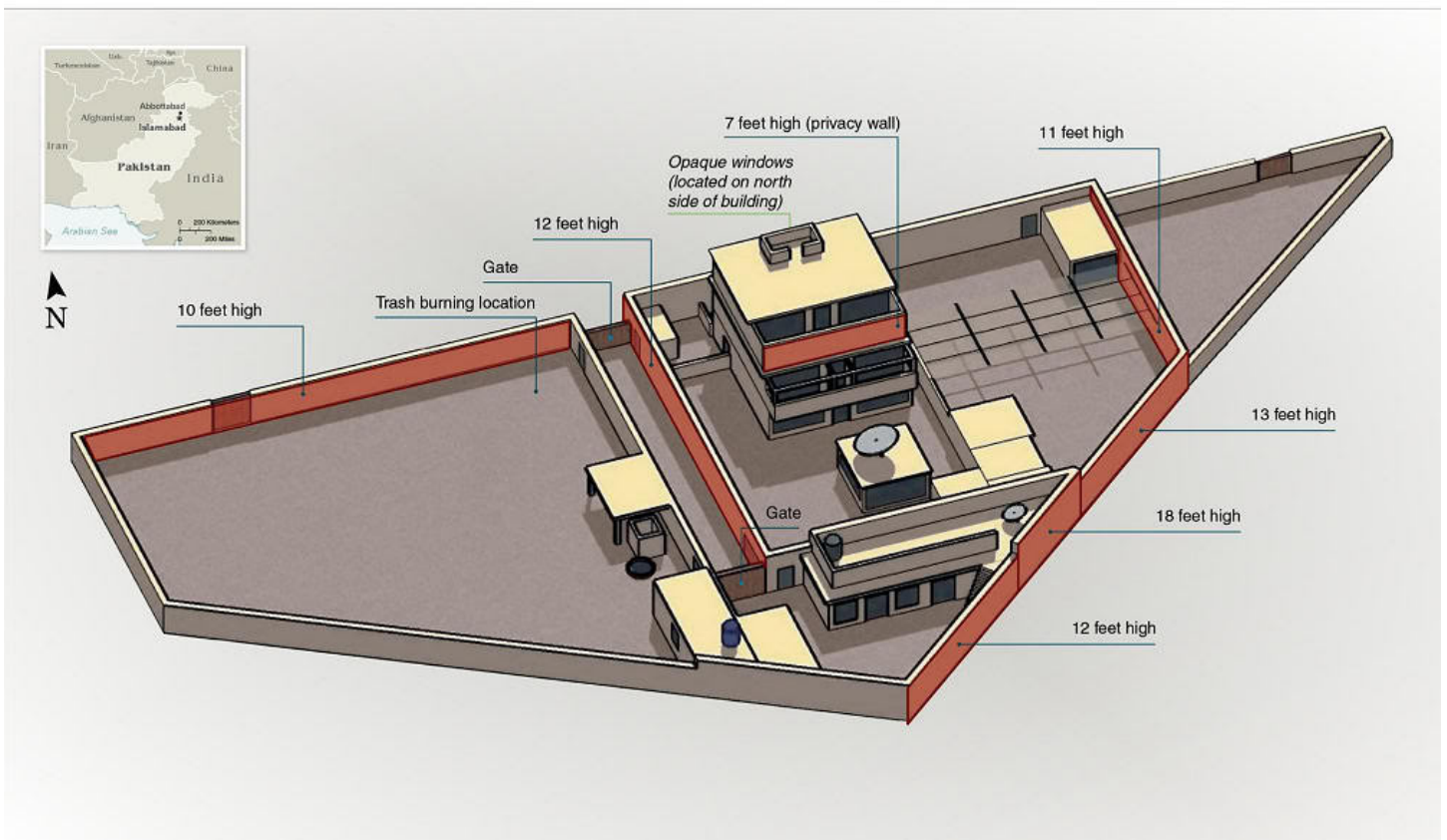


I&A

Illustration of Abbottabad Compound



Osama Bin Laden's compound in Abbottabad, Pakistan

Editor's Comments

This month *I&A* begins with a look at one of the most significant events of the 21st Century: the US Navy SEAL raid on Osama Bin Laden's Pakistani hideout. While eliminating Bin Laden does not end the war on terrorism, it does mark the end of one chapter in the greater war.

With Pakistan in the spotlight following the raid, *I&A* turns to contributor Raj Kumar for an examination of suspected Pakistani nuclear weapon storage facilities. Masis Ingilizian also returns to provide a look at the Armenian SAM network, including the lesser-known Russian air defense presence in the European nation.

Finally, *I&A* reviews Ken Alibek's *Biohazard*. Dr. Alibek's work brings one of the oft-overlooked aspects of the Cold War to light in detail.

I&A continues to grow, and more new and interesting features are slotted for the coming months!

Sean O'Connor

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Osama Bin Laden's Compound Abbottabad, Pakistan 34 10' 09" N 073 14' 33" E



Current Events

Pakistan and Bin Laden

Sean O'Connor

On May 1 2011, US Navy SEALs, supported by currently unidentified American military forces, launched a raid into Pakistan. Their target was a location northeast of the Pakistani capital of Islamabad, where Al Qaeda mastermind Osama Bin Laden resided in a million-dollar high-security compound.

While the death of Bin Laden does not mark the end of American counter-terrorism activities abroad, it is a significant moment in the campaign against Islamic extremism. Following intelligence leads cultivated over an extended period, the United States eventually

identified and tracked Bin Laden's courier to and from the facility. The operation demonstrates the importance of intelligence sources and methods in unraveling the activities of terrorist groups.

Bin Laden's compound was located in Abbottabad, Pakistan, roughly 50 kilometers northeast of Islamabad. Abbottabad houses a Pakistani military academy, the main gate to which lay a mere 1400 meters from Bin Laden's hideout.

Officials from the Inter-Services Intelligence (ISI), Pakistan's primary intelligence organization, have claimed that the Bin Laden compound was a former ISI safehouse, but was no longer in use. The ISI also claimed that it raided the compound in

