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GERD Crisis: Military Capabilities and Likely Confrontation

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Introduction

The Ethiopian Renaissance Dam crisis is currently going through a critical stage, as political negotiations between Egypt, Ethiopia and Sudan are stumbling due to Ethiopian intransigence and failure to take Egyptian-Sudanese concerns into account. After the Kinshasa negotiations (April 2021) held under the auspices of the African Union (AU), the crisis reached a deadlock, which led the head of the ruling military regime in Egypt to hint in a high-pitched tone at the possibility of taking military action to deter Ethiopia and prevent it from proceeding with the second phase of filling the dam reservoir without a legally binding agreement on the filling and operating rules.

This situation raised many questions about the possibility of Egypt carrying out military action against Ethiopia: Does the Egyptian army have the military capabilities that would enable it to take such military action? Does Ethiopia have the military capabilities that would enable it to defend its dam against such likely attacks?

First: Ethiopian intransigence and Egyptian escalation

Despite failure to reach a political solution that could satisfy the three parties (Egypt, Sudan and Ethiopia), Ethiopia has announced its intention to proceed with the second phase of filling of the Grand Ethiopian Renaissance Dam (GERD) in June and July 2021, which can lead to negative repercussions and severe damage to the two downstream countries, Egypt and Sudan. On Saturday, 2 April 2021, Ethiopian President Sahle-Work Zewde announced, during a speech she gave on the 10th. founding anniversary of the dam, that Ethiopia is making preparations to proceed with the second phase filling of the Grand Ethiopian Renaissance Dam reservoir. Zewde said that "Ethiopia has been denied the right to develop projects in the basin, which has great potential to its national wealth, due to domestic and external challenges." She added that "developing the river water resources is a matter of survival for Ethiopia," noting that it contributes to Ethiopia's two-third surface water resource. The President of Ethiopia also expressed her belief that "developments in the river basin

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will eradicate Ethiopia's poverty and also benefit the downstream countries". She also called on neighboring countries to "cooperate for the fair and reasonable use of resource."¹.

Before Zewde's statements, and while meeting with commanders, non-commissioned officers and soldiers of the Egyptian armed forces, Egypt's Al-Sisi on Tuesday, March 9, 2021, said, "We will not negotiate for ever ... rather, a binding legal agreement must be reached on filling and operating the dam." Al-Sisi added, "Egypt enjoys one of the strongest armies in the region, our use of force is always balanced and rational, and aims to protect our borders, national security, and the stability of the country."²

Sisi's statements were interpreted by some observers as being indicative of likely upcoming military strikes by the Egyptian army against the Ethiopian Renaissance Dam.

During his visit to the Suez Canal Authority (SCA) on Tuesday, 30 March 2021, Sisi, escalating his rhetoric, said: "No one can take a drop of water from Egypt; and whoever wants to try, let him try; If it happens, there will be inconceivable instability in the region that no one could imagine; and no one is far from our force."³

On 14 March, Egyptian Minister of Foreign Affairs Sameh Shoukry said, "Ethiopia has not yet shown any real political will to negotiate in good faith on the dam."⁴ During Shoukry's participation in the recent Kinshasa talks on Sunday-Monday (4-5 April), at the invitation of President of the Democratic Republic of Congo Felix Tshisekedi, who is also the current AU president, the Egyptian foreign minister stressed that the Kinshasa meetings must lead to the launch of a new round of effective and serious negotiations, considering Kinshasa talks the last chance that must be seized by the three countries

¹ President of Ethiopia: Proceeding with the second phase filling of the Renaissance Dam, Anadolu Agency, 3 April 2021, accessed 5 April 2021, [link](#)

² Important statements by Sisi, including Egypt's relations with the Gulf and Renaissance Dam crisis ..., Bawabat Al Akhbar, 9 March 2021, accessed 5 April 2021, [link](#)

³ Renaissance Dam: Al-Sisi warns against infringing Egypt's right to Nile waters and says it is a "red line", BBC, 30 March 2021, accessed 5 April 2021, [link](#)

⁴ Foreign Minister: Ethiopia has not yet shown any real political will about the Ethiopian dam, Bawabat Al Akhbar, 14 March 2021, accessed 6 April 2021, [link](#)

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to reach a binding agreement on filling and operating GERD during the coming months, before the next flood season.⁵

After Shoukry's statements, Egyptian Foreign Ministry Spokesman Ahmed Hafez stated that the round of negotiations that was held in Kinshasa on the Grand Ethiopian Renaissance Dam on April 4 and 5, 2021, did not achieve any progress and failed to reach an agreement on re-launching negotiations. He added that Ethiopia rejected a proposal submitted by Sudan and supported by Egypt to form an international quartet led by the Democratic Republic of the Congo which currently presides over the African Union, for undertaking mediation between the three countries. During the meeting, Ethiopia also rejected all other proposals and alternatives put forward by Egypt and supported by Sudan in order to develop the negotiation process and enable countries and parties participating in negotiations as observers to actively engage in discussions, participate in the conduct of negotiations, and propose solutions to the controversial technical and legal issues.

