Yemeni rebels enhance ballistic missile campaign

Yemen-based rebels have launched numerous ballistic missile attacks against Saudi Arabia since the outbreak of conflict in 2015. *Jeremy Binnie* traces the origin and evolution of their arsenal, and assesses how rebel forces are sustaining their campaign and the course it may take in the future

The use of ballistic missiles by rebels aligned with Ansar Allah (popularly known as the Houthis) in Yemen's ongoing civil conflict has been remarkably persistent. The rebels - Ansar Allah forces and those loyal to former Yemeni president Ali Abdullah Saleh - have been fighting supporters of the internationally recognised Yemeni government led by President Abdrabuh Mansur Hadi and a Saudi-led military coalition since March 2015.

Saudi Arabia has confirmed that more than 34 ballistic missiles have been launched from Yemen into its territory since the conflict began. Although Saudi Arabia's Patriot air-defence systems have ensured that these attacks have so far had very little impact, they still enable the rebels to claim that they are retaliating in kind for airstrikes and signal their continued defiance.

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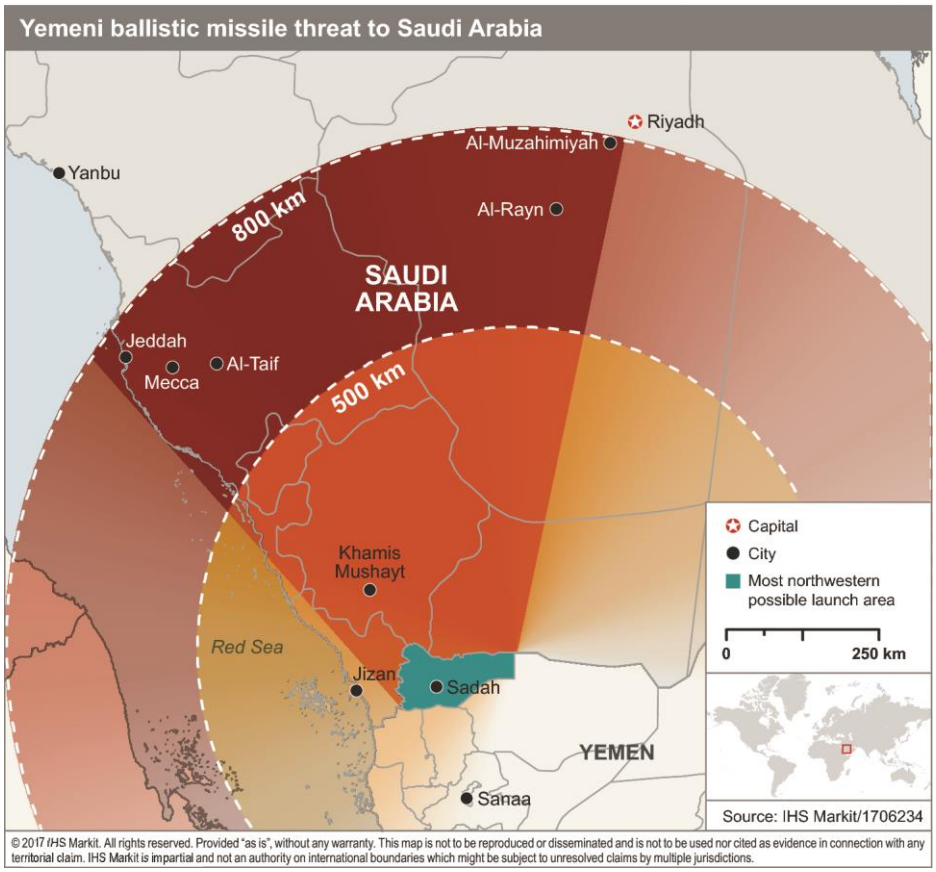

Yemeni ballistic missile threat to Saudi Arabia. (IHS Markit)

