picture nearly here.**

- **Theater Battle Management Core Systems provides Joint Force Air & Space Component Commander (JFACC) with powerful ISR integration tool for air campaigns.**
  - **Automated & web-enabled**
  - **40 applications & 500 functional segments (6M lines of code)**
  - **All phases of command & control: monitoring/assessment/ planning/execution**

- **Already operational at 20 Air Operations Centers worldwide & 300 other sites (including Navy carriers).**

- **Continuously evolving via spiral development.**

Air Dominance: Missing Lesson

- **Much of the critical ISR during spring campaign in Iraq was generated by air-breathing systems.**
  - **JSTARS & AWACS**
  - **Global Hawk & U-2**
  - **RC-135 & EP-3**

- **The most neglected lesson of the campaign is how critical air dominance was to every facet of military success.**
  - **Destruction of enemy fighters & missiles**
  - **Suppression of enemy sensors**
  - **Dis-integration of enemy communications**

- **Without early air dominance, many ISR systems could not have been used to optimal effect.**
  - **Vulnerable manned aircraft like JSTARS & EP-3 operated deep in Iraqi airspace**
  - **Aerial refueling tankers penetrated to support ISR**
  - **Unmanned vehicles nearly defenseless if attacked**

Role of Unmanned Vehicles Growing

- **Unmanned aerial vehicles (UAV's) are claiming a bigger role in ISR collection & exploitation.**
  - **39 U.S. & 4 U.K. vehicles deployed in spring campaign**
  - **First time 4 Predators flew simultaneously in combat**

- **Heavy use of Global Hawk underscores trend toward larger, more capable UAV's.**
  - **Single prototype flew 357 hours & produced 4,800 images**
  - **55% of all time-sensitive-target imagery**
  - **Significantly shortened kill-chain**

- **Large payload includes synthetic aperture radar, electro-optical camera & 3rd-generation infrared sensor.**
  - **3 times the persistence of manned aircraft**
  - **Reachback enables remote piloting from U.S.**

- **Minimal analysis prior to posting & extensive use of secure chatrooms seemed to validate Task-Post-Process-Use (TPPU).**

Unmanned Vehicles Have Limitations

- **Growing role of UAV's has created widespread misconception that manned aircraft are obsolete in ISR.**

- **UAV's offer more endurance & less risk than manned aircraft, but in most respects they are inferior.**

  - **Vulnerable vehicles require weak enemy**
  - **Small payload constrains productivity**
  - **Limited flexibility/versatility**
  - **Unclear cost advantage given high attrition rate**

- **Heavy use of U-2 reconnaissance planes in Iraq reflects continuing advantages of manned aircraft in ISR.**

  - **15 of 34 U-2's deployed to theater**
  - **First time six U-2's flew in same ATO**
  - **169 sorties totaling 1,400 hrs. (average duration 8 hrs.)**

- **U-2 has much bigger payload than any UAV -- multiple imagery systems plus SIGINT collection.**

Manned SIGINT Aircraft Vital

- **U.S. forces deployed over 40 aircraft capable of collecting signals intelligence during the spring campaign.**
  - **18 Army RC-12 Guardrail**
  - **15 USAF U-2**
  - **9 USAF RC-135 Rivet Joint**
  - **3 Navy EP-3**

- **Additional SIGINT provided by NSA orbital & surface sensors and dozens of tactical collectors.**
  - **Monitoring of military communications**
  - **Targeting of air defenses & missile launchers**
  - **Localization of leadership elements**

- **Unprecedented integration of national assets & personnel with tactical operations (NSA cell in air operations center).**

- **Improved datalinks & conops enabled cross-cueing, fusion of orbital/airborne/ground sensors -- leading to greater precision & timeliness of intelligence.**

Joint STARS a Core ISR Asset

- **Spring campaign was biggest-ever deployment of Joint Surveillance & Target Attack Radar System (JSTARS).**
  - **Nine of 15 aircraft in USAF inventory**
  - **191 flights with >3,000 hours on-station**
  - **30,000 synthetic aperture radar images generated**