Hafez also emphasized that Ethiopia rejected an Egyptian proposal supported by Sudan, that was presented during the closing session of the ministerial meeting, with the aim of resuming negotiations under the leadership of the Congolese president and with the participation of observers in accordance with the existing negotiating mechanism. He added that this situation proves beyond a reasonable doubt the flexibility and responsibility that Egypt and Sudan have shown, and shows their serious desire to reach an agreement on the dam, but Ethiopia rejected all proposals, which led to failure of the coferees to reach a consensus on re-launching negotiations.

Hafez added that such situation once again reveals Ethiopia's lack of political will to negotiate in good faith, and its procrastination, through satisfaction with a formal and useless negotiation mechanism, which is an unfortunate approach that the Egyptian negotiator is well aware of.⁶

⁵ Foreign Minister: We negotiated on the Renaissance Dam for 10 years ... and we have one last chance, Bawabat Al Akhbar, 4 April 2021, accessed 5 April 2021, [link](#)

⁶ Egypt announces failure of "Kinshasa" negotiations due to Ethiopian intransigence. Rai Al-Youm, 6 April 2021, accessed 7 April 2021, [link](#)

On the other hand, Sudanese Minister of Water Resources and Irrigation Yasser Abbas, on 13 March said, "If the Renaissance Dam negotiations fail, we will defend our rights by all legitimate means."⁷

March 2021 witnessed intensive meetings between Egyptian and Sudanese officials. Lt. General Mohamed Farid Hegazy, Chief of Staff of the Egyptian Armed Forces, visited Khartoum in early March, to participate in the seventh meeting of the Egyptian-Sudanese Joint Military Committee headed by the chiefs of staff of the two countries.⁸ Lt. General Hegazy's meetings with Sudanese officials resulted in signing joint military and security cooperation agreements by Cairo and Khartoum, especially in the areas of joint training, rehabilitation, border security, and the transfer and exchange of military and security expertise.⁹

Lt. General Mohamed Farid Hegazy stated in a press conference during his visit to Khartoum that Egypt is ready to meet the needs of the Sudanese army in all fields of training, rehabilitating and securing common borders, adding that the surrounding multiple and serious threats require integration between Egypt and Sudan. Lt. General Hegazy and Sudanese Chief of Staff Lt. General Mohamed Othman Al-Hussein stressed in the joint press conference that Ethiopia's proceeding with the second phase of filling the dam unilaterally would constitute a direct threat to the water security of the two countries.¹⁰

In the same context, Sudanese Prime Minister Abdullah Hamdok on 11 March 2021 visited Cairo and met with Sisi and Director of the General Intelligence Service Major General Abbas Kamel, where the meeting reviewed the latest developments and joint efforts between Egypt and Sudan regarding the

⁷ Foreign Minister: We negotiated on the Renaissance Dam for 10 years ... and we have one last chance, Daarb, 13 March 2021, 5 April 2021, [link](#)

⁸ Egypt Chief of Staff leaves for Sudan to participate in the Joint Military Committee meeting, Bawabat Al Akhbar, 1 March 2021, accessed 5 April 2021, [link](#)

⁹ Egypt Chief of Staff returns from Sudan after agreement to boost military and security cooperation, Al-Ahram Gate, 3 March 2021, 5 April 2021, [link](#)

¹⁰ Egyptian-Sudanese military agreement ... is it targeting Ethiopia ?, Arabic21, 3 March 2021, accessed 25 April 2021, [link](#)

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issue of the Renaissance Dam. It was also agreed to intensify coordination of the two sides' efforts in light of the current critical stage that the GERD crisis is going through.¹¹

The recent Egyptian-Sudanese rapprochement is not limited to harmonious meetings and statements only, but the Sudanese authorities announced in March arrival of military equipment and vehicles from the Egyptian army via Port Sudan, referring this to joint cooperation protocols. The official Sudanese News Agency (SUNA) stated that according to the protocols of joint cooperation and twinning between the leaderships of the Sudanese Corps of Engineers and the Egyptian Corps of Engineers, the Egyptian weapon supplied its Sudanese counterpart with equipment and machinery that recently arrived at Port Sudan port; and SUNA indicated that "the equipment is a real addition to the Sudanese Engineers Corps".¹²

During March 2021, units of the Egyptian Air Force, with the participation of the Sudanese Air Force, carried out the second joint air exercise of its kind codenamed as "Nile Eagles 2", where elements of the Egyptian and Sudanese Thunderbolt forces also participated in the exercises that were conducted within the Sudanese territories and airspace, in the presence of Egyptian Chief of Staff Lt. General Mohamed Farid Hegazy and Sudanese Chief of Staff Lieutenant General Mohamed Othman Al-Hussein. Some believed that the Egyptian-Sudanese air exercises were intended to be a strong message to the Ethiopian side that insists on its unilateral position in filling the dam. Egyptian Military Spokesman Colonel Tamer Al-Rifai commented on the Egyptian-Sudanese military exercises that took place at the Sudanese Meroe base, saying that they aim to measure readiness to carry out joint operations on various targets.¹³

