Jane's Defence Weekly

Access denial - Syria's air defence network

While the 2013 air strikes carried out by Israel against targets in Syria seemingly belie recent improvements in the country's air defences, the strike pattern suggests the Israelis have a new respect for the upgraded network. Sean O'Connor reports

An undated photograph from the Syrian Arab News Agency shows a 2K12 Kub mobile SAM system. (SANA)

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With nearly 200 active surface-to-air missile (SAM) batteries and early warning (EW) complexes, Syria has the largest integrated air defence system (IADS) in the Middle East. Several of these sites have been overrun since 2012, yet the current insurgency represents only a limited threat to the

integrity of the Syrian IADS as the majority of the SAM and EW assets are deployed in government-controlled areas.

While a series of Israeli air strikes carried out in 2013 ostensibly appeared to highlight the weaknesses of Syria's air defences, they actually indicate a renewed respect for the Syrian IADS. Information provided to the media from anonymous US government officials and other sources suggests these airstrikes involved weapons launched from outside of Syrian territory, in contrast to the long-range deep penetration that Israeli aircraft carried out in September 2007.

With Syria's air defence capabilities continuing to improve following the delivery of advanced Russian and Chinese air defence components, its ability to control its airspace will increase, making any airspace violation a far more dangerous prospect. Recent advances represent a possible contributing factor behind the West's unwillingness to commit to military action against Syria, with its advanced mobile SAM systems representing pop-up threats to potential no-fly zone enforcement action.

Soviet-era assets

Controlled by the Syrian Air Defence Command headquarters in Damascus, the Syrian IADS continues to rely heavily on Soviet-era SAMs and radars. The delivery of the first strategic SAMs to Syria is difficult to pinpoint. SIPRI's *Arms Trade Register* lists 1967 as the initial delivery date for S-75 (SA-2 'Guideline')-series systems, while arms transfer registers from the USSR indicate an initial delivery in 1971. S-125 (SA-3 'Goa') delivery is even more disparate, with SIPRI reporting initial delivery in 1971 and Soviet documentation reporting 1979.

Further confusion surrounds the arrival of the long-range S-200VE (SA-5 'Gammon') SAM systems. Soviet documentation suggests delivery commenced in 1984, but published interviews with Soviet officers assigned to initially maintain the S-200VE batteries claimed they were in Syria from 1983. This discrepancy can be explained by the fact that Soviet crews operated the batteries initially as Syrian crews underwent training in Russia, with the actual handover taking place in 1984.

As with many Middle Eastern nations, Syria employs tactical SAMs - highly mobile shorter-range systems designed to accompany armoured units during combat - as strategic systems to defend fixed points or key airspace regions. Satellite imagery shows that there are 42 2K12 Kub (SA-6 'Gainful') batteries at prepared sites in Syria.

Syria's EW network primarily relies on Soviet-era EW radars. *IHS Jane's* has identified 27 EW complexes that rely on the aging P-12/18 ('Spoon Rest') radar system. The remainders operate a mix of longer-range EW systems such as the P-14 ('Tall King') and P-35/37 ('Bar Lock') series. PRV-11 ('Side Net') height-finding radars, complementing other 2D sensors such as the P-12/18, provide altitude co-ordinates necessary for a three-dimensional intercept plot for SAM cueing or guiding fighter aircraft to intercept targets. Few PRV-11s are identifiable in imagery due to the small antenna signature, but are likely present in greater numbers than indicated.

Additionally, P-12/18, P-14, P-15, and P-19 radar systems are deployed with strategic SAM systems to serve as battery-level target-acquisition assets. Typical observed deployments include one P-12/18 or P-15 and one PRV-11 per S-75 or S-125 battery and one P-14 per S-200 complex.

In addition, Syria has Soviet-era mobile short-range air defence (SHORAD) systems in the form of the infrared-guided 9K35 Strela-10 (SA-13 'Gopher') and command-guided 9K33 Osa (SA-8 'Gecko'). These are supplemented by hundreds of anti-aircraft artillery (AAA) guns and shoulder-fired SAMs. All these systems represent a threat to low-flying aircraft and helicopters, thus providing a comparatively cheap force multiplier.

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Revitalisation

It has often been said that Syria began to upgrade its IADS after the Israel Air Force (IAF) destroyed the nuclear reactor it was constructing in Dayr al-Zawr province in September 2007 (see Operation 'Orchard' box). In fact, contracts for new systems had already been signed and initial deliveries of some systems had begun by that date. Moscow's decision to write off nearly 80% of Syria's Soviet-era debt in 2005 may well have been the main driving factor behind the new arms deals.

