

Why has ISR Technology been ineffective in combating the IED threat in Afghanistan?



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JIEDDO has spent over \$20 Billion to counter the IED threat in Iraq and Afghanistan. Afghanistan, however, has seen a drastic increase in IED attacks over the past three years. Commanders in the field are demanding new technology, though technology is being fielded at a rapid rate, yet the problem continues. We have learned technology may not be the answer; terrain, spatial randomness of IED events, lack of infrastructure, and degraded support of the local are all contributing factors to why ISR technology is not always effective.

The Pennsylvania State
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Culminating Experience in
Geospatial Intelligence

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Introduction

A Brief History on IED Defeat

In August 2003, the Army Chief of Staff formed the Army Improvised Explosive Device (IED) Task Force to combat the escalating IED threat in Iraq. The IED Task Force reached out to various components—military, academia, and private sector—in an effort to improve intelligence gathering techniques and develop counter-IED (C-IED) technology. In February 2006, under the direction of the Secretary of Defense, the Army led task force became the Joint IED Defense Organization (JIEDDO). The organization's charge was to leverage the experience and expertise of warfighters across the Department of Defense, focusing on two areas: 1. Attack the network 2. Defeat the device (JIEDDO, 2011).



Figure 1: Buffalo Armored Vehicle used for Counter IED (Defeat the Device)

JIEDDO's first mission was to develop courses of action for counter-insurgency (COIN) and C-IED by applying the two tiered approach, in Iraq. The Iraqi insurgency steadily increased and reached an all-time high between 2007 and 2008. Coalition forces faced a significant increase in IED attacks, as a result, Intelligence, surveillance, and reconnaissance (ISR) platforms—mostly funded by JIEDDO— operated around-the-clock to support kinetic operations by Route Clearance Teams throughout the area of operation. By the end of 2009, this approach began to pay off and the number of attacks began to decrease significantly.

JIEDDO has spent over \$20 billion on technology to counter the insurgency in Iraq and Afghanistan (JIEDDO, 2011). However, the war in Afghanistan has proved to be more of a challenge than faced in Iraq.

Question

Why has ISR technology been ineffective in combating the IED threat in Afghanistan?

Grounding

Background

Since 2001, the United States has been operating kinetically to thwart the control Taliban insurgents have enjoyed the better part of a decade. The Taliban, unlike the Iraqi insurgents, are skilled in combat operations. They rely on topography and militant tactics, techniques, and procedures (TTPs) to effectively target coalition forces, as well as the local populous. Complex ground attacks are not uncommon; however, the largest threat to coalition forces remains the IED.

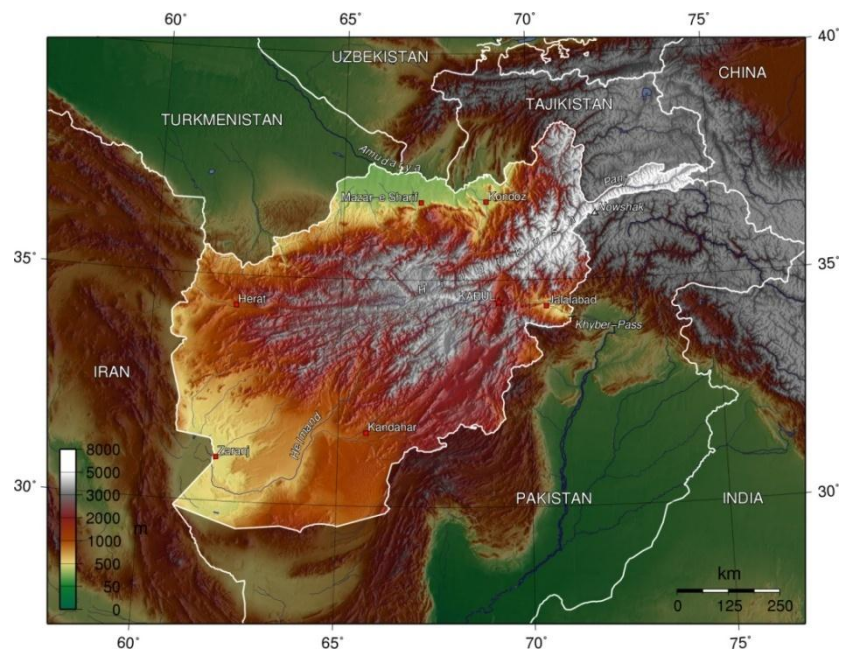


Figure 2: Map overview of Afghanistan. The Hindu Kush Mountain Range extends throughout most of the Country

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The IED

The improvised explosive device is nothing new to Afghanistan. During the USSR invasion, the Afghani Mujahedeen would combine the explosives from US provided anti-tank mines into oil cans to generate a more powerful explosion (Unknown, Improvised explosive device, 2011). Today, According to Tom Vanden Brook, (2011)

“The vast majority of IEDs in Afghanistan are powered by homemade explosives whose main ingredient is fertilizer (Figure 3). Virtually all of that comes from Pakistan, and it is “ubiquitous” in Afghanistan. The Pentagon, State Department and intelligence agencies have formed a task force to reduce the amounts entering Afghanistan. The fertilizer ammonium nitrate already has been banned in Afghanistan.”