At the conclusion of the exercises, Lt. General Hegazy stressed that joint work with Sudan is necessary to face security challenges, border safety and protection of capabilities. Hegazy also confirmed that the Egyptian armed forces stand by the Sudanese army defending with it in one trench, and that the

¹¹ Al-Sisi discusses with Hamdok efforts of Egypt and Sudan in the Renaissance Dam issue, 11 March 2021, accessed 5 April 2021, [link](#)

¹² Egyptian army sends equipment and machinery to Sudan, Arabi21, 20 March 2021, accessed 5 April 2021, [link](#)

¹³ Is zero hour approaching? Sudanese-Egyptian air exercise "Nile Eagles 2", Arab Defense, 21 March 2021, accessed 5 April 2021, [link](#)

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“Nile Eagles” exercise witnessed a positive development in all stages and elements of the training in both its first and second versions, in terms of preparation, planning and execution. He explained that this training came within the framework of cooperation between the Egyptian and Sudanese forces, adding that it is a strategy for joint military cooperation to contribute to enhancing the security of the two countries. Hegazy also renewed the call for speedy execution of the next version of the exercise to complement the system of exchanging experiences to preserve the national security of the two countries.

For his part, the Sudanese chief of staff emphasized that such exercises do not target a specific country, but they contribute to the integration of national security between Egypt and Sudan.

According to the Sudanese Armed Forces’ official page on the internet, Commander-in-Chief of Sudanese Air Force Lt. General Essam al-Din Said Koko said that these joint exercises (Nile Eagles-2) by the Sudanese Air Force and the Egyptian Air Force included participation of ground forces and special forces from the two countries. He explained that these exercises were in accordance with the agreements signed between the two countries, launched regularly on an annual basis with the aim of exchanging experiences and enhancing training in the areas of planning and execution. The commander of the Sudanese Air Force also confirmed that they have been working to protect the country's airspace from all direct targeting of its strategic sites and to control any air attacks that undermine security and stability.¹⁴

Second: Capabilities of Egyptian army and Ethiopian army

Is the Egyptian army really capable of launching a military strike against the Ethiopian Renaissance Dam amid the escalating political and media statements related to the crisis? Does the Ethiopian army have defensive capabilities against any likely military attack?

1- Egyptian potentials

There is no common border between Egypt and Ethiopia, as Ethiopia is about 2.213 km from Egypt. Usually, military actions between countries that do not have common borders take place in one of

¹⁴ Nile Eagles 2.. Egyptian Chief of Staff: Working with Sudan is necessary to face security challenges, Al-Jazeera, 4 April 2021, accessed 5 April 2021, [link](#)

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two forms, the first by parachute landing of troops from air into the enemy territory (landing behind enemy lines). The second is through directing a military strike by means of air attack fighters.



Due to the nature of the potential conflict between Egypt and Ethiopia – it is not a border dispute that requires forces to remain on likely liberated territories, but rather a dispute over a specific issue, that is the Renaissance Dam –, the most appropriate option is to direct qualitative strikes on the desired target. Therefore, it is necessary to review the Egyptian army's air capabilities that would enable it to carry out such strikes, if any:

Rafale aircraft:

The Egyptian army owns a number of Rafale combat aircraft¹⁵, where the French Rafale fighters are one of the most famous long-range warfare fighters, developed by France in 2006. According to the American [Aviatia](#) website, the specifications of the French fighter jet included the following:

Rafale's maximum speed is 1.8 Mach (1912 kmph) and a range of more than 3700 km with 3 drop tanks; but this range can be reached if the aircraft is not loaded with missiles, that is, when it is empty. Military experts confirm that the range of a Rafale fighter jet with explosive missile payload is

¹⁵ Specifications and Performance Data, Dassault-Aviation, [link](#)

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only 2,500 km, in addition to the fact that they need to be refueled every 600 km. The French fighter can fly at altitudes exceeding 15 thousand meters, and it can change the flight altitude (vertical flight) at a speed of 300 meters per second. The French fighter is 15.27 meters long, the span between the wings is 10.8 meters, and it weighs 10.3 tons.¹⁶

The Rafale fighters operate the French Scalp/Storm Shadow missile, one of the most powerful and destructive missiles, that is designed to strike high-value fixed assets, air bases, radar installations, communication centers and port facilities. It can penetrate fortifications and trenches; and therefore, it is really appropriate for blowing the Renaissance Dam, where its specifications include:

- Speed: 0.8 Mach (approximately 1000 km / h)
- Range: more than 300 km
- Length: 5.1 m
- Weight: 1,300 kg
- Warhead weight: 450 kg high explosive
- Penetration of fortifications and shelters up to 10 meters of concrete or 45 meters of ordinary dust and rocks
- Guidance systems: INS / GPS / thermal passive imaging and ability to identify targets by means of stored images.