The modernisation efforts focused on upgrading both SAM capability and the EW network. SAM imports had resumed by August 2007, when the Russian press reported that the first 96K6E Pantsyr-S1E (SA-22 'Greyhound') SHORAD systems were delivered. In 2011, delivery of 9K40 Buk-M2E (SA-17 'Grizzly') tactical SAM systems commenced. Some Syrian S-125 batteries were upgraded to the mobile Pechora-2M standard.

The Pantsyr-S1E system combines command-guided missiles with twin 30 mm guns. It can shoot down incoming precision-guided munitions and is useful for defending key installations or weapon systems. Russia, for example, employs it as close-in defence for its S-400 SAM batteries. The Buk-M2E, meanwhile, represents the first medium-range, multiple-target capability in Syria's IADS.

While the Pantsyr-S1E and Buk-M2E are highly capable tactical SAM systems, a longer-range strategic SAM system was required. The Syrians upgraded some of their S-125 systems to the mobile, digitalised Pechora-2M standard, but this did not significantly increase the capability of the overall network. To substantially increase capability, Syria ordered the long-range S-300P-series system.

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Strengths and weaknesses

The new Russian SAM and Chinese radars have several advantages in addition to their ability to engage multiple targets. Importantly, they have not as yet been encountered by Western militaries in combat. As comparative unknowns, the systems represent far more dangerous threats to any incursions into Syrian airspace. Indeed, China remains a world leader in cyber warfare and as such is in position to develop systems hardened against network-centric warfare techniques.

The new systems are also more survivable because they are highly mobile. No permanent Pantrys-S1E or Buk-M2E sites have so far been identified in satellite imagery, although videos filmed by opposition activists suggest one Buk-M2E fire unit may be at least semi-permanently deployed at Al-

Mazzah (Mezze) Air Base near Damascus. Similarly, satellite imagery shows that the Pechora-2Ms are being moved between pre-prepared sites. This is part of a wider trend that has seen the Syrian Air Defence Command take advantage of the 129 prepared, but inactive SAM sites around the country to periodically move its assets. There have been numerous examples of this, with SAMs often being deployed at sites that were prepared for a different system. A site south of Latakia, for example, has hosted S-75, S-125, and Pechora-2M batteries at various points since 2003. This raises doubts in the minds of hostile planners and significantly enhances system survivability during combat.

However, there are still numerous deficiencies in the Syrian IADS that could be exploited by adversaries. Some of these are beyond Syria's control, terrain being the most significant one. The mountains of western and southern Syria produce blind zones in its EW coverage and limit the effectiveness of SAM engagement radars to identify targets, particularly at lower altitudes. This means that hostile aircraft could use 'terrain masking' where they put high ground between themselves and a SAM battery's radar systems. For example, aircraft flying on the eastern side of the Alawiyin Mountains that run inland from Syria's Mediterranean coast would be masked from engagement by SAM positions on the western side of the mountains.

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Conflict degradation

The ongoing civil war within Syria potentially represents a threat to the overall network's integrity. Since 2012, insurgent attacks on at least eight Syrian military positions have compromised air defence assets in the form of SAM batteries, EW complexes, or equipment garrisons. However, there is no evidence that any of Syria's new SAM systems have been compromised and none of the SAM losses significantly degrade Syria's overall IADS posture as they occurred in regions still covered by multiple SAM batteries.

Arguably the worst losses were suffered towards the end of 2012, when the two of the EW complexes in northwest Syria that overlook Turkey's Hatay province were overrun by insurgents. It is unclear whether the Syrian military has been able to return these sites to an operational status.

More air defence sites remain at risk in the insurgent strongholds near the northwestern border with Turkey in Aleppo province and along the southern border with Jordan in Daraa province. Potential losses in these areas include seven S-75 batteries, four S-125 batteries, and five 2K12 batteries, along with ten EW complexes, including one Type 120 and two JY-27 radar positions.

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Israeli incursions

The Israel Air Force (IAF) began a series of air strikes in 2013 that reportedly targeted weapons systems that Syria was transferring to its Lebanese ally Hizbullah. These air strikes all struck targets in areas largely controlled by pro-government forces.

A still from Syrian state television shows the three Osa SAM systems that were apparently destroyed in a 30 January Israeli air strike at the Jamraya military research facility outside Damascus.1482400A still from Syrian state television shows the three Osa SAM systems that were apparently destroyed in a 30 January Israeli air strike at the Jamraya military research facility outside Damascus. (Syrian television)

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The first was carried out on 30 January 2013, when vehicles were destroyed at the Al-Jamraya Research Centre just northwest of Damascus. Western media reports cited unnamed US officials as saying Buk-M2E mounted on transporters had been targeted before they could be driven across the border into Lebanon. In contrast, Syrian television showed footage of 9K33 Osa SHORAD systems and a number of transport trailers that had been destroyed in the air strike.