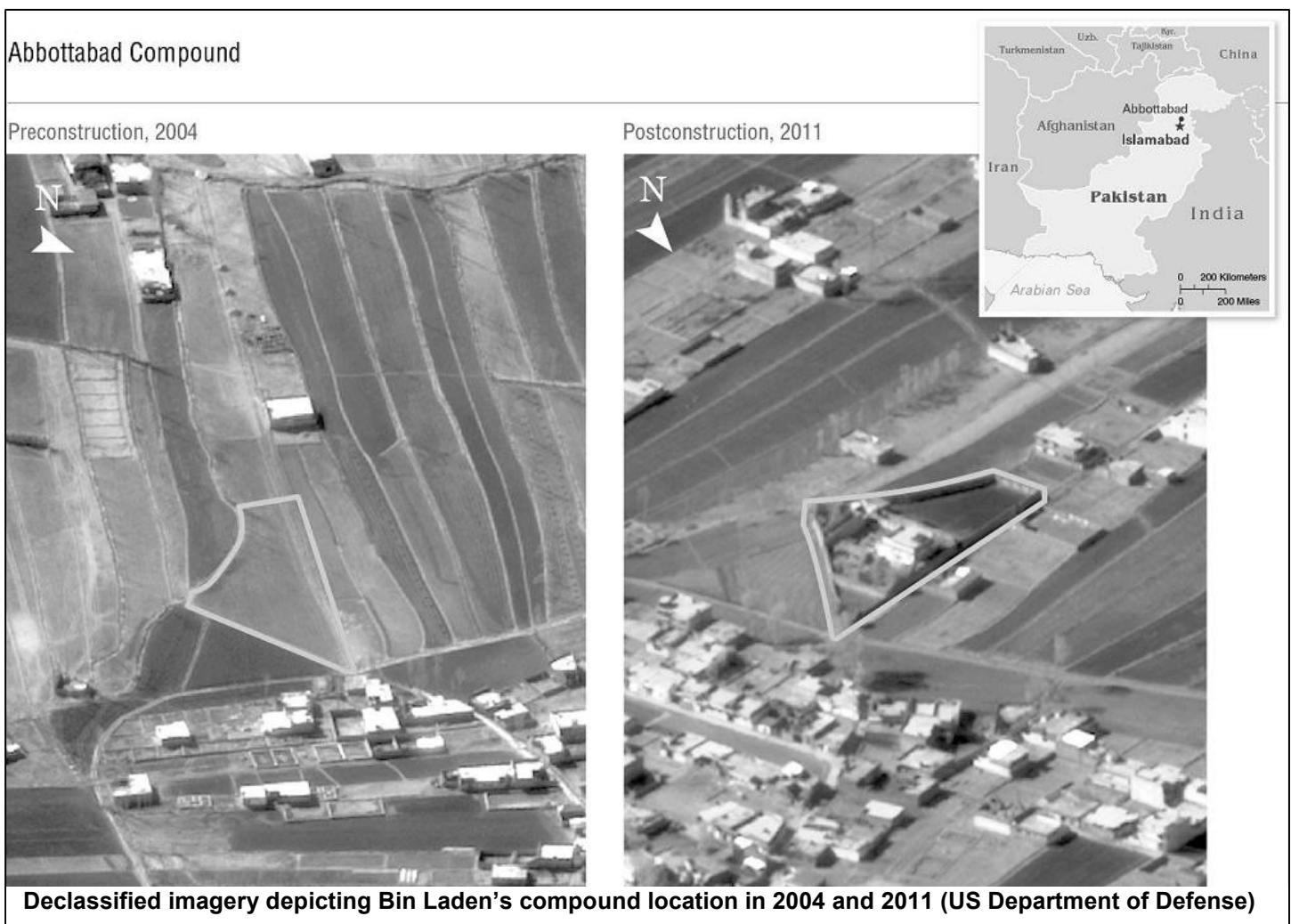
2003. This allegation is spurious given that construction on the facility did not begin until 2005, with DoD imagery of the location showing a bare field in 2004.

The US operation to eliminate Osama Bin Laden has served to highlight difficulties in the US-Pakistan relationship. US government officials are keen to learn how one of the world's most wanted terrorists came to reside in Abbottabad. Pakistani officials have chalked this error up to a colossal intelligence failure, claiming no knowledge of Bin Laden's whereabouts. US officials are reluctant to accept such explanations from a nation considered an ally in the war against terrorism without supporting evidence.

While Pakistan does take action against terrorist cells in Waziristan and other provinces, the current situation regarding the Bin Laden raid is confused. Pakistani officials

decry the raid as an assault on their sovereignty. According to Pentagon briefings, American officials informed Pakistan of the raid, but only upon its completion for fear of Pakistan alerting Bin Laden. For the time being, counter-terrorism operations in the region may unfortunately take a back seat to politics while attempts to repair US-Pakistani relations take place.

The main question remains: why did the US not trust Pakistan with foreknowledge of the Bin Laden raid? US officials are on record stating that they do not believe Pakistan had any overt knowledge that Bin Laden was in residence at the Abbottabad compound. In this light, the Al Qaeda leader's presence at a secure facility may fall under the intelligence failure described by Pakistan. To bolster its position, Pakistan paid lobbyists in Washington, D.C. to spread the word that the nation had no knowledge of Bin Laden's



whereabouts. However, many US officials still desire an explanation as to how one of the world's most wanted men came to reside in a Pakistani town, less than two kilometers from a major military installation.

Further complicating relations, on May 9 2011, Pakistani Prime Minister Yousuf Raza Gilani alleged that Pakistan would meet any future incursions into its territory by the US military with "full force". Gilani's statement echoes a growing opinion that the US illegally violated Pakistani sovereignty to conduct the Bin Laden operation.

Gilani's words already ring hollow in the light of a May 6 drone strike in Waziristan. Furthermore, Pakistan's IADS apparently proved incapable of intercepting American helicopters used in the May 1 raid.

A listener can go so far as to interpret the reference to "full force" as an oblique nuclear threat. While it is unlikely that Pakistan would resort to nuclear warfare to combat American counter-terrorist incursions, the harsh wording of Gilani's statement indicates that all options are presumably on the table.

Air Defense

Armenian Air Defenses

Masis Ingilizian

The Caucasus has been a significant strategic location for Russia. It is home to many military bases including the 102nd Military Base in Gyumri, Armenia, and a much larger strategic and tactical force structure throughout the Northern Caucasus. These military bases are Russia's defence assets in the South of its territory known as the Northern Caucasus District.

During Soviet times, Soviet tactical doctrine stated that Armenia would be the battleground between the Soviet Empire and the NATO/West allies, while its true strategic forces and defences would be located in Georgia, Azerbaijan and throughout the Northern Caucasus. In light of new alliances

from the breakup of the Soviet Union, and after the pull out of the Russian bases from Georgia, the Russian base in Armenia is one of the largest outside Russian territory. It houses up to 5,000 Russian soldiers and includes 18 MiG-29s (FULCRUM) at the Yerevan military airport.

The current air defence inventory of the 102nd Military Base includes the S-300V1 (SA-12A GLADIATOR), 2K12 Kub (SA-6 GAINFUL) with six TELARs and six Strela-10 (SA-13 GOPHER) systems. This represents a capable air defence arm for Armenia and the Russian base. The mobility of the systems clearly indicates its priority to protect the base with its military hardware in times of peace and war. Mobility ensures the protection of the base in time of deployment and tactical manoeuvres throughout the conflict. It also presents a capable air arm of the overall air defence of Armenia under the CIS air defence network. These systems are under Russian control, however, and form only one part of the overall defence network for Armenia.

Early warning coverage for the S-300V1 system is provided with 9S15 Obzor (BILL BOARD) acquisition radar a fully mobile system providing coverage for TBM's, cruise missiles and fighter type aircraft, while the 9S32 (GRILL PAN) provides engagement and tracking capability. The S-300V1 system is one of the most capable air defence systems providing robust air defence in a manner of shoot and scoot against ballistic, cruise and all fighter type aircraft including LO platforms. The S-300V1 battery in Gyumri lacks the 9S19 (HIGH SCREEN) sector scanning radar normally associated with the S-300V2 (SA-12B GIANT), limiting its capability to track intermediate range ballistic missiles. Although Russia does house these systems together, the 9S19 is not present in current imagery of the 102nd Base. The system however still represents a significant early warning capability against a large variety of various threats. How these systems integrate with Armenia's other early warning capabilities is not known, as a fully integrated system would choose targets

Russian Air Defense Site Gyumri, Armenia

40 45' 40" N 043 57' 25" E



according to their threat and provide a more disciplined air defence network.