This missile also has the advantage of exploding when it reaches its target, as the front of the warhead consists of its penetrating charge, followed by the bomb, so that the missile is able to penetrate the buried fortifications and ground layers. The missile operates a self-guided system via satellites and a radar seeker, from the moment it is launched from the aircraft until it hits its target, which gives the missile the ability to resist jamming without risking the introduction of the fighter carrying the missile

¹⁶ 9 pieces of information about Rafale fighters used by the Egyptian army, Sputnik, 28 July 2020, accessed 5 April 2021, [link](#)

into areas with air defense systems. The missile can work in all environmental conditions, different altitudes and all weather conditions.¹⁷

Some public figures close to the Sisi regime, including journalist Imad al-Din Adib and academic/politician Moataz Abdel Fattah, have stated that the Rafale aircraft in this way is able to reach the target point due to the fact that its range can reach 2,400 km, loaded with missiles; where Ethiopia is 2,213 km away from Egypt. But this is a critical mistake from the military point of view, because the ultimate distance is calculated by multiplying the distance by 2 (to and fro), so calculation of the required distance in this case is $2.213 \times 2.213 = 4.426$ km.

In order for Rafale fighters to be able to reach the Ethiopian airspace (to and fro) when taking off from the nearest point, that is Berenice Air Force Base that is about 1,400 km away from the Ethiopian airspace, they must be able to fly a distance of approximately 2,800 km (to and fro), that is more than the range of 2,400. Also, the Rafale fighter jet needs to be refueled every 600 km, which is costly both financially and logistically, and needs prior arrangement with the Sudanese side to supply the Egyptian aircraft with the necessary fuel.

MiG-29 Fighters:

The Egyptian army has a number of Russian MiG-29 fighter jets that are capable of bombing the Ethiopian dam if the Egyptian regime make such decision, but the geographic dimension remains a real challenge, as the Grand Ethiopian Renaissance Dam is about 1,400 km far from the nearest Egyptian air base, that is the Berenice military base located in Egypt's southern military zone.

The MiG-29 can carry six R-73 air-to-air missiles, in addition to the R-60 missiles and a 30mm cannon. The MiG-29 is a multi-role aircraft designed to carry out air superiority, air defense and even ground attack missions. Although many experts compare MiG-29 to the American F-16 due to similarity in size, MiG-29 jets are in fact somewhat similar to the F-15 fighter.

¹⁷ How will a military strike be directed to the Renaissance Dam while it is holding 4 billion cubic meters of water?, Arab Defense, 7 March 2021, accessed 5 April 2021, [link](#)

The MiG-29 is built mainly from duralumin with a number of other composite materials. It has a 40-degree retrospective wing, the average height in the fuselage, and the aircraft has a tail that is turned backwards in addition to two horizontal tail. The aircraft's fixed-wing profile with large wing leading-edge root extensions and the lack of fuel load gives good maneuverability and control at subsonic speeds, including maneuvers at high angles of attack. The aircraft has a number of models, including MiG 29 m2, MiG-29 SMT, and MiG-29K.

General specifications of the MiG-29 fighters:

- Maximum speed: Mach 2.4 (2,445 km/h)
- Range: 700 km (combat) in the case of supplying an explosive payload - 2,900 km empty, you need to refuel every 400 km.
- Maximum height: 18,013 meters
- Rate of climb: 330 m/s (65,000 ft/min)
- Wing loading: 442 kg/m² (83 lb/sq ft)
- Thrust/weight: 1.13
- Crew: 1
- Height: 17.37 meters
- Wingspan: 11.4 meters
- Height: 4.73 meters
- Wing area: 38 m² (410 sq ft)
- Empty weight: 11,000 kg
- Gross weight: 16,800 kg
- Maximum takeoff weight: 21,000 kg
- Engine: two-jet engines of the Klimov R. The D-33 is equipped with an additional combustion chamber, each giving a thrust of 81.4 kN.¹⁸

The MiG-29 fighter jets gained by the Egyptian Air Force can carry missiles capable of bombing water dams, and thus they are able to carry out a military strike against the Renaissance Dam, as they are

¹⁸ Learn about the specifications of the MiG-29, latest Russian plane to join Egyptian Air Force, Al-Masry Al-Youm, 17 September 2014, accessed 5 April 2021, [link](#)

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equipped with the Kh-59MK2 cruise missile against ground targets with inertial guidance and then active radar with an electro-optical system to identify the target and increase the accuracy of the hit with an error rate of 3 to 5 meters. It has a highly destructive piercing warhead weighing 320 kg or a head equipped with cluster bombs weighing 283 kg and a range of 285 km, with subsonic velocity, launched from a height of 200-11 thousand meters at maximum flight speed of 550-1100 km/h, fired by MiG-29M fighters.¹⁹

It is worth noting that Egypt has gained a small number of Russian Sukhoi 35 combat aircraft. However, in terms of numbers and training, experts believe that it is unlikely that the Sukhoi 35 may be used in the case of a qualitative strike against the Renaissance Dam, as there must be a squadron of one type of combat aircraft heading collectively. However, until now Egypt has not obtained the full 20 Sukhoi 35 deal that it concluded with the Russian side in 2019.²⁰

The Egyptian Air Force also has got a number of the American F-16 fighters. The F-16 is a multi-role fighter that can fly in all weather conditions, capable of carrying nuclear and conventional weapons, and can be relied upon when carrying out an air strike against the GERD, but with some conditions that will come later.