Figure 3: Homemade Explosives Cache used in Roadside Bomb attacks

The roadside bombs being used in Afghanistan present a different challenge. In Iraq, the warfighter was able utilize electronics to scan the battlefield for remote triggers and jam the radio frequencies before a signal could reach the bomb (Riechmann, 2011). The IEDs in Afghanistan are simply not as advanced as those used in Iraq. This suggests that high tech equipment may not be the answer.

To back this theory, Dakota Wood, a military analyst at the Center for Strategic and Budgetary Assessments and a retired Marine officer says, “The data show that high-tech equipment may not be the key to finding and eliminating the IED threat. The key is likely to be a wary infantryman on foot, perhaps with a bomb-sniffing dog or hand-held detector.” (Vanden Brook, Foot patrols boost IED detection, 2011)

IEDs continue to be the leading cause of death and injury within Operation Enduring Freedom. In 2010, there were 268 IED casualties a 60% increase over the year prior. This may not seem like a huge number, but when you look at the number of wounded caused by IEDs, it is easy to see how devastating this problem is. Deb Riechman (2011) reports, “There were 3,366 U.S. service members injured in IED blasts — up 178 percent from the 1,211 hurt by the militants’ crudely made bombs in 2009.” And the numbers for 2011 seem to be consistent with what has been seen in subsequent years. Greer (2008); used pre and post surge open source data to analyze the statistics of the attacks for a better understanding of the levels of violence in Afghanistan. When all events of violence were tabulated there was a 13% increase in attacks in Afghanistan during April 2007 – March 2008. The same data was downloaded and converted to show the attacks graphically (appendix A).

The ISR

The functions of Intelligence, Surveillance, and Reconnaissance are an integral part of the United States defense capabilities. ISR provides a variety of systems that are used for gathering and processing data/ information for senior decision makers. ISR technology can be remotes sensors such as satellites and unmanned aircraft down to handheld devices (Best, 2005). The unconventional warfare in Afghanistan often pairs general purpose forces with



Figure 4: Army Soldiers with a RQ-11 Raven

special operation forces; this has increased warfighter demand for ISR capabilities that can track and locate moving elusive targets. In order to achieve this, capabilities need to be “developed, acquired, and operated” so information / intelligence can be collected from a national and tactical level (Defense, 2009).

However, ISR technology in the untrained hands of ground forces effect decision making when it comes time to target effectively, for example, one Marine explains,

“If I got my trusty G-Boss [the Ground Based Operational Surveillance System is a tower-based surveillance camera system] aimed down that road, I don’t need to patrol it or if there is a boom in the area, no reason to go and investigate as I will just tract it on my handy G-Boss. No doubt these things are impressive tools and can help considerably but nothing compares to a Marine being there or seeing it with his own eyes. I don’t know how many times I have seen stuff on G-Boss that I was 100 percent convinced a hostile act is occurring but when I got down there, I found the guy was slaughtering a goat in the middle of the road at five in the morning and that historic IED spot was just the place to do it at or just farming at night because it’s hot in the day time” (Ricks, 2008)

ISR technology is being made available to the warfighter in Afghanistan a staggering rate. This suggests that there is no single solution to the growing problem.

Geospatial Considerations

Life spaces:

1. Coalition Forces rely on foot patrols to traverse the difficult terrain to locate and neutralize IED.
2. Coalition Forces have to Work with the local tribal leadership in order to identify enemy locations-often futile
3. ISR assets are vulnerable to targeting due to terrain

Intellectual spaces:

1. The Taliban fighters use the knowledge of the landscape to target effectively
2. The Taliban fighters use terror tactics to their advantage when dealing with local tribes
3. ISR capability of persistent operations and dynamic tasking based on operational needs of the warfighter

Physical spaces:

1. Taliban forces use low tech bombs to ensure successful attacks
2. Taliban forces study emergency response and tailor future attacks
3. Limited number of ISR assets to cover the area of operation

Key Assumptions

1. ISR technology is properly used in Afghanistan
2. The warfighter understands the technology and is able to utilize data
3. The warfighter relies solely on “eyes on” approach to counter-IED
4. The Terrain in Afghanistan poses the biggest challenge to ISR technology
5. Local Nationals do not provide any early warning in counter-IED due to fear of retaliation
6. High-Tech ISR is no match for low-tech IEDs

Alternative Explanations

1. ISR is not limited by one factor but multiple factors

2. Taliban fighters have shifted their efforts to targeting the local populous, leaving coalition forces vulnerable to small arms attacks when investigating these attacks. ISR assets are pulled from other missions in order to provide over-watch rather than C-IED operations.