Armenia's major early warning systems comprise one modern 64N6 (BIG BIRD) and five older 36D6 (TIN SHIELD) radars, possibly serving as a fully integrated system with Armenia's S-300PT (SA-10A GRUMBLE) batteries. Together the five 36D6 radars provide overlapping coverage; although older systems, they still represent a capable early warning and target acquisition capability. 36D6 radars provide a detection range of 165km and acquisition capability without the support of the battle management complex. One 36D6 is co-located with an S-300PT battery acting as an organic acquisition asset, while the 64N6 Big Bird provides all three S-300PT sites with

target track data assigning them priority targets. The 64N6 has a 300 km detection range and better capability against detecting stealth and low RCS targets at further ranges than the 36D6.

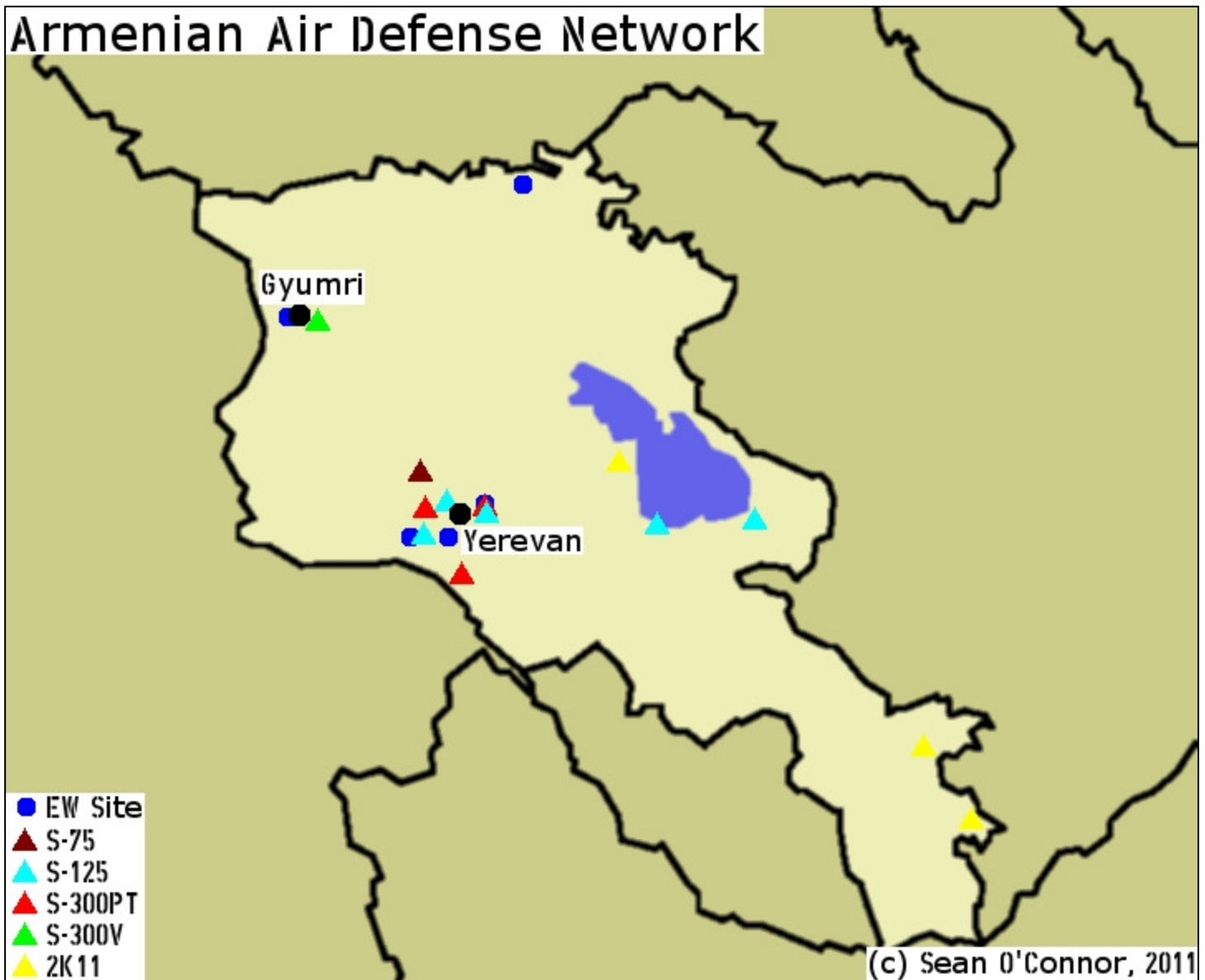
The most modern SAM assets available for Armenian air defence include the S-300V1 at the Gyumri base under Russian control, and three S-300PT battalions stationed around the capital of Yerevan. The S-300V1 represents the most modern tactical SAM asset, with overhead imagery identifying three S-300V1 TELARS. The S-300V1 employs the 9M83 missile to a maximum range of 75 km, with an exceptional guidance system based on a modified version of semi active radar homing providing robust resistance to jamming. An S-

300V battery typically consists of S-300V2 TELARs in conjunction with S-300V1 TELARs; the lack of the 9S19 radar might suggest the reason for the S-300V1 being the only identifiable SAM component.

The S300V, though providing the Russian base with an air defence umbrella, still provides support to Armenia's overall air defence system with a redeployment time of 5 min. It represents the best choice against TBMs, cruise missiles (in particular stealthy cruise missiles) and stealthy fighter aircraft. Current engagement capability with the three TELARs allows for the simultaneous launch and guidance of six missiles, two missiles for each target to ensure a higher kill probability. In a larger strike package, the S-300V2 can

simultaneously engage 12 missiles at 12 different targets launching at 1.5 sec intervals. The overall integrated capability of Armenia's air defence will ensure correct choice of missiles against targets depending on ECM, stealth and pin point air defence against difficult strike packages such as guided munitions and cruise missiles.

The S-300PT provides Armenia with capable air defence with overlapping coverage. The S-300PT will provide a robust air defence against modern manoeuvrable aircraft though it will lack some resistance against modern ECM packages. Depending on the variant of the S-300PT's it can use three different types of missiles. Imagery analysis is insufficient to determine whether Armenian S-300PT



batteries represent early or later variants. The 5V55K missile with a maximum range of 49 km with radio command guidance used in the earlier S-300PT will have a limited scope of capability in terms of range and against ECM. With simultaneous tracking of up to six targets with each battalion, three battalions with an overlapping coverage will provide simultaneous engagement of 18 targets. The 5V55KD missile has an improved range of 75 km and employs the same command guidance system as the 5V55K. The 5V55KD will also lack the resistance to jamming compared to later missile variants. The upgraded S300PT-1A uses the 5V55R missile with a range of 75 km using a more modern guidance system similar to Track Via Missile (TVM); it offers much better resistance to jamming and true performance against ballistic targets. The S-300PT-1A can employ earlier variants of the 5V55 series.