From a military perspective, according to its combat capabilities, the Egyptian Air Force is capable of carrying out an air strike against the Grand Ethiopian Renaissance Dam, but the long distance between the two countries is a major challenge, in spite of the Rafale's ability to reach the Ethiopian airspace and destroy GERD, but the problem of the need to supply the aircraft with fuel is a major challenge. The best way to overcome this challenge is to use the Sudanese air bases close to the Ethiopian border, which most likely amid the recent Egyptian-Sudanese exercises operational coordination. Perhaps the recent Egyptian-Sudanese rapprochement is an indicator of this, especially that recent statements of the Sudanese officials emphasize rapprochement with the Egyptian position.

¹⁹ How will a military strike be directed to the Renaissance Dam while it is holding 4 billion cubic meters of water?, Arab Defense, 7 March 2021, accessed 5 April 2021, [link](#)

²⁰ Why does the Russian Sukhoi 35 fighter plane deal to Egypt worry Washington? BBC, 26 February 2021, accessed 6 April 2021, [link](#)

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Sudan and Ethiopia have common borders, but there are border tensions between the two sides, where there have recently been border clashes between the Sudanese army and the Ethiopian army, specifically in the Al-Fashaqa border area between Sudan and Ethiopia²¹. Sudan has several air bases near Ethiopia, ranging from 250 to 500 km from the Renaissance Dam site near the Sudanese border, which is an appropriate distance for the Egyptian war fighters to take off and perform their mission.

Figure (1): Locations of the Sudanese air force bases with indication to those near the GERD site. Sudan has three bases in the vicinity of Ethiopia, as shown in Figure (2):²²

1- Kassala Airport, a civilian-military airport, that is approximately 250 km from Ethiopia.

2- Wad Medani Airport, a military air base, about 400 km from Ethiopia.

3- Rabak Airport, a civilian-military airport, about 500 km from Ethiopia.

Those Sudanese bases are the most appropriate in the event that the Egyptian regime intends to launch a military operation against GERD, and thus surpassing the long distance challenge.

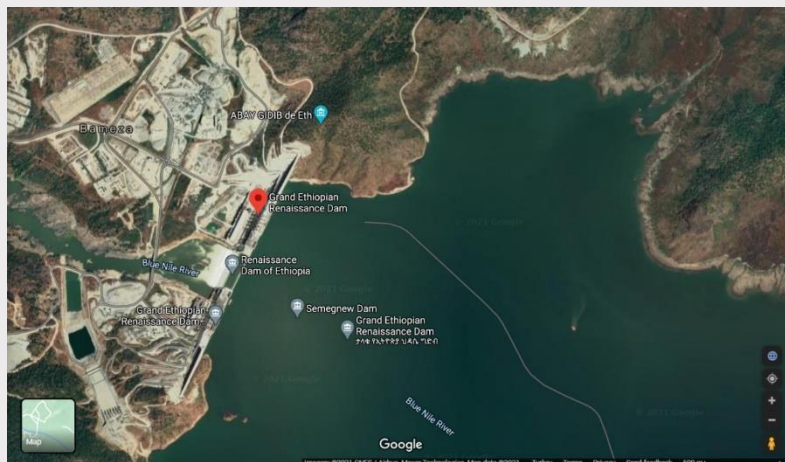
²¹ Media: Sudanese artillery strongly bombard Ethiopia in response to an attack from Addis Ababa, Sputnik, 24 January 2021, accessed 5 April 2021, [link](#)

²² Civil and military airports in Sudan, Arab Aviation, [link](#)

2- Ethiopian defenses

The Grand Ethiopian Renaissance Dam (GERD) for the Ethiopians is a national project that is aimed at achievement of a gigantic renaissance for Ethiopia; and therefore, the Ethiopian military forces worked to secure it from any hostile act as of the early moment of its foundation.

Figure 2: a recent photo of the structure of the Grand Ethiopian Renaissance Dam:



In fact, there is an Ethiopian blackout on the defense systems used to secure the dam, which is understandable, as most countries that work to secure strategic sites and important facilities tend to concealing information about them.

