

EDITORIAL HIGHLIGHTS

26-06-2026

GS 3: INTERNAL SECURITY THE HINDU PAGE: 06

Netra, India's airborne surveillance platform, gets final operational nod

Hemanth C.S.
BENGALURU

The indigenous Netra Airborne Early Warning and Control (AEW&C) system, which played a pivotal role as a force multiplier for the Indian Air Force in the 2019 Balakot strikes and Operation Sindoor last year, was accorded final operational clearance (FOC) on Thursday.

Developed indigenously by the Bengaluru-based Centre for Airborne Systems (CABS), the Netra AEW&C is integrated on the Brazilian Embraer EMB-145I aircraft platform.

The system encompasses a sophisticated suite of mission equipment, including an Active Electronically Scanned Array (AESA) radar, Identification Friend or Foe (IFF), mission computer, secure communication networks, electronic support measures (ESM) and communi-



Air Marshal Awadhesh Kumar Bharti and others, pose during a ceremony marking the FOC of NETRA on Thursday. MURALI KUMAR K

cation support measures. India is the fifth country in the world to develop this capability, as Netra can detect, track, identify and monitor airborne and maritime targets enhancing the network-centric operations capabilities of the IAF.

Dedication

At an event to mark the occasion, scientists and IAF officers dedicated the

achievement to colleagues killed in a tragic air crash in 1999. The seeds of India's airborne warning and control system (AWACS) were sown in the early 1980s.

However, the tragic crash of a modified HS-748 Avro aircraft near Arakkonam in Tamil Nadu, with eight people aboard, including four IAF personnel and four scientists, on January 11, 1999 resulted in the programme being

abandoned temporarily.

The programme took off again after being sanctioned afresh in 2004. During this intervening period, scientists kept their perseverance and hoped for the best.

"On January 11, 1999, the ill-fated aircraft had a crash. I salute personnel who were on board, who made their supreme sacrifice. Today we have shown that their sacrifice has not gone in vain. This FOC is dedicated to them," Director-General of Aeronautics Cluster of the Defence Research and Development Organisation (DRDO), K. Rajalakshmi Menon said.

The Initial Operational Clearance (IOC) for the Netra was accorded in 2015 and it was inducted into the IAF in 2017.

The Cabinet Committee on Security (CCS) has approved the development of six more AEW&C Mk-1A systems by the CABS.

GS 3: SCIENCE AND TECHNOLOGY THE HINDU PAGE: 08

Keeping humanity at the centre of the AI revolution

At the peak of human history, the Artificial Intelligence (AI) revolution stands out as a transformative moment, harnessing the infinite potential of science and innovation in the service of humankind. The endless possibilities of AI in every sphere of human activity and its empowering potential to deal with the unprecedented challenges of our times, is a tribute to mankind's collective ingenuity that validates the boast of accomplishments of which 'even the gods might be envious'. The automating of tedious tasks involving repetitive work and freeing time for leisure, expanding access to essential services, breakthroughs in medicine, ensuring longevity and better health care including cancer screening and prediction of terminal illnesses, robotic nursing of the sick, a more effective targeting of economic aid to the marginalised, enhanced accessibility of education and knowledge to all and its vast contribution to environmental sustainability in several ways including disaster management and weather forecasting are some of the crowning contributions of AI toward a more inclusive development agenda.

Technology and human values

Even so, questions about the future of human society and the 'destiny of intelligence' are most vigorously debated by philosophers, scientists, statesmen and the technology czars, some of whom have pleaded for a pause in the further development and deployment of AI that could hijack our idea of humanity. The claims of the AI protagonists about the 'amazing abundance' of goods and services and the caution against slowing down of scientific progress through regulation must contend with the compelling questions about the necessity of ethical guardrails warranted by humanitarian considerations and emotions embedded in the deepest recesses of our being through a cultural evolution spanning the millennia. The question of who we are, and whether we are ready for a new narrative of humanity in which functional efficiency and promised material abundance prevail over the yearnings of the human soul and the dignity of emotion, is an unavoidable and larger inquiry that has resisted the seduction of technological wonders. This is particularly important given that AI is able to replicate, and in some cases even outperform, cognitive skills, including the ability to understand human emotions and intuition.

