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The Headlines of Today. The Battles of Tomorrow.

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## 'Peeling the Onion', IAF Style



### Pantsir-S1 Weapon System.

Western air forces face a growing threat of A2/AD capabilities that threatens the hard-won air superiority that has characterised the western way of war for the past three decades.

The SAM threat has evolved from the crushing defeat experienced by Iraq in 1991, where US stealth fighters, cruise missiles and SEAD tactics honed since

Vietnam, made short work of the Iraqi C3/IADS system (supplied by the French KARI) and highly lethal Russian-built integrated air defence system (Radars and SAM units). At that time, the coalition partners worked closely with KARI's original supplier to identify and exploit vulnerabilities in the system, incl. tapping communication nodes.

The implications of how (comparatively) easily the US coalition had taken down a Warsaw Pact-style IADS in Iraq was thus a wake-up call to Moscow in developing more lethal and survivable SAM systems in a multi-layered, highly mobile IADS. Even by 1999, the experience of NATO vs Serbia showed how that a resourceful adversary could use

older SAM systems to even shoot down a F-117 stealth platform – a reminder that LO platforms are not invulnerable.

Today, these A2/AD threats have intensified with the introduction of 'triple digit' SAM systems such as Russia's S-300V4 (SA-23) S-400 (SA-21) and

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**Russia is resupplying the Syrian Army with S-300 systems.**

China's HQ-9. These systems, which are made up of multiple launchers, are highly mobile and use a range of missiles to be able to engage aerial targets as far away as 400km (250nm). Using new radars and digital fire control systems, they are also much more resistant to electronic warfare (EW) attacks such as jamming or spoofing than previous generations of SAMs. It is important to remember that these batteries, such as the S-400, also do not deploy alone – but will be protected by shorter-range SAMs such as the Tor M1 & M2 or SA-22 Pantsir – able to swat precision guided

munitions (PGM) or cruise missiles out of the sky.

IADS themselves are not new – but the speed of modern computers and datalinks now enables not a just shared picture of the battlespace between radars, SAMs, AWACS and fighters – but also can theoretically allow the latest SAMs to 'cross cue' each other, eliminating the effect of radar horizons or terrain. Thus, a long-range SAM could shoot at a target, cued by another systems radar, without ever detecting or tracking it using its own radars. This means that modern IADS represent a far tougher set of targets to suppress or destroy

– with more nodes to take into account and the possibility of 'pop-up' threats being a constant concern for pilots over any air campaign.

Traditional Western SEAD (suppression of air defences) DEAD (destruction of air defences) tactics are thus fast evolving to match this threat – with high-speed antiradiation missiles (HARMs) now part of a wide set of tools that include deception, jamming, drones, decoys, stealth and long-range stand-off weapons. It may be, for example, not necessary for a SAM system to be destroyed if it can be otherwise kept off the air and prevented from emitting.

For air force operational planners, who are tasked with taking down a modern IADS or 'peeling the onion' as it is sometimes described, a large part of the task now is in ISTAR (intelligence, surveillance, targeting and reconnaissance) and in 'electronic preparation of the battlefield' – that is to say, using multiple sensor platforms to identify, locate and target these highly mobile SAMs and piece together the parts of the IADS. It is unlikely that any

professional SAM operator will radiate unnecessarily, so instead this becomes a battle of wits, to trick or provoke a radar into revealing itself. Meanwhile, if time sensitive targets (for example weapon convoys or high-value individuals) are the strategic objective, building the intelligence picture and electronic order of battle will also become a race to narrow down and locate these mobile SAMs and destroy, degrade or neutralise them before they are able to relocate elsewhere.

Finally, these Russian and Chinese-built SAMs are not just a concern for large-scale peer-on-peer conflict in the Baltics or South China Sea. Russia has deployed its S-400 to its Syrian ally and the SAM has been exported to other nations including, Belarus, China India, Saudi Arabia and most controversially, Turkey – a causing a massive spilt with the US. Meanwhile China's HQ-9 has been exported to Morocco, Turkmenistan and Uzbekistan. The global proliferation of these advanced SAMs thus means that countering them will be a key challenge for many air forces in the 21st century



**Israeli Heron Drone.**

“The Israeli Air Force (technically now the Israel air and Space Force) has long experience in how to deal with surface to air missiles and IADS.”

– especially those that lack the extensive range of EW, SEAD and DEAD platforms and weapons that the US can boast.

## New weapons, new capabilities

The Israeli Air Force (technically now the Israel air and Space Force) has long experience in how to deal with surface to air missiles and IADS. It was, the first air force in the 1973 Yom Kippur War that encountered a new generation of mobile SAMs that had kept up with Egyptian tanks and which took a toll of Israeli pilots.