However, the available declared information about the defense systems around the Renaissance Dam indicates that Ethiopia uses two defense systems, namely:

1- Pantsir-S1:

The Ethiopian Army has deployed a Russian-made Pantsir-S1 air defense system near the GERD site, to protect it from any potential threat. Press reports in mid-2020, citing military sources in the Ethiopian defense and security affairs, revealed that Addis Ababa sought from the early moments of GERD foundation to obtain an appropriate air defense system from the Russian Federation, to be

capable of protecting the dam from any threats. The sources pointed out that the defense system acts as a preemptive deterrent against any plans targeting the dam's body with any harm..²³

The Russian Pantsir S-1 defense system is considered one of the most recent Russian systems that have been developed during the past few years, as it performs air defense tasks with great effectiveness. The Pantsir S-1 system performs air defense tasks with great effectiveness. It is capable of providing flexible combat control and protection for small vital army centers and escort military assets and units.

This defense system is capable of engaging with any type of air threat (cruise missiles, aircraft, guided bombs, anti-radar and reconnaissance missiles, and drones), as well as ground targets.

The Russian Pantsir S-1 includes an air defense system and an artillery system. It consists of 6 vehicles: a combat vehicle, in addition to a battery control vehicle, surface-to-air guided missiles, transport and cargo vehicle, maintenance facilities, and training aids.

The combat vehicle consists of a firing compartment, a control compartment, a power supply system, a search radar, a multifunctional radar for tracking missiles and targets, a SAM launcher, AA self-propelled guns, and chassis.

The Pantsir S-1 system performs air defense tasks with great effectiveness. It is capable of providing flexible combat control and protection for small vital army centers and escort military assets and units. It is also capable of engaging with any type of air threat, as well as with ground targets. The Pantsir S-1 integrates long-range air defense units to cover low-level and extremely low-lying areas, thus handling multiple attacks even if the terrain is difficult.

It should be noted that the Pantsir system is armed with surface-to-air guided missiles, as well as a solid-fuel power gain and warhead fragmentation device, allowing engagements with multiple air

²³ Ethiopia deploys an air defense system to protect the Renaissance Dam, The New Gulf, 10 June 2020, accessed 6 April 2021, [link](#)

targets. The Pantsir is also equipped with double-barreled automatic rifles in addition to a large load of ammunition that can effectively address air threats and ground targets.

Pantsir system in numbers

1- Maximum target speed	1200-20000 AD
2- Missile range	15-15000 AD
3- Missile height	200-4000 m
4- Cannon range	0-3000 m
5- Cannon height	8-12 ammunition
6- Ammunition: ready-to-fire SAM	1,400 ammunition
7- 30 mm ammunition	1000 m / s
8- Type of warhead for ammunition	Hash rod
9- Maximum speed of ammunition	1300 m / s
10- Radar control system components	Search radar, tracker radar, and optronic radar
11- Response time	4-6 seconds
12- Target detection range	Up to 80 km
13- Number of targets engaged with at the same time	4 goals
14- Crew	3 people²⁴

The Pantsir-S1 is undoubtedly a strong defense system, but it cannot completely protect the Renaissance Dam, according to some military experts, because it has gaps that Egyptian air fighters can penetrate. The most severe vulnerability of the Pantsir-S1 system is the fact that they are distracted when many missiles are launched simultaneously, and accordingly become unable to respond to them. For example, Pantsir-S1 was unable to repel the Bayraktar Turkish drone attack in Libya and Syria. According to Turkish military expert Enes Kaya, the Turkish army used a group of 20 Bayraktar drones to attack the Pantsir-S1 complexes in Idlib, Syria, leading to their destruction.

²⁴ Pantsir-S1 system, learn the most prominent features, Arab Defense, [link](#)

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Military reports state that Russian Pantsir air defense batteries could not simultaneously defend themselves against at least twenty guided missiles.²⁵

Although the Pantsir-S1 defense system that was captured by the legitimate Government of National Accord (GNA) forces in Libya a few months ago from the Khalifa Haftar forces, was somewhat an old version, one of the reasons for being bombed and damaged was by attacking it with several missiles at once, which leading Russian military expert, colonel in reserve and editor-in-chief of 'Arsenal of Homeland' magazine and member of the Council of Experts of the Russian Military Industrial Complex Viktor Murakhovsky said that the Pantsir-S1 that was captured by the Government of National Accord in Libya is an export version that was developed in the second half of the nineties of the last century specially for the United Arab Emirates and at their expense, that is, before the modern version that is currently in the service of the Russian army²⁶; but the same thing happened with the modern version in Idlib, Syria.

Based on the capabilities of the Egyptian air fighters, Egypt can carry out air strikes against the Grand Ethiopian Renaissance Dam despite the presence of the Pantsir-S1 system.