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Pre-conflict capabilities

Prior to the outbreak of the current conflict, Yemen was known to have acquired R-17 Elbrus (SS-1C 'Scud B') and OTR-21 Tochka (SS-21 'Scarab') ballistic missile systems from the Soviet Union, with both types being used during the 1994 civil war. At least one source - the 2014 edition of *The Military Balance* published by the International Institute for Strategic Studies - reported that Yemen had six 9P117-series Scud transporter erector launchers (TELs) and 10 Tochka TELs in its national arsenal. A July 2009 US diplomatic cable released by WikiLeaks reported that Yemen was attempting to acquire an engine for a MAZ-543 vehicle in April 2009, suggesting that one of its 9P117s was no longer serviceable. This unserviceable TEL may have been the one visible in satellite imagery from August 2012 to March 2015, when it was left in the open at a facility near Al-Dulaimi Air Base outside Sanaa. That facility had six bunkers suitable for storing TELs, suggesting that it was the main base for Yemen's Scud unit at the time.

Although the number of missiles that Yemen had in its inventory at the start of the conflict remains unclear, it supplemented those originally received from the Soviet Union with at least one additional shipment from North Korea. The United States imposed sanctions on the North Korean company involved in the transfer in August 2002, and Spanish naval vessels intercepted a ship carrying 15 Scud-type ballistic missiles to Yemen in December of that year. That ship was later allowed to complete the delivery. The missiles found on board were 'Scud Bs' (a reference to North Korea's Hwasong-5 copy of the R-17), according to a June 2003 US diplomatic cable.

Members of the RSADF Patriot unit that has been deployed to protect the Saudi city of Jizan from ballistic missile attacks launched by Yemen-based rebels. The rebels have sustained their campaign of attacks by repurposing missiles from S-75 surface-to-air missile systems. (Royal Saudi Air Defence Forces)

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Although Sanaa promised that this would be the last time it would import missiles from North Korea, it is possible that it was one of several shipments that also included longer-range variants such as the Hwasong-6, which is also known as the 'Scud-C', and has a range of 500-550 km.

After Saleh was forced to resign as president in 2011, his successor, Hadi, attempted to reorganise the military to sideline Saleh loyalists. This included disbanding the Republican Guard and putting its missile units under the newly formed Strategic Reserve Forces. Reuters reported in December 2012 that the Republican Guard, then still formally commanded by Saleh's son, Ahmed Ali Abdullah Saleh, initially refused to give up its ballistic missiles, but eventually relinquished them later that month.

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Surviving the storm

From the outset, the Saudi-led coalition identified the rebels' ballistic missile capability as a justification for the military intervention and one of the primary targets for the air campaign. When the coalition announced the end of Operation Decisive Storm in April 2015, the opening phase of the intervention, it said that it had successfully achieved all its objectives, including the destruction of heavy weapons such as ballistic missiles.

However, signs soon began to emerge that this was not the case. A video emerged on social media the following month showing a damaged 9P117 TEL being moved on a transporter, purportedly north from Sanaa. The survival of a rebel ballistic missile capability was confirmed on 6 June 2015, when the coalition released a statement via the official Saudi Press Agency (SPA) saying that the Royal Saudi Air Defence Forces (RSADF) had intercepted a Scud-type missile heading towards Khamis Mushayt, a Saudi city in the southwest around 100 km from the Yemeni border. King Khalid Air Base, probably the most important location for the coalition's air operations over Yemen, is to the east of the city.

Stills from a video released on 17 May 2015 show a 9P117 'Scud' TEL being moved on a transporter. The TEL was purportedly filmed in Amran province on 16 May 2015 as it moved northwards from Sanaa to Sadah. (amraan.net)

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Since then, the coalition has released statements to the SPA confirming that at least 34 ballistic missiles have been launched into the kingdom, all of which were intercepted. This figure raises questions about the accuracy of the coalition's repeated claims to have located and destroyed TELs immediately after they have launched their missiles.