Taking all this in consideration, Armenia's military doctrine and strategy needs a closer look. After the breakup of the Soviet Union, Russia's treaty with Armenia in 1997 only provided Armenia with military assistance in the case of an attack from any non-CIS country. Azerbaijan being a part of the CIS meant that any attack on Armenia from Turkey would meet with assistance from Russia, though an attack from Azerbaijan would require Armenia to defend itself. Armenia's latest treaty with Russia, extending the 102nd Military base in Gyumri for an additional 40 years, includes assistance from Russia from an attack from any external threat, including Azerbaijan. This does not however include Nagorno Karabagh as part of the Armenian nation. The treaty also requires Armenia to assist Russia with any potential Russian conflict that might arise. Taking this in consideration Armenia relies on the Russian base to secure its western border, with the treaty preventing a strike package within Armenian territory from Azerbaijan in the context of the Nagorno Karabagh conflict. Armenia does however need a capable force to withstand any limited attack as a further treaty between Turkey and Azerbaijan represents a threat of limited and potential strikes from Turkey in the case of

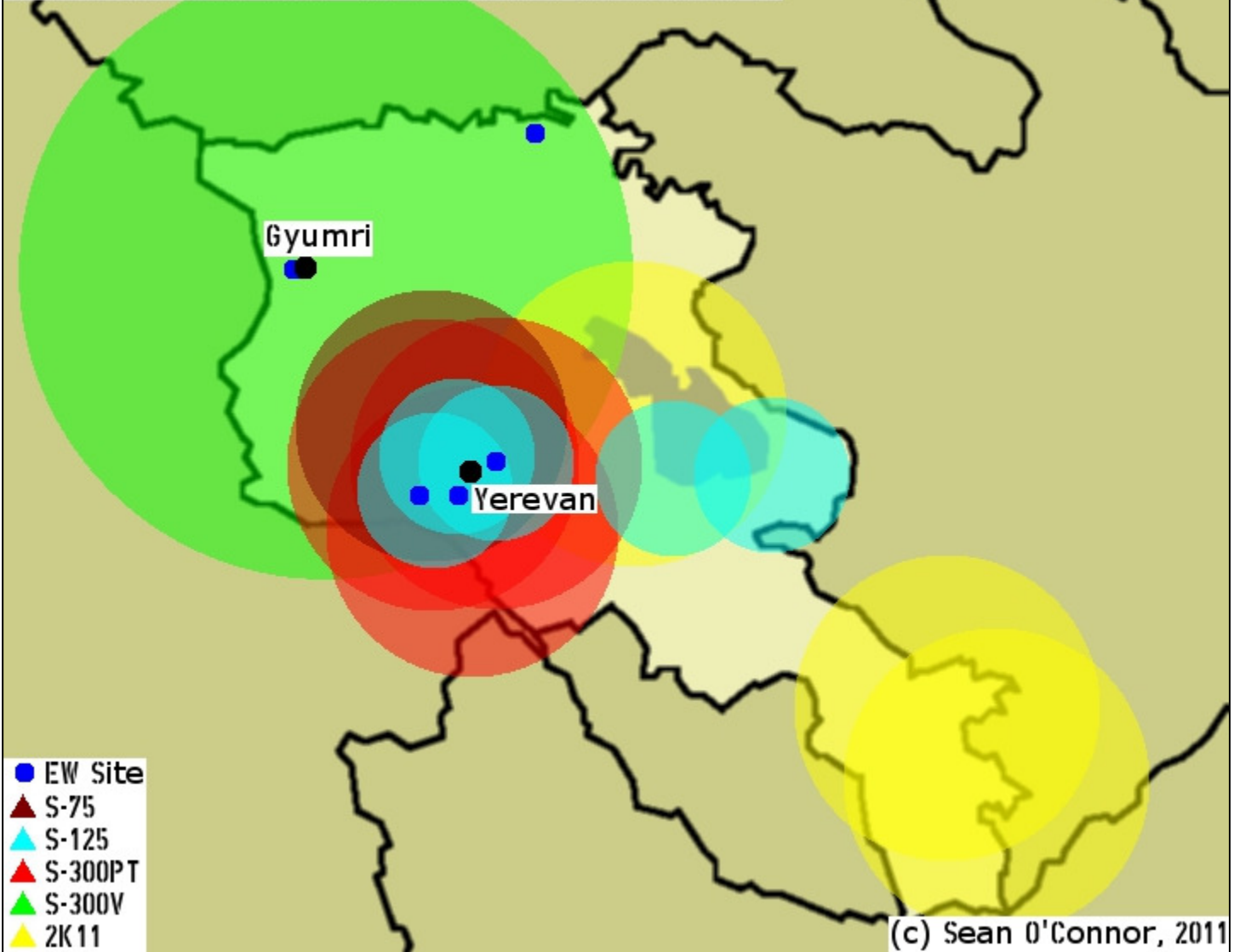
resumption of war between Armenia and Azerbaijan.

Russia's continued interest in Azerbaijan as an energy trade partner is evident through Armenia's lack of modern SAM systems in the east of the country. Russia's hesitation to help provide Armenia's eastern border with capable SAMs has left the eastern border with single target engagement SAM systems. Nagorno Karabagh consist of one inactive site for an S-300P system housing a 36D6 radar. This inactive site is ready for deployment of a S-300PT or possibly the components of an S-300PS (SA-10B GRUMBLE) system seen on Armenian television in April.

The S-300PS System is a mobile SAM system employing the 5V55RD missile with a maximum range of 90 km. This will provide Nagorno Karabagh with a robust air defence against Azerbaijan's limited air arm, as Armenia will have a true shoot and scoot capability SAM system to for relocation to Nagorno Karabagh in the resumption of hostility. The S-300PS also provides Armenia with a greater capability against anti-radiation missiles as the system can be powered down in a time of a conflict to draw in SEAD operations and reset within five minutes to track, engage and launch. This capability is crucial against any strike package as the S-300PT in Armenia are located at fixed sites with a minimum of 45 minutes required for site tear down. The S-300PS will be the better choice for relocation to the Nagorno Karabagh region because of its true shoot and scoot capability.

Armenia's eastern regions host two 2K11 Krug (SA-4 GANEF) battalions in an overlapping manner providing further assistance to the Nagorno Karabagh region. These two Krug battalions mainly cover the south of the country providing further defence for the region. This is in addition to the five overlapping 2K11 batteries in the Nagorno Karabagh region. The northeast of the country is protected by one 2K11 battery with two S-125 (SA-3 GOA) batteries. Imagery depicts a

Armenian Air Defense Network



military base near these systems, overlapping coverage protecting not only the base but covering air defence in the northeast of the nation.

Within the modern context, the SAM coverage of eastern Armenia represents a limited threat. It lacks ATBM capability as well as any modern capability against low RCS targets. Azerbaijan's MiG-29S (FULCRUM-C) represents the only fighter aircraft providing serious threat from the east and will be giving these legacy systems a run for their money, performing missions while quite possibly evading SAM's such as the legacy 2K11. The effectiveness of Armenia's 2K11 single target engagement capability coverage will be tested against Azerbaijan's air arm. Short range SAM's fall outside the scope of this article and

sources regarding these SAM's in Armenia mention up to 40 9K33 (SA-8 GECKO); this can be confirmed with many sighted in military parades. A 9K33 battalion usually consists of 4 batteries which can work in tandem with the P-40 (LONG TRACK) long range acquisition radar.

Armenian legacy SAM systems have yet to be modernized. Two S-125 sites and a further two S-75 Dvina (SA-2 GUIDELINE) systems remain. These legacy systems do have the opportunity to provide a further air defence capability depending on the type of strike package. The S-125 can be prioritized against low flying aircraft and helicopters, depending on the number of targets engaged with the more sophisticated systems.