2- Spyder system

Despite Israel's denial, several reports state that Ethiopia has probably acquired the Israeli Spyder defense system to secure the GERD, while other reports confirm that it has actually acquired the Israeli Spider system, and that it participates with the Pantsir S1 system in securing the dam.²⁷

²⁵ 20 Turkish "Bayraktar" attack drones simultaneously attacked the Russian air defense missile system "Pantsir-S1", Arab Defense, 5 March 2021, accessed 6 April 2021, [link](#)

²⁶ What are the secrets that the Russian "Pantsir" captured in Libya will reveal to the Turks, Russia Today, 21 May 2020, accessed 6 April 2021, [link](#)

²⁷ A report on the Israeli SPYDER air defense system, short and medium-term, likely to be in Ethiopia, Arab Defense, 3 March 2021, accessed 6 April 2021, [link](#)

The Spyder defense system is produced by an Israeli company, Rafael Advanced Defense Systems, and is carried on a 6 × 6 Tatra truck.²⁸ The Israeli defense system consists of: PYthon 5 and DERby missile launcher modes of operation

a- Python-5 missiles:

The Python-5 missile is 3.5 m long, 105 kg in weight, the warhead weighs 11 kg, with a range of 20 km. The missile is guided by infrared and electro-optical guidance.

b- Derby missiles:

The Derby missile is 3.6 m long, 118 kg in weight, the warhead weighs 23 kg, and is guided by active radar with a range of 50 km. Missile velocity: Mach 4.

The defense system is available in the short-term SR version and the mid-term MR version.

In the short-range system, each launch vehicle carries 4 missiles, two of each Python and Derby. In the medium-range system, the launch vehicle carries 8 missiles (4 of each type) and is distinguished from the other version by its vertical firing that gives the system preference in dealing with all types of targets and achieving the highest casualty rate.

The system deals with warplanes, helicopters, drones and winged missiles. It is characterized by flexibility, deployment speed, and ability to provide air defense cover for the ground forces.

Spyder system key features:

- Fast and destructive reaction, needs only 5 seconds to fire after target verification.
- Coverage area: 360 degrees, hunting 60 targets at the same time.

²⁸ Short- and medium-range air defense missile system, Military Today, [link](#)

- It has a special infrared directive, with an image archive is stored in its memory for a large number of targets that must be hit. Both missiles find their targets by themselves and keep tracking them until hit.
- The defense system can be used by inexperienced soldiers, which is the core feature of the Spyder system, as its performance is unrelated to the expertise of the soldier in charge of its operation, whether due to electronic accuracy or ease of use. Neither type of missiles used leave smoke behind, which makes it difficult to visually detect the missile or even know its launching point.
- The defense system can operate alone or as part of a defense formation made up of other mechanisms. If it operated alone it would include a command and control vehicle containing radar, two vehicles for refueling missiles, a vehicle for logistics and maintenance, 6 vehicles with missile launchers, each carrying 4 or 8 missiles depending on the version available. In addition to the radar for monitoring targets, the vehicles are equipped with their own radar and an internal communication unit that allows them to communicate within a distance of 10 kilometers, which means that each vehicle can be deployed separately to reduce the possibility of harming or destroying them, as well as increasing their effectiveness.
- The Spyder defense system has three modes of operation: The first is manual, where the soldier identifies the target, then directs missiles at it and launches them manually. The second is semi-automatic, where the radar detects the threat, identifies it and follows it while moving, and then the system becomes ready to launch, pending the manual command from the soldier in charge. The third is fully automatic mode, as the system determines the target and deals with it directly without waiting for manual confirmation from the soldier in charge.

The above mentioned specifications make both types of the Spyder defense system as an impregnable fortress, and indeed it could launch accurate and direct defensive strikes against the Egyptian fighters if the Egyptian political administration made a decision to carry out an air strike on the GERD. However, in military action, there is always a margin of maneuver and error that should be taken into account.

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During the Pakistan-India skirmish that broke out in February 2019 over the Jammu and Kashmir region, Pakistani fighter jets completely deceived the Spyder system, and 12 Pakistani F-16 fighters and 4 Mirage fighters were able to carry out their mission in the Indian rear without losses, as the Israeli defense system was unable to stop either the fighters or any missile or bomb that were launched from them.

When the Spyder defense system woke up, it fired all its missiles, but to no avail, as no Pakistani fighter jet was hit. On the contrary, the defense system hit an Indian Mi-17 helicopter by mistake, killing 6 persons on board and a civilian on the ground.

Some military experts believe that the use of advanced jamming devices that Egypt has can blind Spyder radars and prevent the monitoring of the fighters and their attacking missiles, and that by using the Spectra system on Rafale fighters, the sites of Spyder radars can be monitored from a point that does not fall within their launch range, so destruction of the Spyder radars becomes most likely as the Rafale fighters do not need to operate their main radar, which avoids exposure to detection by any passive early warning systems, and depends on the Spectra system with a range of 200 km, in addition to the thermal monitoring and tracking system consisting of a thermal sensor capable of monitoring an air target from a distance up to 130 km from behind, and from a distance of up to 80 km from the front, which means that the Spyder systems can be monitored and handled without the Egyptian fighters entering their range.

On the other hand, military experts believe that with the attacking aircraft's application of the "numerical density" tactic, the Spyder defense system can be overcome. While the Rafale fighter jets attract the attention of the defense system and its missiles from a range out of their ability, the Egyptian Air Force-owned or F-16 fighters can strike the desired target, GERD, but on the condition that they take off from the Sudanese bases, because Egypt does not have aircraft to refuel its F-16 or MiG-29 fighters.²⁹

²⁹ A report on the Israeli SPYDER air defense system, short and medium-range, likely to be in Ethiopia, Arab Defense, Op. Cit.