If rebel claims are to be believed, the number of ballistic missile attacks on Saudi Arabia is actually far higher than acknowledged by the coalition. Although it is possible that the Saudis are not reporting missiles that the RSADF does not successfully engage, there has been no corroborating evidence to support rebel claims that these attacks are inflicting significant damage and casualties.

It consequently seems that the redeployment of Patriot systems to southern Saudi Arabia has mitigated the threat and effectively reduced the missiles to propaganda weapons.

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Modified missiles

The rebels have sustained their campaign of ballistic missile attacks at least in part by repurposing missiles from S-75 (SA-2 'Guideline') surface-to-air missile (SAM) systems to create the Qaher-1, which was unveiled in December 2015 and supposedly has a range of 250 km. The Yemeni military had numerous S-75 batteries at the start of the conflict, many of which were targeted during the coalition air campaign. The liquid-fuel S-75 missiles typically have a 195-kg fragmentation warhead that can be set to detonate before it hits the ground. They are normally used with static launchers, but a rebel video aired on the Al-Masirah television channel on 22 December 2015 appeared to show one being fired from the back of a civilian truck.

Using pro-rebel media outlets Al-Masirah and the Saba News Agency, the rebels announced on 28 March that they had, for the first time, launched an improved version called the Qaher-M2 with a claimed range of 400 km and a 350-kg warhead, claiming that three had been fired at King Khalid Air Base. This was supported by a video showing three S-75-type missiles being launched in quick succession. The coalition confirmed the attack, telling the SPA that four ballistic missiles had been shot down before they reached Khamis Mushayt (the fourth missile may have been launched from another location). This appeared to be a failed saturation attack using multiple missiles in an attempt to overwhelm the Patriot battery defending the city.

The rebels have also unveiled new Scud versions, the first being the Burkan-1, which was announced on 2 September 2016. The rebels claimed that it was 88 cm in diameter (the same as an R-17), 12.5 m long (more than 1.5 m longer than a conventionally armed R-17), and weighed 8,000 kg with a 500-kg warhead (around 2,000-kg heavier than an R-17, although the warhead weighs roughly half as much). According to the rebels, the first Burkan-1 attack was carried out on 9 October 2016 when a missile hit King Fahd Air Base outside the Saudi city of Al-Taif, about 525 km from the Yemeni border. The coalition confirmed the incident, telling the SPA that a missile launched at Al-Taif was intercepted on that day.

The rebels claimed a second Burkan-1 hit King Abdulaziz International Airport in Jeddah on 27 October 2016. This was potentially the longest-range attack to date, as the airport is 630 km from the Yemeni border.

Although the coalition did not confirm this range, it told the SPA that a missile had been intercepted around 65 km from Mecca. Saudi Arabia and its allies used the attack to discredit the rebels on the basis that they were endangering Islam's most holy city. The rebels protested this assertion, saying that they had used a highly accurate missile to attack a military base that was supporting the bombing campaign in Yemen. This was an apparent reference to the Royal Saudi Air Force (RSAF) base for C-130 transport aircraft, situated next to a busy civilian airport.

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Rebels unveiled their Burkan-1 ballistic missile on 2 September 2016, saying that it was a modified Scud with an 800-km range. A missile with a range of more than 550 km may reflect increased Iranian support. (Al-Masirah TV)

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Reaching for Riyadh

The rebels unveiled their solution to this problem on 6 February in the form of the Burkan-2, saying that one had been launched against a military base near Al-Muzahimiyah the previous day. The Al-Muzahimiyah base is around 40 km southwest of central Riyadh and more than 800 km from Sadah. However, there were no corroborating reports of a ballistic missile landing in Saudi Arabia on that particular day.

The rebels have not provided any specifications for the Burkan-2, but released images showing missiles with 'shuttlecock' warhead sections rather than the more cone-shaped and voluminous ones used with most 'Scud'-types, including the Burkan-1. This implies that the Burkan-2 has a smaller warhead contained in a separating re-entry vehicle that would be more stable as it approaches its target. The rebels also released a video showing the Burkan-2 being launched, purportedly at Al-Muzahimiyah. Although the launchers are typically obscured in such videos, this one appeared to show the Burkan-2 launched from a TEL made from a civilian tractor-trailer combination rather than a 9P117.