Even if the Syrians removed Buk-M2E components from these trailers after the air strike, the presence of the SAMs would not have been indicative of an intention to transfer them outside of Syria. Tracked vehicles that are capable of severely damaging paved roads are often transported on trailers and this has been seen with Syrian Buk-M2Es heading towards Al-Mazzah Air Base west of Damascus.

At the same time, Hizbullah would not be able to operate and maintain complex systems such as Buk-M2E SAMs on its own. Furthermore, the transfer of that system to Hizbullah would put Russia under far more international pressure to discontinue arms deliveries to Syria and to concede to a UN arms embargo on the Arab country. There are other possible explanations: Syrian may have intended to deploy Buk-M2E batteries to Lebanon to defend Hizbullah positions and/or challenge the Israeli aircraft that currently operate over Lebanon with impunity, or to transfer the less sophisticated Osa SAM systems to Hizbullah.

A series of airstrikes in early May 2013 appeared to have been directed at Hizbullah-oriented weapon systems. According to an unidentified US official quoted by *The New York Times* , the first strike on 3 May targeted Iranian-supplied Fateh-110 surface-to-surface missiles (SSMs) under the

control of Iranian Quds Force and Hizbullah personnel. The Fateh-110 is a far less sophisticated weapon system than the Buk-M2E and potentially could be operated by Hizbullah personnel.

Another Israeli air strike destroyed a compound near the northern port of Latakia in July 2013. Unnamed US officials told both *The New York Times* and *The Guardian* that the strike targeted long-range Yakhont anti-ship missiles. Although these have been in Syria's arsenal since 2007, the officials said the strike was likely a response to recent Russian deliveries of Yakhonts with upgraded radars. *The New York Times* also reported Israeli fears that the missiles would be transferred to Hizbullah, which used Iranian-sourced anti-ship missiles to strike an Israeli Navy vessel in 2006.

Some uncertainty exists over the attack method and the overall success of the Latakia strike, with some reports claiming that submarine-launched cruise missiles rather than air-launched weapons may have been used. In August 2013, *The New York Times* cited US officials as saying that that at least some of the Yakhonts were removed from the site prior to the strike. In January,*The Wall Street Journal* reported that Yakhont components (as well as Syria's longest-range Scud-D ballistic missiles) had been smuggled to Hizbullah, although the group was not believed to have all a complete system as yet.

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Future outlook

The IAF's unwillingness to enter Syria's airspace indicates that its efforts to improve its IADS have been successful. Furthermore, the incorporation of modern Chinese radar systems following the 2007 incursion suggests a more robust EW network is being established, designed to limit the effectiveness of any network-centric warfare attempts to degrade it. At the same time, the more strikes that the IAF carries out, the better the chances of the Syrian Air Defence Command predicting future strikes. In doing so, the command has the ability to relocate advanced mobile systems such as the Buk-M2E and Pantsyr-S1E in an attempt to successfully repel hostile action.

The network will be further improved by the incorporation of the S-300P-series system. This would complement the modernised and advanced short- and medium-range systems already in Syria and replace the aged S-200 as the primary long-range strategic air defence weapon.