Evidence

There is not a lot of useful unclassified data related to IEDs or ISR in Afghanistan; therefore, analysis was limited. The USGS, however, is one of the only sources I could find that contained any imagery data of the study area. I was also fortunate to find two shapefiles containing: 1. IED attacks from April 2007-September 2007 and 2. IED attacks from October 2007–March 2008. Using what little data I had, I was able to do limited analysis.

Analysis

Data used:

1. ASTER 1B of Kabul and surrounding area
2. DEM of Afghanistan
3. Shapefile of IED attacks: 1. April-September 2007 and 2. October 2007- March 2008.

My original hypothesis was: Terrain was the limiting factor in ISR effectiveness, however as I searched for data that could support the hypothesis, I was unable to locate any substantial supporting evidence. Using ArcScene, I loaded the DEM to get a 3D view of Afghanistan. I added both shapefiles to see if there was any spatial correlation between events and elevation. However, because of randomness or the IED events this was inconclusive (figure 5).

Next, I loaded the ASTER image into ArcMap along with the shapefiles in order to generate an overview and close up of an IED event in order to study the area. The event that was selected is located in a wadi (dry water channel) west of “Ring Road.” (Figures 6&7) I then loaded the ASTER image into ENVI 32bit using bands 3,2,1 for natural color and exported this into ArcMap to view the same data used in figures 6 and 7 (figure 8)

Finally, I performed a *Band Ratio* in ENVI using bands 4 and 6 to view the clay content on the ASTER image of Kabul. The new image was exported into ArcMap and the shapefiles were loaded. Performing a band ratio allows you to divide bands and correlate the wavelength to a certain mineral or rock type. Using bands 4 and 6 we can see clay content which will be softer than rock and a possible better location for an IED (figure 9 &10).

Conclusion

The IED threat in Afghanistan is one that may never be solved. Technology may be able to locate and neutralize some of the IED events, but not all. The Terrain, spatial randomness of events, the lack of infrastructure and degraded support of locals are all contributing factors of why ISR is ineffective. In conclusion I found no definitive answer to: Why has ISR technology been ineffective in combating the IED threat in Afghanistan? This conclusion is Based on open source data; I feel the study may have gone in a different direction had classified information been used.