On the other hand, given the huge disparity between the size and capabilities of the Egyptian and Ethiopian armed forces, Ethiopia cannot deter Egypt from carrying out its attack if its leadership wanted, nor to respond by any military means to such a likely attack if it were to take place, which makes the military cost of such Egyptian air strike on the Ethiopian dam at a minimal level.³⁰

Third: The alternatives available to the Egyptian regime

1- Carrying out air strikes against the dam:

Based on the current developments in the GERD crisis and the threats announced by Sisi, the Egyptian regime is likely to carry out a direct military strike against the Renaissance Dam, as the Egyptian armed forces have the required capabilities to do so, where the starting point could be the Sudanese bases close to the Ethiopian airspace, in light of the recent Egyptian-Sudanese rapprochement.

Given that the geographic dimension poses a real challenge, the Egyptian-Sudanese coordination and use of Sudanese military bases close to the Ethiopian borders may be more appropriate for Egyptian fighters, whether the Rafale, the MiG-29, or the F-16, to take off from there.

Even in the presence of the Spyder system as a strong defense system to protect the GERD, it is possible to apply some military tactics as explained above; taking into mind that stakes in military action must sometimes be required when there is a real threat, to defend the homeland and its national security.

2- Carrying out airstrikes against targets inside Ethiopia:

The second possible alternative for the Egyptian army is to launch airstrikes inside the Ethiopian interior, but not a direct air strike on the Renaissance Dam, albeit on targets in the vicinity of the Renaissance Dam, for two reasons:

- Sending a message to Ethiopia that Egypt is serious about using the military solution as a last option when political talks and negotiations reach a deadlock, which is evident now, in order

³⁰ Egypt and Sudan armies in the face of Ethiopia, Comparison in military buildup Arab Defense, 5 April 2021, accessed 7 April 2021, [link](#)

to force Ethiopia to seek a political solution through negotiations and abandon its intransigence towards the Egyptian and Sudanese concerns.

- Sisi's statements on using all-inclusive forces to defend the lives of Egyptians has raised the morale of Egyptians, where many of them lined up around these statements, including some of Sisi's opponents. Therefore, it is possible for Sisi to order carrying out such a low-cost strike to gain the confidence of his supporters, to give credibility to his threats, and even to gain additional support from groups that have never been supportive of him.

3- Failure to take military action and satisfaction with political negotiation:

Surprise, secrecy, deception, and distraction in the sense of distracting the enemy with actions indicating that it is unlikely to take military action at that time, are among the most important elements of any military action. However, direct and explicit statements of likelihood of launching a certain attack may be a blatant military error, because in this case, the other party prepares itself and becomes alert to repel imminent attacks. The use of direct threats in this form may indicate that the Egyptian regime only intends to practice pressure on the Ethiopian government only to achieve some political ends, as they did in the Libyan issue and in the first stage of the dam filling in 2020, without taking any serious steps to prevent it.

Conclusion

Some Egyptian sovereign bodies had reportedly sent recommendations to Sisi, advising him not to sign the Declaration of Principles in 2015 in Khartoum, for violating Egypt's interest, but Sisi at the time insisted on his decision to sign it, and told his aides and those bodies that he would be able to push for a major change in the Ethiopian position by using his personal influence on the Ethiopian officials, and even on the Ethiopian public opinion,³¹ which never happened, proving his failure. Ironically, Sisi is currently warning that water is a matter of national security, emphasizing that "No one can take a drop of water from Egypt", and threatening that "If it happens, there will be inconceivable instability in the region that no one could imagine."

³¹ Renaissance Dam ... a brief story about reaching a "stumbling" in 10 years, Mada Masr, 26 September 2019, accessed 6 April 2021, [link](#)

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Despite this critical situation, there is still time for correction and the use of all-inclusive force to maintain Egyptian national security, taking into mind that currently available time is not open for ever; as in the event that military options are adopted, it must be before the second phase of filling the dam, because if the second phase is completed, then any military strike to the dam can have catastrophic repercussions on Sudan first, then on Egypt, in addition to the damage to Ethiopia.

The GERD crisis does indeed pose an existential threat to Egypt and the Egyptians; and the Egyptian official statements may indicate that Cairo has begun to think of using other methods to pressure Ethiopia that adopts a intransigent attitude and works according to its own interests overlooking the likely damage to the two downstream countries, Egypt and Sudan.

In terms of military potentials, Egypt has the required capabilities to carry out deterrent military action against the Grand Ethiopian Renaissance Dam in the event of existence of a real political will to preserve Egyptian national security and the lives of Egyptians. Meanwhile, Ethiopia would not be able to face a well-planned air attack. it is unimaginable to maintain such political negotiations that would only lead to loss of rights forever, amid the continued Ethiopian intransigence, according to the statements of the Egyptian officials themselves.