- **Extremely valuable in generating ground-moving-target intelligence day or night, in any weather.**

- **JSTARS rapidly evolving from Cold War C2 role.**
  - **Users beginning to grasp full potential**
  - **Datalinks like Link-16 enhance timeliness**
  - **Task/Post/Process/Use enhances relevance**
  - **Fusion with other sources & sensor types advancing**

- **But optimization of JSTARS requires system upgrades.**
  - **Blue-force tracking to distinguish friends from enemies**
  - **Direct datalink with Global Hawk for cross-cueing**

Orion A Surprise Star in ISR

- **During Iraq campaign, P-3 maritime surveillance plane was surprisingly useful in supporting ground forces.**
  - Imagery collection & on-board analysis for special forces
  - Blue-force tracking
  - Route reconnaissance & assessment of nearby enemy

- **1st Marines lessons-learned said P-3 AIP variant "was of immense utility for the collection of intelligence in the immediate fight for the maneuver elements."**
  - 28 P-3's deployed to theater
  - 3 additional EP-3 for SIGINT

- **However, Navy leadership removing P-3 from overland missions in hostile airspace due to survivability concerns.**
  - Overland surveillance moves to Global Hawk
  - P-3 reverts to antisubmarine warfare
  - EP-3 SIGINT role absorbed in Army Aerial Common Sensor

Emerging Air-Breathing Lessons

- **Airborne collection & processing of ISR becoming more valuable as digital datalinks & improved conops facilitates multisource fusion.**

- **However, ISR fleet is full of high-demand/low-density assets.**
  - **Airframes are aging rapidly**
  - **Regional commanders (outside CENTCOM) complaining about coverage gaps**

- **UAV's are increasingly important, but their payloads & versatility are generally inferior to manned aircraft.**

- **Penetration of manned & unmanned collectors alike depends on U.S. air dominance.**

- **Need for battlespace flexibility raises doubts about wisdom of concentrating multiple ISR missions on one airframe.**

Ground Truth: Army

- **Third Infantry Division lessons-learned found that newly-deployed ISR systems often performed well.**
  - Quick Reaction System for exploiting national-level imagery a "critical resource"
  - Automated Deep Operations Coordination System (ADOCS) "an invaluable tool for situational awareness and quick analysis"

- **However, 3rd ID saw numerous shortfalls in its organic ISR and access to joint/national assets.**
  - Comms can't support fast & fluid ops over long distances
  - Divisions need organic collection & processing capacity rather than relying on echelons above division
  - Divisions need tactical SIGINT systems that can collect & jam across the spectrum
  - "Divisions must have UAV's at division and brigade level to provide near-real time imagery & targeting"
  - Human intelligence for coping with unconventional enemies deficient

Ground Truth: Marines

- **First Marine Division lessons-learned acknowledges big gains in ISR timeliness, precision & access.**
  - Intelligence units "could not have achieved their mission" without Trojan Spirit -- "a godsend"
  - JSTARS common ground station had "tremendous positive effect for integrating information into a comprehensive intelligence picture"
- **But Marines highly critical of ISR shortfalls.**
  - "After crossing the line of departure, the division received very little actionable intelligence from external intelligence organizations"
  - "Intelligence sections at all levels were inundated with information … that had little bearing on their missions"
  - "The existing hierarchical collections architecture, particularly for imagery, is wildly impractical"
  - Solution: procure family of tactical intelligence collections platforms (ground & air) and decentralize collection

The Bottom Line

- **No doubt about it -- ISR is in the midst of a revolution.**

  – **Unprecedented richness (sensors)**
  – **Unprecedented reach (connectivity)**
  – **Unprecedented relevance (not just information, knowledge)**

- **But the fog of war is lifting slowly & unevenly.**

  – **Iraq operation looks more transitional than transformational**
  – **System not yet truly integrated or user-friendly**

- **Iraq experience validates Cebrowski view that networked warfare isn't just about technology.**

  – **New technology is an enabler**
  – **Conops & organization make the revolution real**

- **Emerging ISR system well-suited to defeating conventional adversaries -- what about unconventional ones?**