Appendix A

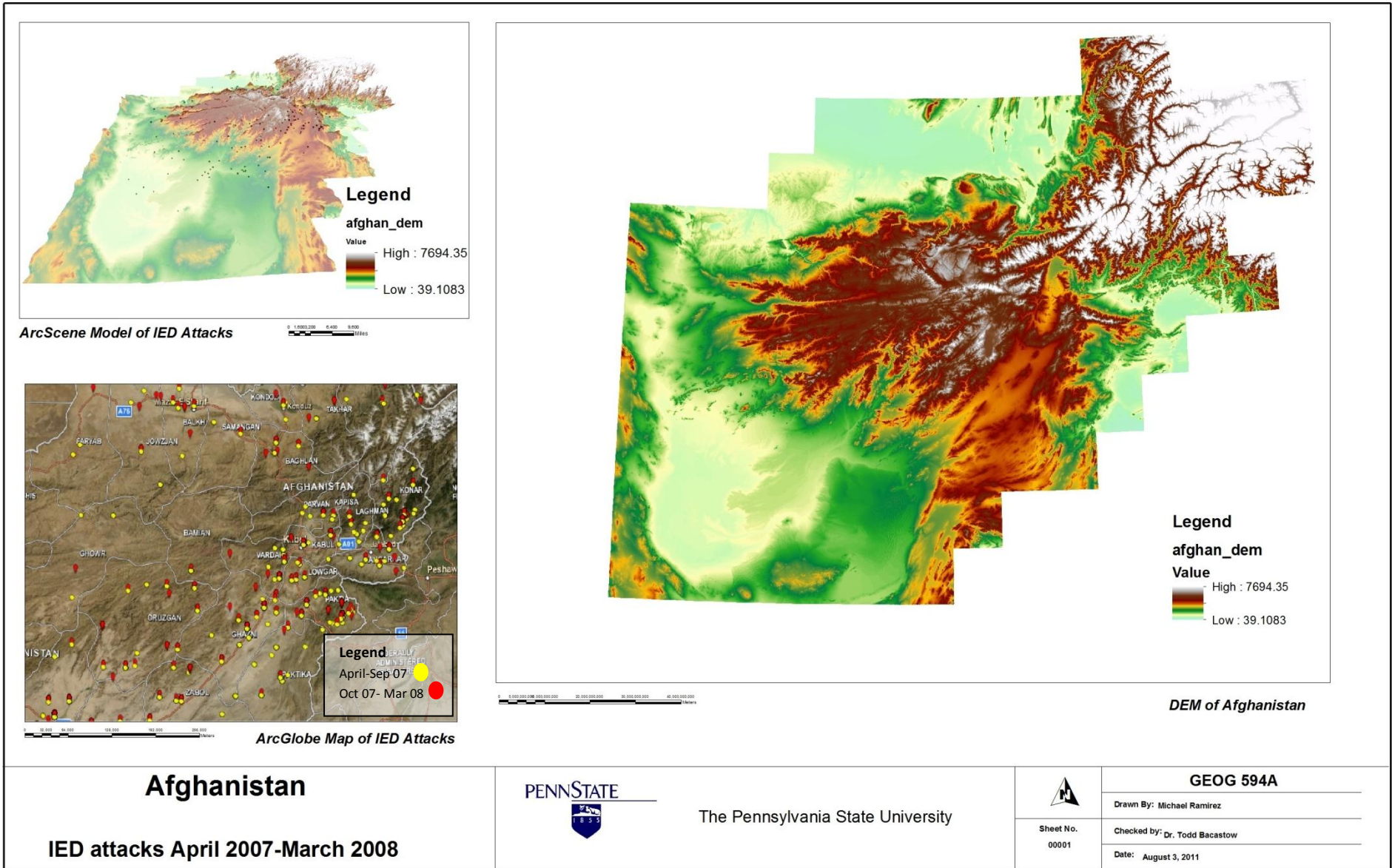
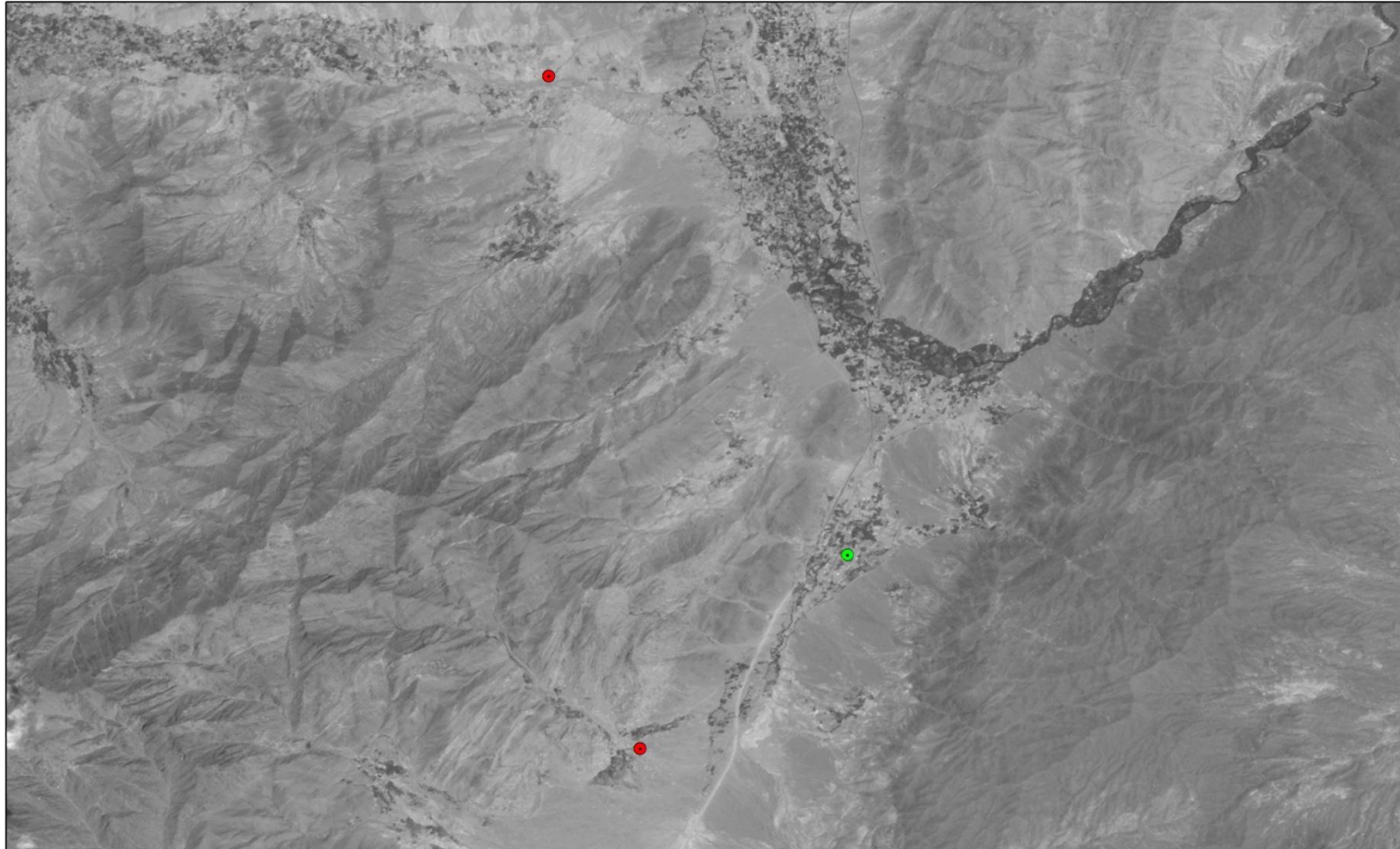