Overall Armenia's air defence seems to be robust given the nature of the threat it faces and the systems on hand. Compared to Syria, whose overlapping SAM coverage relies on legacy S-75 and S-125 batteries, Armenia SAM capability is more sophisticated against TBM, cruise missiles and modern fighter aircraft. Compared to Iran, it does not have sizeable gaps to provide aircraft with ECM packages to move freely. The small size of the nation provides an advantage to the deployed assets. In a true modern context with an unlimited strike package, Armenia's air defence can be oversaturated. With over 500 modern aircraft in the Turkish air force inventory and the limited scope of the S-300PT against a salvo of modern cruise missiles it will have its shortfalls. Armenia will be forced to be content with the losses it would inflict on the enemy, as only a very strong modern ECM package might just disrupt some of its guidance of missiles. Armenia will still have opportunity to provide losses to the enemy with Russian S-300V1 and Armenian S-300P-series systems.

Modernization should be a must for Armenia as this will inevitably help Armenia provide itself with a modern SAM network not reliant on Russian support. Various modern SAM upgrades will significantly improve its coverage. The east of the country should pursue the Pechora-2M upgrade improving the system to a multiple engagement capability and most of all improving its scope against cruise missiles and ECM. The capital city needs to house at least one more S-300PS system for improvement in range and guidance and most of all for the overlapping multiple target capability and true shoot and scoot capability. Armenia's last investment should be in terms of point defence systems, to ensure safety of the S-300P systems from a salvo attack of cruise missiles, in particular the one 64N6 radar that serves all the S-300PT batteries. A Tor-M1 (SA-15 GAUNTLET) system will be an expensive piece of equipment for Armenia though it will complete its job for this requirement. Another option for Armenia will be to purchase a handful of Pantsyr (SA-19 GRISON or SA-22 GREYHOUND) systems. These upgrades will

improve Armenia's air defence to a highly robust system but for now the nation must rely on discipline and training to man current systems to their full potential.

Strategic Warfare

Pakistani Nuclear Weapon Storage Facilities

Raj Kumar

The Distrust

Pakistan trying to equalize asymmetry in conventional forces with India by amassing scores of nuclear weapons is not a new revelation. What is concerning and worrying is that Pakistani proliferation appears prompted by religious zeal alone. Nuclear abstinence cannot be found in Pakistani dictionaries. Pakistan will not choose totally forsaking nuclear weapons, accepting a "No First Use" policy, stopping nuclear weapon production or pronouncing a self imposed moratorium on nuclear tests. Pakistan's India-centric policies and religious zealot polity will not permit it to choose any of these options. Pakistan would go to any extent to fulfill its ambitions of achieving nuclear parity with or more preferably nuclear superiority over India. Pakistan does not have a publicized nuclear doctrine, but its policy of "minimum credible deterrent" is widely regarded as "maximum nuclear deterrence" designed to dissuade India from taking military action against it.

General David H. Petraeus, the former Commander of U.S. Central Command, also the future CIA Chief, testified to the US senate on March 31, 2009: "Pakistani state failure would provide transnational terrorist groups and other extremist organizations an opportunity to acquire nuclear weapons and a safe haven from which to plan and launch attacks." 1

President Obama addressed this issue in an April 29, 2009 press conference, stating, "I'm confident that we can make sure that Pakistan's nuclear arsenal is secure, primarily,

initially, because the Pakistani army, I think, recognizes the hazards of those weapons falling into the wrong hands. We've got strong military-to-military consultation and cooperation." He also recognized the sensitivity of the issue for Pakistan, saying, "[w]e want to respect their sovereignty, but we also recognize that we have huge strategic interests, huge national security interests in making sure that Pakistan is stable and that you don't end up having a nuclear-armed militant state." 2

Now that Osama Bin Laden (OBL) has been killed in Abbottabad, this distrust is likely to increase gigantically.

The Open Source

The increased number of reactors and processing facilities at Chasma, Khushab and PINSTECH along with the increased production at Baghalchur and Mianwali (Isa Khel) provide Pakistan an expanded capability to produce weapon grade nuclear material in quantities at least double its known capability of 100kgs per annum. This equates to approximately 10-15 weapons per year. This would allow Pakistan to have 110-165 warheads over a period of eleven years from 2000-2010. The ISIS assesses, as of the end of 1999, that Pakistan possessed 585 - 800 kilograms of weapon-grade highly enriched uranium (HEU) and 1.7 - 13 kilograms of separated plutonium; these quantities are sufficient for 30-50 nuclear bombs or warheads. 3

At a conservative estimate, Pakistan should be logically holding 140-215 warheads as of date. By 2020, Pakistan could have accumulated approximately 450 kg of plutonium and ~6000 kg of highly enriched uranium (HEU). Pakistan may be able to produce more weapons if it either increases its rate of uranium mining or has more advanced weapon designs requiring less fissile material. 4 These stocks would be sufficient for perhaps 300-450 simple fission weapons based on HEU and 90 plutonium-based weapons. If the consideration is low yield weapons requiring

less fissile material than Pakistan may currently possess ~600 warheads.

Security Threats

"The present day security threats to Pakistan's nuclear weapons arsenal include the following:-

Outsider Threat -- The possibility that armed individuals or groups from outside a facility gain access and steal weapons, weapons components or fissile material. The outsiders' objective is to gain control of these items for their own use or to transfer them to another state or to other non-state actors.

Insider Threat -- The possibility that individuals who work at a facility will remove weapons or weapons components without proper authorization. The insiders' objectives may be to control these items for their own use, transfer control of the items to a previously identified outsider, or to sell these items to a previously unidentified outsider. In the case of transfer, the insider may be motivated either by profit or ideological affinity with an outside group.

Insider/Outsider Threat -- The possibility that insiders and outsiders conspire together to obtain weapons or weapon components. Again, the motivation for the theft may be either profit or ideology.

Leakage of Sensitive Information -- Insiders provide key information about Pakistan's nuclear weapons to outsiders. The information could include classified nuclear weapons data, exact storage locations, security and access control arrangements, or operational details about the weapons.

Loss of Central Control of Storage Facilities -- In the event of a civil war in Pakistan, clear lines of

communication and control over weapons, weapons components, and information may be broken or lost entirely.” 5

The Pakistan government is well aware of the dangers existing to its nuclear weapons from internal (insider and outsider) threats discussed above but is reluctant to accept any assistance from a foreign country, especially the USA. There are no external threats envisaged at this date by any writer, and Pakistan has been working assiduously to safeguard its nuclear capability from first strike and to acquire survivability. The Pakistani government is always expecting an external threat from her ally the USA in the wake of LWOT. The distrust of the USA became more

