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New Technologies in Houthi Drones

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Cover photo: A homeless man sits beneath mock aircraft and missiles displayed in Sana'a city's Al-Tahrir Square on January 21, 2025 // Sana'a Center photo.

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On February 13, 2025, the National Resistance forces, led by Presidential Leadership Council member Tareq Saleh and based on Yemen's Red Sea coast, announced the seizure of a smuggled shipment of military equipment intercepted en route to the Houthi group (Ansar Allah). The shipment included devices and equipment that suggest the Houthis are working to enhance their drone capabilities by integrating new and previously unused technologies—or at least technologies not widely deployed. Specifically, these include jet engine technology and first-person view (FPV) systems, both of which have the potential to significantly amplify the scale of threat anticipated in any future local or regional escalation.

Jet Engines

Among the items seized, the National Resistance forces showcased several jet engines, which, judging by their dimensions and external characteristics, are presumed to be either the P500-PRO-S or the P550-PRO-S[1] models produced under the JetCat brand. Although the interdiction of jet engines intended for the Houthis is not unprecedented, it is noteworthy in that the specifications of these particular models differ from any seized previously or known to be used by the group. The following table provides a comparative analysis of the weight, dimensions, and thrust of the new engines relative to those models.[2]

Classification of Jet Engines	Engine Model	Engine Weight (in kilograms)	Engine Diameter (in millimeters)	Engine Length (in millimeters)	Thrust (in Newtons)
Jet Engines Seized in the Latest Shipment	P500-PRO-S.	5.4	175	419	492
	P550-PRO-S.	5.4	175	419	550
Jet Engines Previously Seized or Documented in Use by the Houthi Group	PBS-TJ100. Utilized in the various models of cruise missiles known as "Quds," these are sometimes replaced by reverse-engineered Iranian versions featuring similar dimensions and capabilities.	17	272	636	1250
	TRI-60-2. Used in the cruise missile known as Mandab-1.	49	330	749	3700
	AMT-TITAN. Used in the Saqr-1 or "358" air defense missile.	3.7	147	385	392

[1] The uncertainty concerning the seized engine models arises from the fact that these two models are nearly indistinguishable in terms of appearance and dimensions, with the only variation being their thrust. This is clearly demonstrated by the images and information available on the manufacturer's website: P500-PRO-S and P550-PRO-S.

[2] The identification of jet engines used by or intercepted on their way to the Houthis is based on the annual reports of the United Nations Security Council Panel of Experts on Yemen.

The engines seized in the latest shipment are considerably smaller and substantially less powerful than those typically employed in cruise missiles. Indeed, their dimensions render them unsuitable for this type of deployment. Nonetheless, these engines surpass the size and power of those typically used in surface-to-air missiles, albeit not by enough to warrant developing a new model.[3] It is therefore reasonable to infer that the engines could be incorporated into unmanned aerial vehicles (UAVs) used by the group. Until now, all known Houthi UAVs have exclusively relied on piston engines for propulsion, according to UN Panel of Experts reports.

This potential shift is consistent with indications suggesting that Tehran and its allies are increasingly moving their attention to this technology. Notably, reports have surfaced indicating that Russia intends to rely more extensively on Iranian drones equipped with jet engines in Ukraine.[4] However, the drones deployed there use different engines from those discovered in the recently seized shipment.

Drones powered by jet engines are up to four times faster than those powered by piston engines. This enhances their ability to evade air defense systems and reach their targets, whether during tactical battlefield operations or swarm attacks on strategic objectives. While jet-powered drones are sometimes compared to cruise missiles, and may not necessarily have a higher success rate, they offer a comparable advantage due to their lower cost.[5] Their affordability allows for a greater number of attacks, thereby increasing the likelihood of successfully bypassing air defense systems and reaching intended targets.

First-Person View Technology

First-person view (FPV) drones are defined as unmanned aerial vehicles that provide their operators with real-time video-feed access to the drone's flight trajectory and surrounding environment. The term specifically refers to a class of drones characterized by their simple design and low cost, which were primarily employed for civilian purposes before the Russian invasion of Ukraine. Since then, a growing phenomenon has emerged involving the modification and utilization of these drones for military applications, particularly for conducting tactical strikes against enemy positions, vehicles, and personnel along front lines.

Among the seized items, the National Resistance forces showcased a collection of DJI MAVIC3 drones, classified as FPV drones and widely used in the war in Ukraine. The National Resistance forces also displayed TARANIS X9D control systems, which are used to operate FPV drones, as well as several related surveillance and tracking systems.

[3] It would appear impractical to develop a new model of air defense missile using the new engine, given that its relevant capabilities are highly comparable to those of the engine powering an earlier type known as "Saqr-1" or "358." This is evident in Iran's own approach when developing a new model within the same series. Iran opted for a significantly larger engine (more than double the thrust) for the new model, named "359," with the aim of enabling it to perform a broader range of missions compared to the previous "358" missile. See, "Exclusive: Iran Unveils "359" Loitering Drone Capable of Targeting AWACS and Refueling Tankers at High Altitude," Army Recognition Group, January 16, 2025, https://armyrecognition.com/focus-analysis-conflicts/army/defence-security-industry-technology/exclusive-iran-unveils-359-loitering-drone-capable-of-targeting-awacs-and-refueling-tankers-at-high-altitude

[4] "Russia begins producing turbofan-powered Shahed-238 drones," BULGARIANMILITARY-News website, February 18, 2025, https://bulgarianmilitary.com/2025/02/18/russia-begins-producing-turbofan-powered-shahed-238-drones/

[5] The engine utilized in "Quds" cruise missiles costs US$69,500, while the cost of the engine seized in the recent shipment was US$7,890.

The available evidence indicates that the Houthis aim to deploy FPV drones on a large scale and are preparing to counter the potential use of the same technology by adversaries. Although the Houthis already enjoy a clear advantage over their local adversaries in terms of drone capabilities, the group's extensive use of this technology in future hostilities could result in an unprecedented shift in the balance of power. This shift could be further exacerbated now that pro-government forces no longer receive air support from the Saudi-led coalition and lack adequate drone defense systems.

Implications

In this context, Houthi drone advances could have serious repercussions in any future escalation, whether at the local or regional levels. Success in advancing their military capabilities might embolden the Houthi group to adopt more rigid positions in negotiation or undertake extreme escalatory actions. These developments pose a substantial threat to the prospects of achieving peace in Yemen, will inevitably exacerbate the suffering of the Yemeni people, and will continue to put regional security and maritime navigation at risk.

There are reports that the Houthis have flown traditional jet aircraft over areas controlled by the internationally recognized government. But amongst the domestic players, traditional jet aircraft have assumed—and will likely continue to assume—a largely symbolic role, given the logistical challenges involved in operating and maintaining them and the technical limitations that hinder their effective deployment on the battlefield. Recent developments in drone technology warrant greater attention than such claims, as unmanned aerial vehicles have played—and will continue to play—a significant and impactful role in Houthi military capabilities.

Khaled Mukhtar is a Yemeni researcher writing under a pseudonym for security reasons.

This analysis is part of a series of publications produced by the Sana'a Center and funded by the government of the Kingdom of the Netherlands. The series explores issues within economic, political, and environmental themes, aiming to inform discussion and policymaking related to Yemen that foster sustainable peace. Any views expressed within should not be construed as representing the Sana'a Center or the Dutch government.

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