The country's small size and location wedged in between Arab states has focused minds – not just in the threat of land invasion through the past 70 years – but now of the new long-range ‘triple digit’ SAM systems such as the S-300V4/S-400/HQ-9 that can extend their WEZ (weapons engagement zones) far into a neighbouring country's airspace as part of a A2/AD strategy. Though the effectiveness of these SAMs falls off at longer ranges

and is dependant how high a target is flying, the capability of an adversary to erect a lethal SAM umbrella over your own airfields is disconcerting and requires extra planning and precautions. Russia's deployment of its own S-400 SAM in Syria to Latakia in 2015 has also undoubtedly focussed planners' minds in Israel and elsewhere on the challenges of today's A2/AD umbrellas.

The IAF then, has acquired a range of capabilities to counter SAMs and air defences. In 1982, in Operation Mole Cricket 19, the IAF used UAVs and electronic warfare to neutralise a Russian-built Syrian SAM network that less than 10 years earlier had surprised them. This expertise has been honed and refined by Israel over the past 30 years or so – in operations against Hezbollah, Hamas and in interdicting a build-up of Iranian weapons and support in neighbouring Syria, as well as strikes in Sudan. However, in 2018, the IAF suffered its first aircraft SAM loss since 1982, when an F-16I was shot down by a Syrian SA-3 Goa – a reminder that even



older SAM systems need to be respected.

One interesting SEAD capability that Israel has pioneered is cyber attacks. In 2007, the IAF attacked a suspected Syrian nuclear facility – seemingly penetrating high-threat airspace and Syria's IADS at will to set back the Assad regime's nuclear programme. Speculation from analysts is that this attack saw the use of a 'Suter'- style electronic cyber-attack – which unlike traditional jamming – enters the air defence computer network to insert false targets or confuse the enemy. It can even, according to one quote, make a SAM system think it is a washing machine. However, some informed observers speculate that, though effective, it may be a 'one-shot' style attack on an IADS – as once

known, cyber vulnerabilities are easily patched.

The Israeli Defence Forces have also fielded 'Kamikaze' anti-radar drones with the IAI Harop – a development of the Harpy. Unlike rocket-powered anti-radar missiles, the piston engine-powered Harop is able to loiter around for up to six hours and wait for threat radars to emit – before homing in onto the emissions to destroy the SAM. This effectively negates a key tactic used by SAM operators of switching radars off and on to reduce their exposure to being hunted by Wild Weasel SEAD aircraft.

Israel has also become the first foreign operator to use the Lockheed Martin F-35 Lightning II stealth fighter in combat. In 2018, the IAF chief showed a picture of a F-35I flying in daylight over



IAI Harop UAV.



**9A316M launcher of the Buk-M3 surface-to-air missile system.**

Beirut, Lebanon – adding that the aircraft had been in action on already on ‘two fronts’ – a clear message that Israel was now operational with a platform that penetrate these A2/AD threat zones. In any future conflict then, IAF F-35Is will be at the tip of the spear in locating and destroying

the highest-threat SAMs and clearing a way for other aircraft. Additionally, Israel, alone among the F-35 customer nations has been granted permission to modify the stealth fighters to its own needs – with Israeli specific C4 avionics and the ability to add its own EW systems. Israel is

also to equip its large external drop tanks, to boost the range of the F-35 and also reportedly develop conformal fuel tanks– allowing the stealth fighter to conduct long-range strikes against Israel’s enemies.

Though Israel already boasts capable stand-off capability

– with air-to-ground missiles like the man-in-the-loop Deliah, and guided bombs such as the SPICE family, the IAF recently revealed a long-range capability with the Rampage air-launched ballistic missile. This weapon, adapted from an artillery rocket, gives a IAF pilots a heavy-hitting supersonic long-range (90nm) strike capability – and is thus presumably a response to the latest generation of highly mobile SAM systems that are able to fire and relocate quickly.

## Summary

In short, the Israeli Air Force already has much experience in going-up against the latest generation of SAMs and IADS, With Iran proxies active in Syria and assisting in the country’s air defences, the IAF has undoubtedly already learned lessons about how to ‘peel the onion’ of the latest ‘triple-digit’ systems. How Israel uses new technology and tactics, from stealth fighters to stand-off weapons, to tackle ‘triple digit’ IADS networks will thus be of immense interest to other Western powers in the 21st century – as these modern SAMs proliferate around the world.



**IAF F-35I in flight.**