Figure 5: DEM Map of Afghanistan showing Elevation and IED locations

ASTER IMAGE of KABUL, AFGHANISTAN with IED EVENTS



Legend

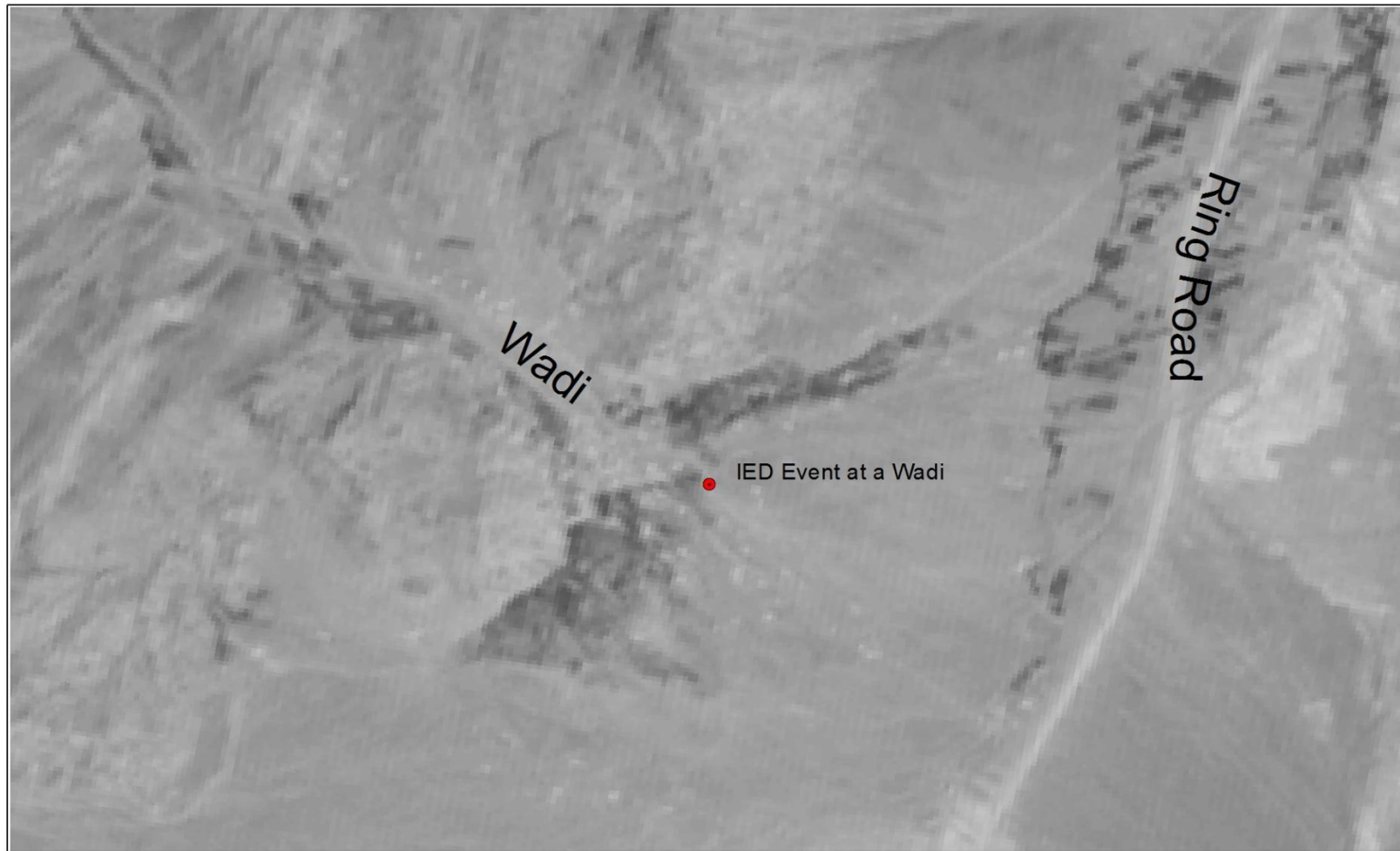
- IED attacks Afghanistan_april_07_-_sep_07
- IED attacks Afghanistan_oct_07_-_march_08