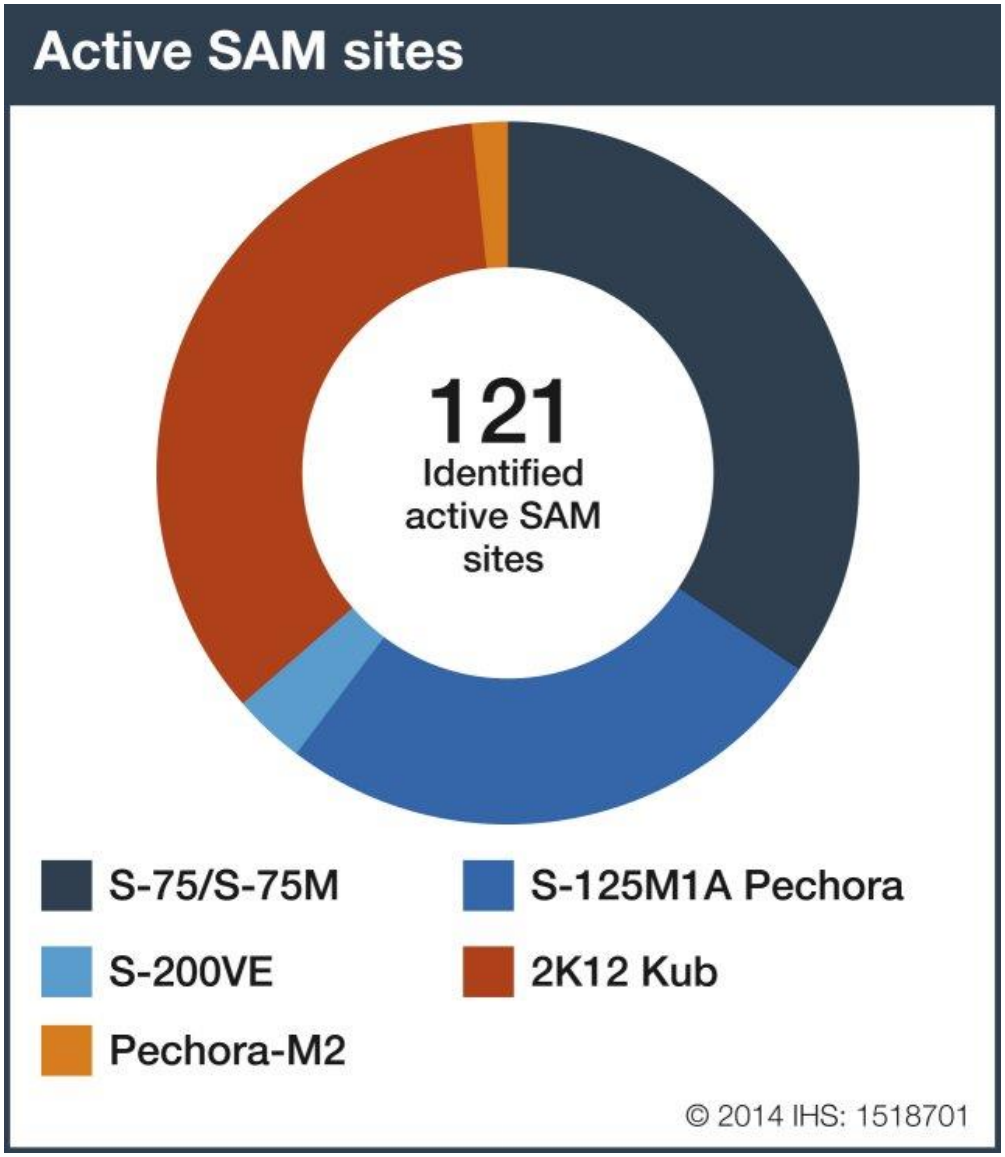
Some reports have been dismissive of the impact that the S-300P series would make. *World Tribune* cited an anonymous Israeli official in July 2001 as saying that Israel possessed indigenously developed countermeasures that were designed to defeat S-300 series systems. In 2008, *The Jerusalem Post* quoted an anonymous Israeli defence official who claimed that, if Iran received the S-300, electronic warfare systems designed to defeat it would be developed and deployed: a statement that appeared to contradict the 2001 assertion.

Both the US and Israel have nonetheless repeatedly tried to pressure Russia into not supplying the systems to either Syria or Iran. This worked in Iran's case, when Russia cancelled a contract after the imposition of a UN arms embargo on the Islamic Republic in 2010.

The situation with the S-300PMU-2 systems that Syria has ordered has been less clear. In January 2014, the Russian newspaper*Kommersant* reported that the delivery of S-300P series to Syria had begun. In May, *The Wall Street Journal* reported that Israeli officials had warned the US that Syria

was making initial payments for the system under a USD900 million contract signed in 2010. Secretary of State John Kerry expressed concern about the possible transfer of the system a few days later. "We have previously stated that the missiles, particularly the [S-300], is potentially destabilising with respect to the state of Israel," he said on 9 May. In August, the Russian media cited the annual report released by Avangard, which is part of the Almaz-Antey group that makes the system, as saying that the delivery of S-300PMU-2s to client 760 (code for Syria) had been delayed. Some 48N6E2 missiles had apparently been delivered, but the second batch had been put back to June 2014. Russian president Vladimir Putin confirmed the delay in September, when he stated: "We have delivered separate components but the whole delivery has not been completed and for the moment we have suspended it."

That does not mean that Syria will not get its S-300PMU-2. The system appears to have become a diplomatic bargaining chip between the Russia and US, and with the latter thinking about increasing its support for the Syrian opposition, the former may decide that President Bashar al-Assad needs additional ways to protect itself against foreign military intervention.