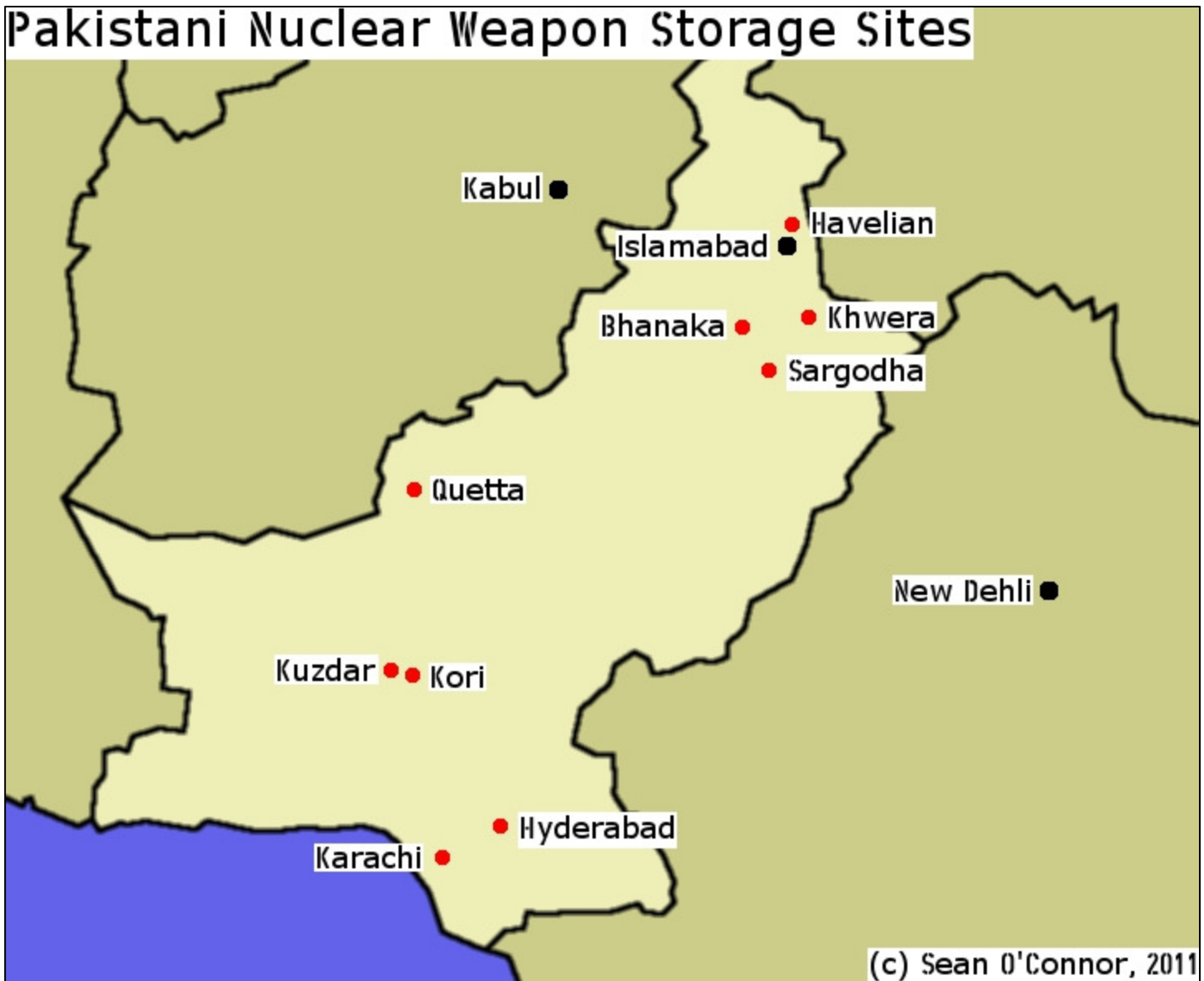
evident within two days of 9/11, as the Pakistan President General Pervez Musharraf ordered an emergency redeployment of the country's nuclear arsenal to at least six secret new locations and reorganized military oversight of the nuclear forces. 6

Nuclear Storage Complexes

Many safe havens Pakistan has constructed to ensure first strike survivability can be identified using open-source imagery. This does not include the over ground facilities that may contain or produce nuclear arsenal.

Khuzdar and Hyderabad

These two facilities feature the most



modern and advanced underground technology, potentially produced with US help. Both facilities are similar in construction. The facilities have four entrances and exits out of which only two are being used. They have six intakes and exhausts covered with small constructions. Both have double fences for physical security. Nothing else is seen over ground suggesting an automated access control system or a computer based security system. The Army Strategic Forces Command (ASFC) formations are co-located for safety, security, training and administrative assistance. No TEL garages or high bay garages are observed in these facilities. These complexes are very well camouflaged to avoid detection. The transportation to and from these facilities can be made either by road or by air since both locations are in the proximity of small airstrips which can be made operational almost at will and the roads have been widened and black topped.

fact seems to have been well spent on construction of these two facilities.



Weapons storage complex at Hyderabad (Google Earth)

Sargodha

The facility has six tunnels complete and three more under construction. The tunnel entrances are at different elevations from 250 m to 220 m. It is assessed that this facility is likely to be a large one inside with multi-storied constructions evidenced by different levels of elevations of the tunnel entrances. The entrances of tunnels vary in width from 6 m to 9 m. These tunnels are located inside an ammunition depot.

The depot has special garages large enough for TELs to be stored. The size and number of these TEL garages suggests the facility is having a minimum of 30-60 nuclear weapons that can be kept at a higher state of alertness. The ammunition depot is served by four rail tracks converging into one outside the facility and is in close proximity of a major PAF air base. Chinese engineers are known to have assisted the tunneling in Kirana Hills in the early 1990s. The increase in number of tunnels in this facility within a short span of time indicates the convenience of this complex as a storage location in Pakistan's nuclear game plan.



Weapons storage bunkers at Kuzdar (Google Earth)

The Bush administration had spent almost \$100 million on a highly classified program (from 2001-2007) to help Gen. Pervez Musharraf (Retired), Pakistan's President at the time, secure his country's nuclear weapons. Much of this money was spent on physical security, like fencing and surveillance systems, and equipment for tracking nuclear material if it left secure areas. 7 The money in



Two images depicting UGF complexes at Sarghoda. The upper image depicts three complexes under construction (Google Earth)

Havelian

This complex is located inside another ammunition depot. There are 17 hardened TEL garages at this facility out of which nine are connected by rail. Four hardened TEL garages also have launch pads next to them. There are five tunnel entrances. The entrances are especially hardened at different elevations. They also have special round earth domes (5m diameter) possibly containing explosive charges to reduce effect of earth penetrating bombs. This facility may contain approximately 90-100 weapons in a higher

state of readiness. The tunneled area is double fenced with inner fence partially complete solid fence. The complex is served by rail and road. It has taken a very long time to construct this facility indicating the amount of area that is available inside these tunnels.



Probable TEL bunker at Havelian with adjacent concrete pad (Google Earth)



Havelian UGF complex (Google Earth)

Karachi

The facility, although very close to a major city, is not connected by road, rail or air. The facility is constructed with a far more secure layout. The complete area has double fences with the inner one being a solid fence.

The security arrangements are on par with any ammunition depot. Although the facility is located very close to a main highway it is higher preventing visual observation to any passerby. There are six tunnels with entrances against the lie of the ground. This assists in making air raids more difficult to execute. The four recently constructed tunnels indicate progress in improving the existing facility. The area in front of the old tunnels can be used for launches. The facility is very well camouflaged.

The construction material in this complex is kept away from the tunnels to avoid detection. This area is likely to be developed at a later stage to locate ASFC formations.



UGF complex at Karachi (Google Earth)



UGF entrance at Kori (Google Earth)

Kori

This particular facility is under construction, possibly with the aid of Chinese technology or personnel. The three entrances are of particular significance. They are very long when compared to such facilities worldwide. The entrances' length is 60 m. The openings at entrances are obviously very high above the road level. The top of the tunnel entrance is almost 60m wide and the road entering is 10-15m wide. The advantage such a tunnel entrance would have is that it would be extremely difficult for a PGM to maneuver to effectively shut it down. The tunnel entrances are also facing a different direction than the lay of the mountain range making air operations against this facility further complicated. The tunnel entrances in all probability are likely to be covered exactly like the Havelian facility.