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Figure 6: Aster Image Overview

ASTER IMAGE of KABUL, AFGHANISTAN with IED EVENT



Legend

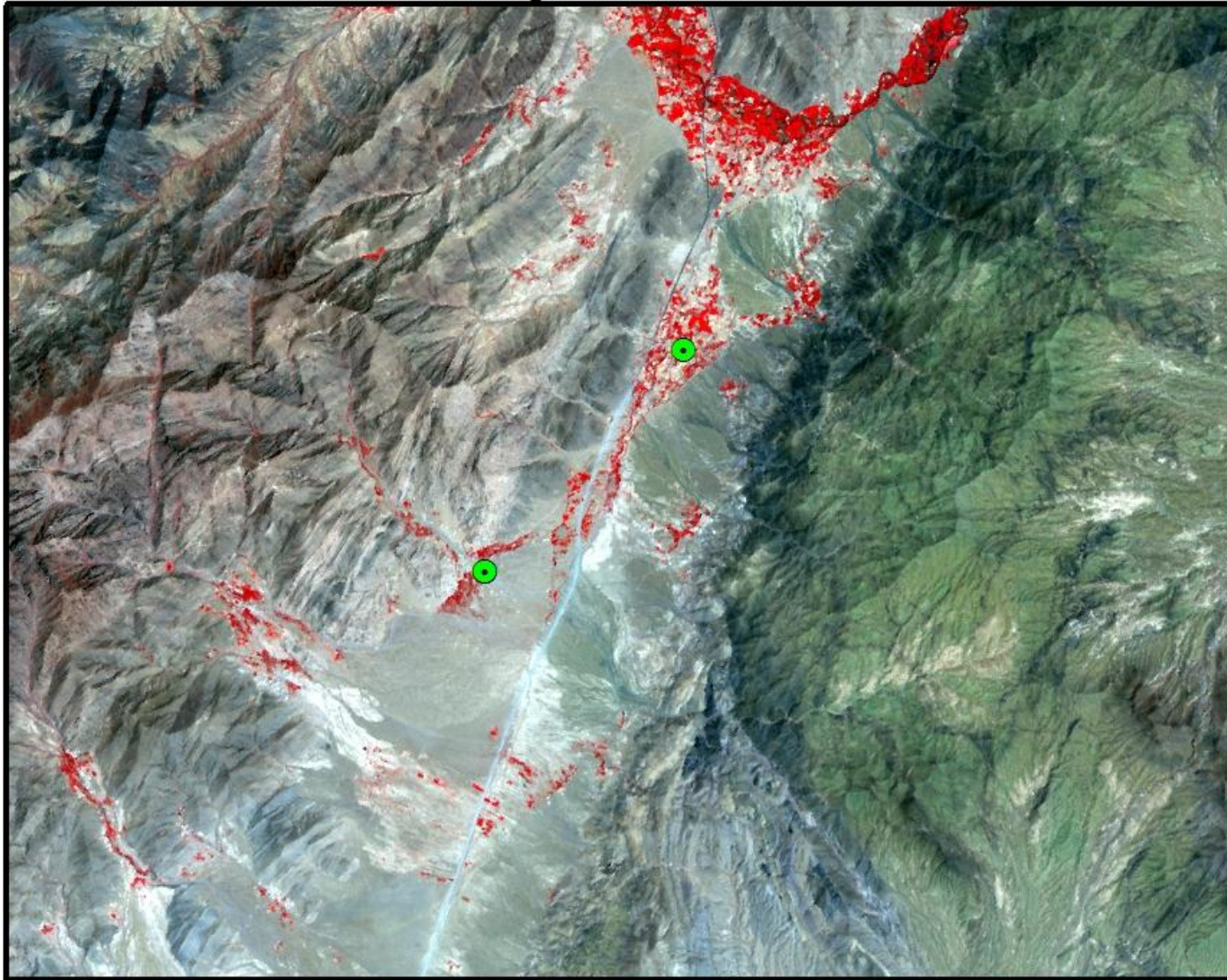
- IED attacks Afghanistan_april_07_-_sep_07
- IED attacks Afghanistan_oct_07_-_march_08