Syria's SAM sites (IHS)

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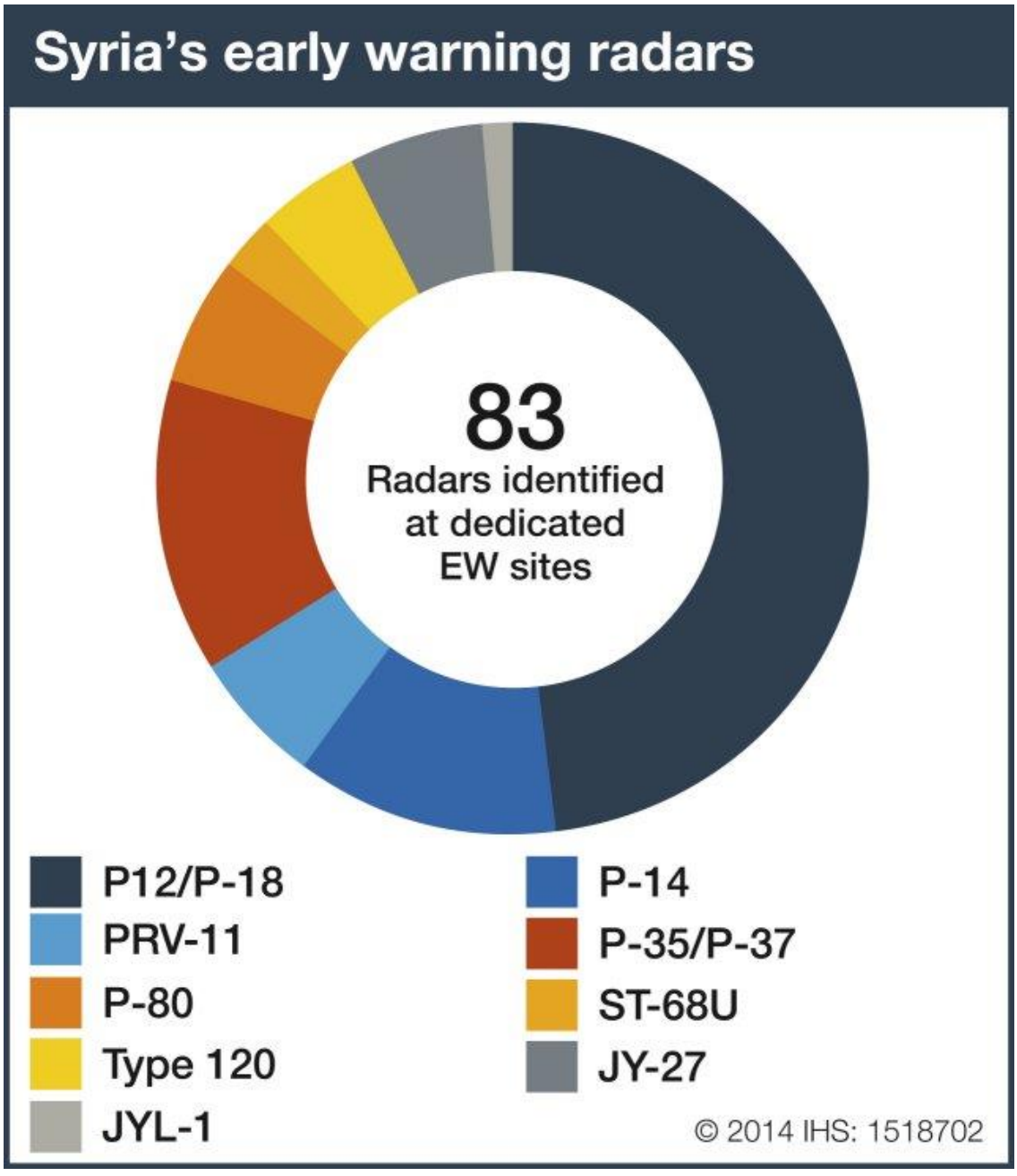

Syria's early warning radars (IHS)

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OPERATION 'ORCHARD'Israel conducted Operation 'Orchard' on 6 September 2007: a long-range bombing raid on a nuclear reactor being constructed north of Dayr al-Zawr in central Syria.
The F-15I and F-16I fighters relied primarily on electronic countermeasures to evade Syrian air defences inbound to the target, according to a media report published a month later. Industry and retired military sources indicated to the magazine that the IAF used something similar to the United States' Project 'Suter' network attack system, which supposedly allowed it to interfere with the operation and effectiveness of Syria's IADS. If this was the case, EW complexes within Turkey would also likely have been affected as the subsequent discovery of drop tanks near Hassa showed that Israeli aircraft transited Turkish airspace at least on their outbound leg.

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