Khenji

This facility is similar to one at Kori except for an extra fourth entrance. The widths of the entrances vary from 10 to 16m. Evidence of construction material and soil excavation indicates a large space is available inside these tunnels. It is assessed that these too will be covered as in the Havelian facility and may have ASFC units located nearby.

Bhanaka

This location in the Keri ranges is an archaeological place of religious importance to Buddhists. Presently Pakistan has a probable nuclear storage facility under construction at this location. A very hectic construction and tunneling activity is in progress. A large amount of construction material and equipment is observed. There are three tunnels nearing completion and two in early stages. The entrances are 7-12m in width. There are tracks leading up the mountain possibly for physical security. The large numbers of buildings constructed at its base are similar to those at Tarnawah complex. The area is one of the safest from Pakistan's internal security

point of view. The ASFC location at Kallar Kahar is also very close by. The complex can be accessed by road alone.



UGF complex at Bhanaka; two tunnels are under construction (Google Earth)

Khwera, Rakh Jalalpur

This complex is very well camouflaged and difficult to locate from the air. The complex is in early stage of construction. This facility is likely to have some tunneled areas and some over ground structures. There are five tunnel entrances.



Khwera UGF complex (Google Earth)

There are eleven emplacements like the ones at Havelian, mostly along the border of the facility. One of them has been obliterated. Two completed buildings appear to be TEL garages with open space outside for quick launch. The complex being very large in size (almost 1.5x2.5 sq km) and is likely to be developed as a large ASFC Depot.

Quetta

The facility is physically secured with double fences as is usually observed at most of Pakistani ammunition depots. The area in the South of the complex has seven small tunnels. There is a road perpendicular to the entrances of these seven tunnels. No activity has been observed indicating that the facility probably does not contain nuclear weapons as of now. The ammunition depot has a large number of other structures which may contain missile components but are not large enough to contain TELs. The facility is accessed by rail and road.



Quetta possible weapons storage area (Google Earth)

Deception

Tunneling at Dhok Khilri has been underway for a very long time. No other constructions or physical security features are observed around it. Work progress is extremely slow compared to other sites. The location seems to be a deception measure

used to avoid detection or monitoring of main facilities. This may also be a spare facility to cater for any special contingencies envisaged.



Tunneling activity at Dhok Khilri (Google Earth)

The historical imagery is extremely useful in multi-temporal study of these complexes at various stages of construction. The soil outputs from the tunneled facilities suggest constructions are large enough for storage of at least a thousand warheads (road mobile, rail mobile and air delivered). The type of construction and the connectivity by rail, road and air suggests the type of nuclear arsenal a complex may be containing as also the state of alertness. The launch from any of these complexes will target most of major cities in India. Such a large nuclear arsenal will create havoc, if it falls into uncouth hands.

Nuclear Surety

It is not known if Pakistan has any Nuclear Surety Program existing or planned. No emergency drills have been verified with the public at large. The authority and accountability of the nuclear arsenal remains vague at its best. The personal management and reliability is questionable considering the present internal security situation and past track record. The Pakistani government's reliance on hardening and physically securing these sites will not necessarily ensure the safety and security of its nuclear arsenal.

There is much credence to the theory of proliferation to non-state actors or terrorists. A failed or rouge state may resort to coercive or blackmailing tactics.

Pakistani universities teach subjects like nuclear electronics and metallurgy with great emphasis on practical learning. It is surprising to note that even small universities like Allama Iqbal Open University of Aza Khel has a department of Nuclear Sciences along with Department of Hadith and Seerah and Department of Islamic Thought, Islamic Law and Jurisprudence. The students in such universities are generally from the lower middle class who are imbued with religious-based animosity towards India, Israel and the USA. A Q Khan, Bashir-ud-Din Mahmood and the likes will not hesitate to proliferate at the slightest theological stimulus. The complete issue is topped by the corrupt political leadership under the strict rule of the Pakistani Armed Forces.

Almost all Pakistani PMs and Presidents have beaten the drum of the Indian threat whenever there was slightest of danger to their governments. General (Retired) Musharraf has disarmed India a number of times by threatening the first use of Pakistan's nuclear arsenal. In Pakistan, it can be safely said, deterrence pessimism reigns supreme. Pakistan must assure the international community the safety, security, and surety of its nuclear arsenal. The least Pakistan can do is to promulgate "No First Use" policy as law.

Historical Perspective

SAM Site Analysis

Sean O'Connor

Historical imagery databases provide the opportunity to conduct temporal analysis of SAM site locations. Temporal analysis involves analyzing changes in equipment, status, or infrastructure over a defined period. Such analysis is useful in determining the operational status of a given SAM battery and can aid in the analysis of a nation's overall readiness.

Establishing a Baseline

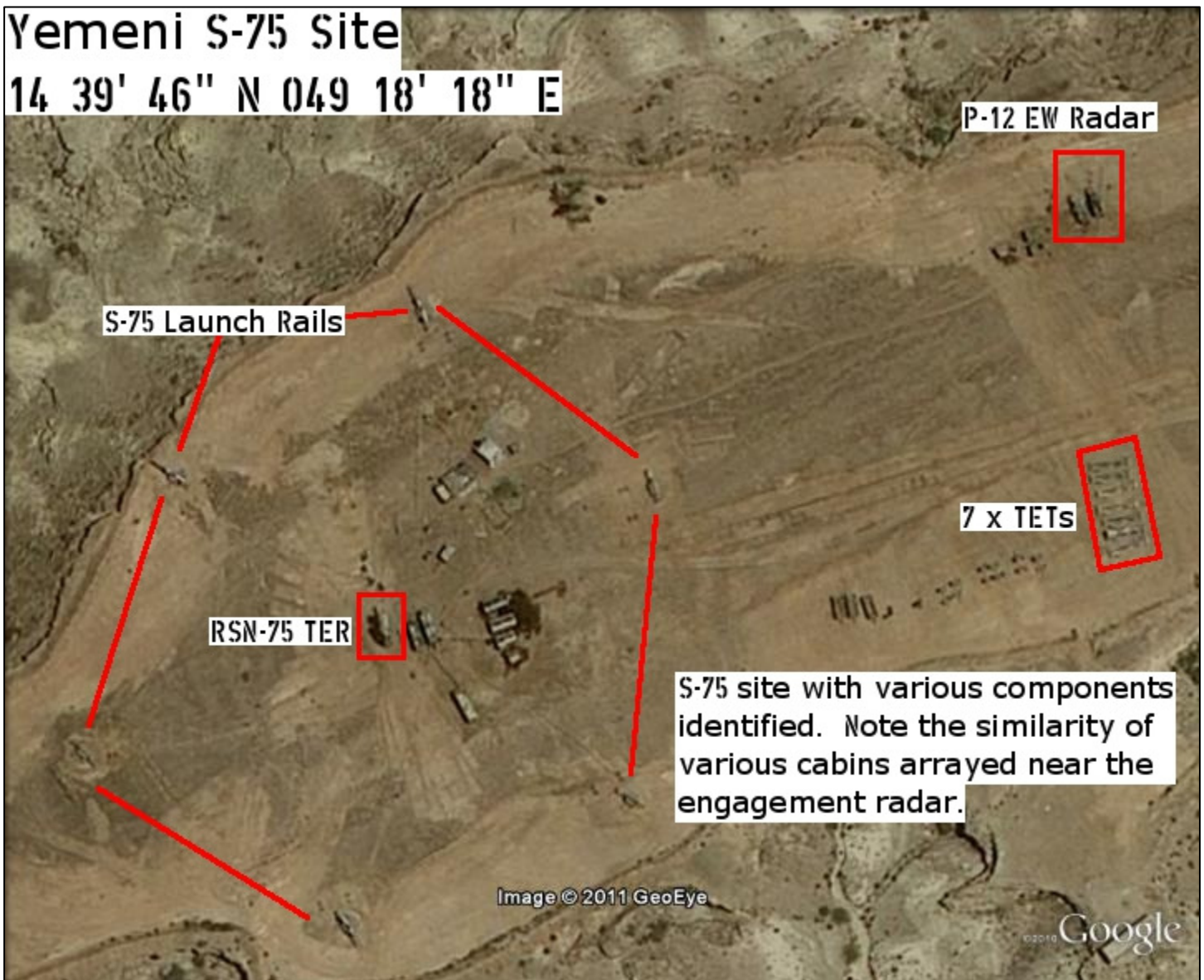
To conduct temporal analysis of a given site, a baseline must be determined. The baseline represents the temporal point of origin for the analytical process. It provides the analyst with a starting point to make future comparisons.