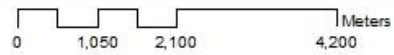
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Figure 7: ASTER Imager Close-up

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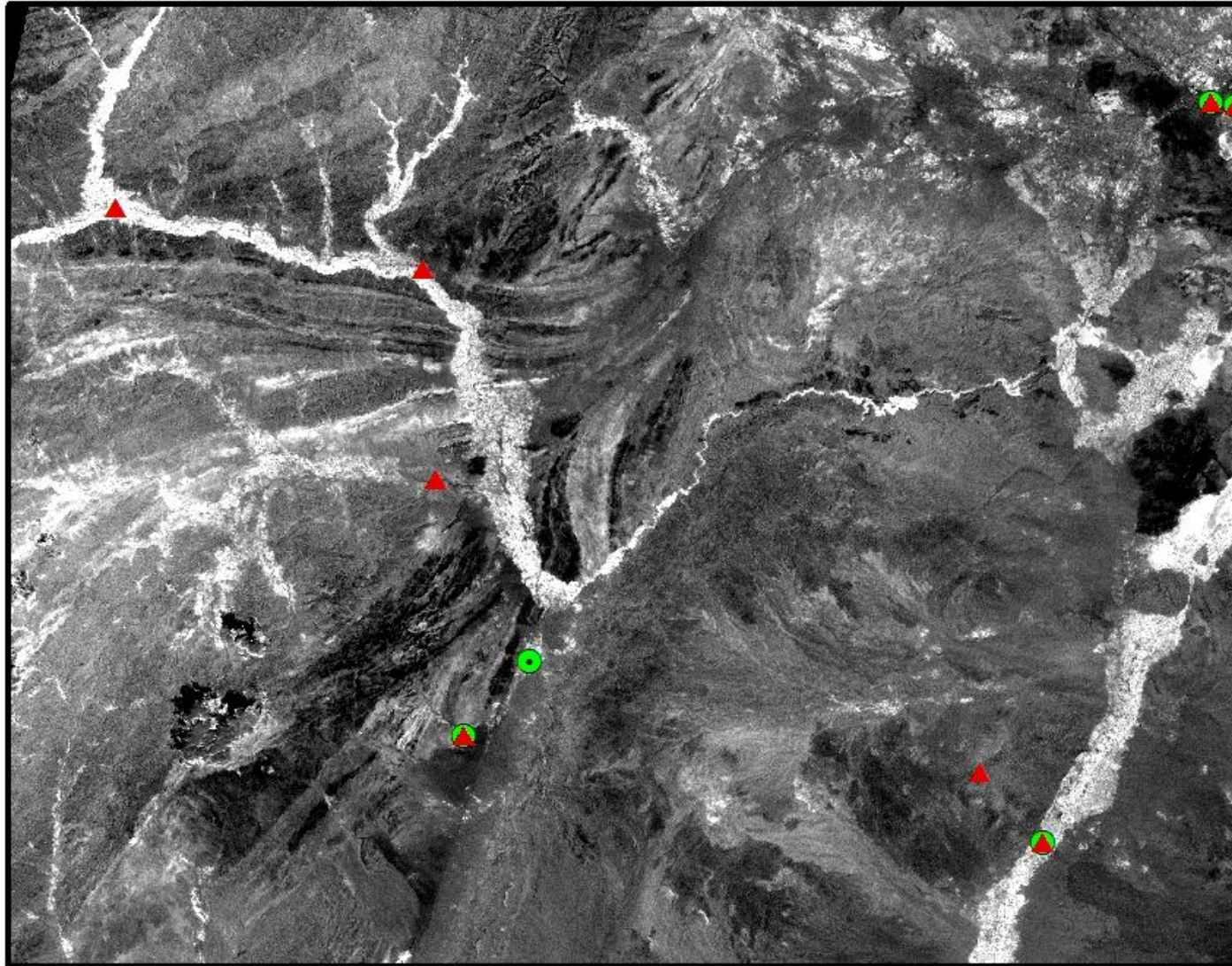
Legend