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Iranian involvement

Given that Yemen has no known history of producing its own ballistic missiles, let alone extended-range Scud versions, the emergence of the Qaher and Burkan missiles appears to support the claims made by the coalition and US officials that Iran is extensively involved. "Iran has provided critical capability and assistance to the Houthis in their campaign to attack Saudi Arabian territory with ballistic missiles and rockets," a US Department of State official told *Jane's* in October 2016.

There is now strong evidence that Iran has been shipping weapons to its Yemeni allies. This includes Iranian-made versions of the Steyr HS .50 anti-materiel rifle, which have been identified by *Jane's* in several photos of armed rebels, as well as in footage of Emirati soldiers recovering rifles from a rebel base outside Al-Mukha. Likewise, the rebels claim to be producing Qasef-1 unmanned aerial vehicles (UAVs), although they appear very similar - if not identical - to the Iranian Ababil 2 UAV.

Four boats carrying infantry weapons from Iran have been intercepted in the Arabian Sea by various navies - including the Australian, French, and US navies - and at least one consignment of Qasef-1s has been intercepted as it was smuggled overland via Oman, according to a report released in March by the UK-based Conflict Armament Research group.

However, it would be difficult for Iran to ship entire ballistic missiles to Yemen. The only rebel-controlled port where heavy weapon systems could be unloaded is Al-Hudaydah, but coalition and Western navies are imposing a UN-approved blockade that only allows vetted vessels to dock. According to *Defense News* , Vice Admiral Kevin Donegan, commander of the US 5th Fleet, said that heavy weapons could be seen on the decks of nine ships that Iran sent to Yemen in April 2014, but the convoy was forced to turn back. The effectiveness of the naval blockade is presumably why the intercepted Iranian arms shipments have consisted of items small enough to be carried across the desert or offloaded from dhows onto smaller boats that can land them on beaches.

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Outlook

It is possible that the Burkan series is a previously unseen Scud derivative that Yemen acquired from North Korea before the conflict. For example, Syria has a North Korean missile known as the 'Scud D' with a range of around 700 km that has never been seen in public. However, if such a weapon was obtained from North Korea prior to the outset of the war, it seems strange that the rebels would wait 18 months before launching one of these missiles. It is therefore more plausible that this time was spent modifying existing Scud types to extend their range, as well as building TELs capable of launching larger missiles.

The stated dimensions of the Burkan-1 suggest that it is a standard Scud that has been lengthened with additional sections welded into its fuselage and fuel tanks so that it can carry the additional propellant needed to extend its range. Iraq carried out similar modifications to produce Al Hussein missiles capable of reaching Tehran during the 1980-88 Iran-Iraq War. There are reports that each Al Hussein was initially made using parts from three R-17s.

The Burkan-2 appears to use a new type of warhead section that is locally fabricated. Both Iran and North Korea have displayed Scud derivatives with shuttlecock-shaped warheads, but none of these match the Yemeni version. The range of the Burkan missiles also appears to have been extended by a reduction in the weight of their warheads. It can be problematic to take too much mass from the nose of a ballistic missile as this shifts the missile's centre of gravity in relation to its centre of pressure, making it less stable in flight. This was a problem for Iraq's Al Hussein missiles, which tended to break up on re-entry, creating multiple targets for US Patriot batteries to engage during the 1990-91 Gulf War.

Yemen's rebels may be experiencing similar problems. The first two Burkan-2 missiles may have come down in the desert on their way to Riyadh, which would explain why there were no corroborating reports of those attacks. The coalition statement regarding the third Burkan-2 attack certainly raised questions about the accuracy of the missile. It seems unlikely that the rebels would have deliberately targeted the remote town of Al-Rayn as implied; if Riyadh was the intended target as stated by the rebels, then the missile was significantly off course and came down well short of the Saudi capital.

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