Identification

The most significant component of any imagery-based analysis of a SAM site is to identify the location and system components. Accurate identification of components is critical to determining the composition of a sited battery.

Component identification of a SAM battery should focus on critical system elements such as engagement radars, launchers or TELs, and co-located early warning sensors. The engagement radar is typically the most critical component of a given SAM battery. If the engagement radar is absent, the battery cannot function in an air defense capacity.

Open source imagery resolution is often unsuitable for the identification of support components such as power generation vans or control vans. However, such components may still be identifiable. For example, an analyst can identify power sources by identifying distribution cables.



Identifying present components will allow the analyst to determine if the battery is operating at full strength. A full-strength S-300PS (SA-10B GRUMBLE) battery deployed by the Russian military typically features eight 5P85S/D TELs. If fewer than eight TELs reside at a given location, the battery is likely operating at a reduced capacity. In this manner, it is important for the analyst to be aware of a given system's standard operational complement within the country of operation.

Temporal Analysis

Once a baseline is established and component identification is completed, the examination of subsequent imagery allows the analyst to construct a temporal image of the activity at the location. Temporal analysis involves re-examining subsequent imagery of a given site to discern any equipment or status changes.

For an example of temporal data, consider the following series of images:



Russian S-300PS battery in Kaliningrad. Four 5P85S/D TELs are present, indicating a battery operating at reduced strength (Google Earth)



Active Syrian S-125 (SA-3 GOA) site imaged in February of 2000 (Google Earth)



Full-strength Russian S-300PS battery sited south of Vladivostok (Google Earth)



When imaged in September of 2003, the S-125 battery was no longer present at the site (Google Earth)



October 2006 imagery depicts an S-125 battery once again residing at the site; the southeast revetment has also been partially razed (Google Earth)



Imagery captured in May of 2007 once again depicts an inactive site (Google Earth)

The preceding series of images provides a comprehensive set of data regarding the site in question. Analysis of the operational site in 2000 and 2006 provides insight into the composition of a typical Syrian S-125 battery. Furthermore, when combined with similar analysis of other Syrian air defense sites, rotation of batteries between sites is a logical assessment. This example highlights the value of temporal analysis beyond merely documenting deployed assets: it can also provide insight into operational strategies and tactics.

Book Review

Biohazard

Sean O'Connor

In 1999 Dr. Ken Alibek, formerly Kanatjan Alibekov of the USSR's Biopreparat, authored one of the most chilling and revealing volumes on biological warfare yet published. *Biohazard* is not an examination of biological warfare, nor is it a reference work detailing various disease strains weaponized during the Cold War. *Biohazard* is far more disturbing: it is a look inside the Soviet Union's biological warfare program, authored by one of its chief architects.

Biohazard focuses less on the warfare programs and more on the administration and the system that fostered such an entity in the first place. There are many references to test programs and weapons concepts, but the majority of the text is devoted to describing the relations and workings inside of the wide-reaching apparatus.

Biohazard reads like a biography, with Dr. Alibek's first-person style expressing his thoughts and experiences in clear and concise terms. The reader is able to discern his growing displeasure with the Soviet system and the Biopreparat apparatus. Especially insightful is Dr. Alibek's account of the breakup of the Soviet Union.

Biohazard is a well-written look inside of one of the most secretive weapons programs of the Cold War. While a perceived lack of attention to the actual products of Biopreparat may discourage some readers, Dr. Alibek's story alone is more than worth the read. *Biohazard* is highly recommended.

Links

May 2011

Sean O'Connor

The U.S. Department of Defense maintains a valuable website useful for analysts of various disciplines. The website

features links to numerous online resources, including news items, leadership biographies, and photograph collections.

Perhaps the most pertinent items available to the public are press releases, along with their accompanying supporting information. The Press section of the DoD website offers readers complete transcripts of DoD press briefings. The 2 May briefing regarding the Osama Bin Laden raid, for example, includes the complete set of supporting declassified imagery, which is exploited in this issue of I&A as the cover image and an image in the Current Events feature.

The DoD website can be accessed at the following link: <http://www.defense.gov> The only potential drawback to the DoD site is that non-US users may find themselves barred from accessing certain resources. All in all, however, the DoD site is a useful resource, particularly pertaining to current military operations.

[Source List](#)

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Overhead imagery courtesy of Google Earth; exceptions are explicitly noted in image captions or as image annotations. All annotations and overlays depicted on such imagery are the work of the respective article's author unless explicitly noted.

Pakistan and Bin Laden

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Facility map and imagery captions by Sean O'Connor

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SAM Site Analysis

SAM site locations and range data sourced from the Worldwide SAM Site Overview KML file available at *IMINT & Analysis*. Historical analysis supported by Google Earth's Historical Imagery database.

Biohazard

Title reviewed sourced directly from the author's personal library.



What Is It? – May 2011

The ability to identify objects, locations, and activity in overhead imagery is an acquired skill, and like many acquired skills, it can degrade with time. Readers are encouraged to apply their analytical abilities and attempt to determine the answer to the question “what is it?”

The answer to the current “What Is It” will appear in this space next month, along with a detailed explanation of the analysis used to arrive at the proper answer.

What Is It? – April 2011

Last month’s What Is It? featured China’s carrier mockup at Wuhan. The facility resembles the ex-Ukrainian *Varyag* currently undergoing refit for the PLAN at Dalian. The primary giveaway to the facility’s identification is the adoption of the *Varyag*’s layout. The facility represents a 1:1 scale mockup of *Varyag*; a length of approximately 305 meters corresponds exactly with that of the ex-Ukrainian vessel. The overall layout and presence of aircraft mockups indicate that the Wuhan facility is likely to serve in a training capacity for future PLAN carrier crews. Without a doubt, the presence of the *Varyag*, the Wuhan mockup, and aircrew training facilities at various locations indicate that China is serious about operating an aircraft carrier.