IED Attack

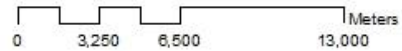
Figure 8: False Color ASTER image using Bands 3,2,1 to show terrain features and populated areas-ENVI to ArcGIS

Kabul, Afghanistan
Band 4 and 6 Ratio with IED Events



Legend

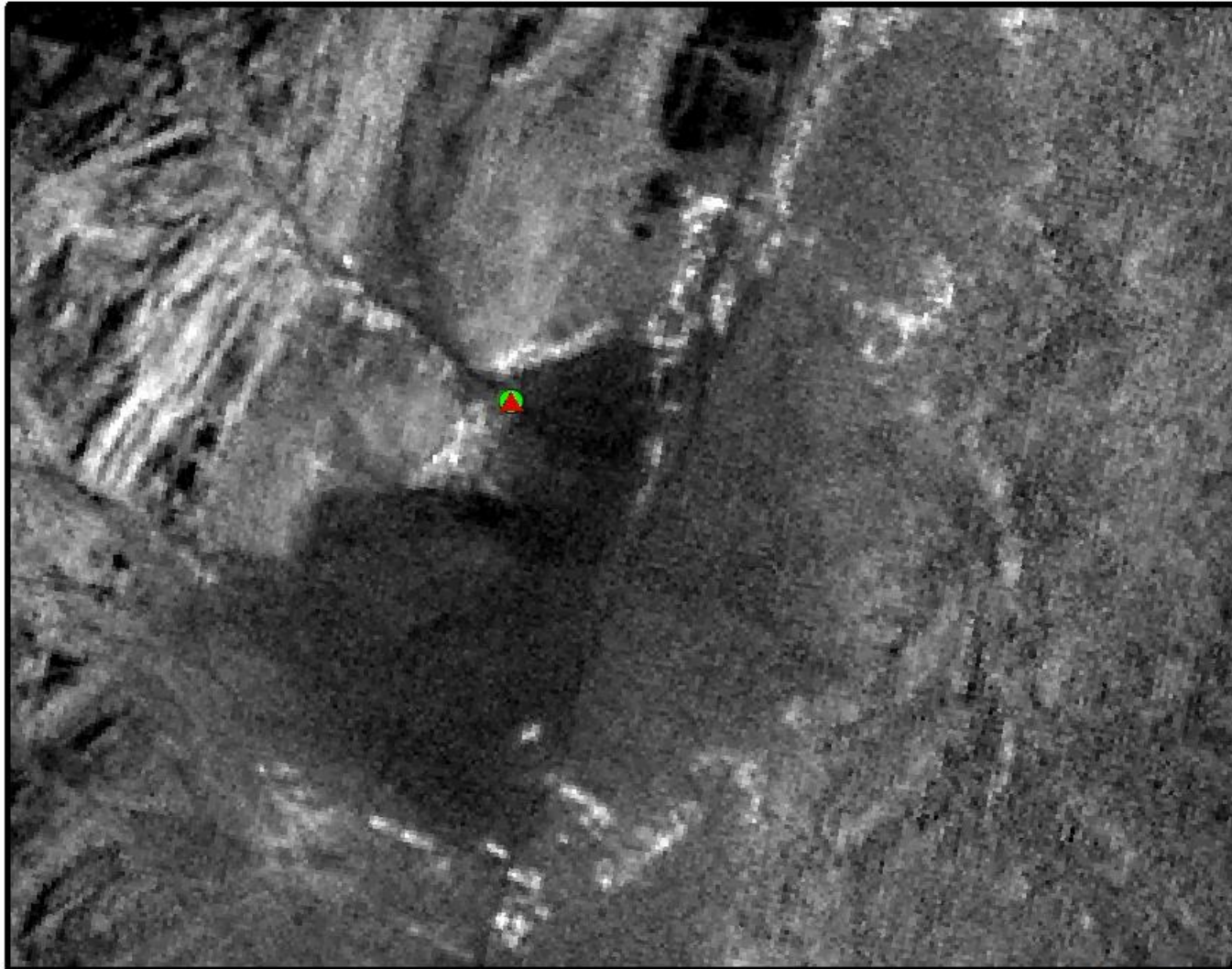
- ▲ IED Apr-Sep 07
- IED Oct 07-Mar 08



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Figure 9: Band Ratio using 4 and 6 Overview

Kabul, Afghanistan
Band 4 and 6 Ratio with IED Events



Legend

- ▲ IED Apr-Sep 07
- IED Oct 07-Mar 08



0 500 1,000 2,000 Meters

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Figure 10: Band Ratio using 4 and 6 show Heavy Concentrations of clay at the wadi

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