Are we ready for an endless technological disruption and a 'global epidemic of stress' caused by a prolonged volatility in the job market



Ashwani Kumar

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AI's promise must be guided by ethics, dignity and accountability

and a predicted 'useless' class of millions caused by an unmanageable stress in coping with the effects of technological disruption? Whether we have new social and economic models that protect individual self-worth and ensure for all a life of belonging and emotional well-being are larger philosophical questions arising from a humanist perspective founded on the sacrosanctity of the values we carry as a badge of humanity.

Clearly, the fact that passionate propounders of AI have cautioned against 'summoning the devil without a kill switch', must awaken us to the urgency of serious reflection on how to preserve 'the hidden realm of the mind from which emotions emerge, from which inspiration flows, from which our desires pulse – the subjective part of the human spirit that makes each of us ineluctably who we are'.

Data privacy vulnerabilities, proliferation of misinformation, electoral manipulations, the possibility of super intelligent weapons systems going rogue, AI-enabled phishing campaigns, and surveillance and censorship are some of the ominous portends that can cause social upheavals without effective global regulation.

Preserving the digital sovereignty of nation-states remains a challenge, given that control over data is intrinsically linked to national security and the strategic autonomy of nations. The establishment of a global regulatory regime that respects national sovereignty and ensures effective enforcement can no longer be postponed.

A moral compass

The world of AI that could rewrite the code of humanity, therefore, needs a moral vision that can harmonise technological advancement with the preconditions of a virtuous and happy society. Terry Eagleton's caution in relation to a sense of seductive self-assurance is eloquent and quote: 'An inflated self-belief can earn its calamitous comeuppance, which caused the ancient Greeks to shudder and look fearfully to the skies'.

Spanish philosopher José Ortega y Gasset reminded us that 'we live at a time when man believes himself fabulously capable of creation, but he does not know what to create. Lord of all things, he is not Lord of himself. He feels lost amid his own abundance. With more means at its disposal, more knowledge, more technique than ever, it turns out that the world today goes the same way as the worst of worlds that have been; it simply drifts'.

The encyclical letter of His Holiness, Pope Leo

XIV on 'Safeguarding the Human Person in the Time of Artificial Intelligence', clinches the moral debate on the humanist dilemmas in relation to AI. Recognising that technology is not antagonistic to humanity, the Pope has stressed the duty to remain 'profoundly human' in an era of AI when 'human dignity is threatened by new forms of dehumanization'.

Emphasising the need to establish standards of ethical discernment based on the dignity of the individual, His Holiness has warned against the 'illusion' of 'self assertion' and cautioned against progress that exacerbates inequalities and is incapable of healing peoples' wounds. He has called for rejection of the 'idolatry of profit that sacrifices the weak, a uniformity that neutralizes differences and the pretense that a single language – even a digital one – can translate everything, including the mystery of the person into data and performance'. These assertions by the Pontiff are moral injunctions in a world that needed a reminder of the 'splendour and grandeur of humanity' beyond its creations and of the limitations of AI in terms of its 'affective, relational or spiritual capabilities'.

The moral code propounded by the Pope, a product of an encounter between lived experiences, spiritual consciousness and historical memory, asserts that humanity flourishes in the 'fragility and finitude' of the human person and in its limitations.

Ethical AI governance

Thus viewed in the framework of core human values anchored in the dignity of man, global leaders are expected to opt for a 'humanist centric' approach in the deployment and regulation of AI for the larger good of humanity with the individual at the centre of their decisions. Prime Minister Narendra Modi has stressed at both the VivaTech 2026 conference in Paris (June 2026) and the India-AI Impact Summit 2026 in New Delhi (February 2026) that such an approach would require a robust and enforceable regulatory framework, rather than voluntary and non-binding commitments, to govern the use of AI. Such a framework could democratise access to frontier AI and help build a shared, trustworthy AI ecosystem in an age that 'levels everything and reveres nothing'. How nations deal with this epochal challenge will define the quality of political leadership and our commitment to inclusive democracy anchored in equality and human dignity as the ultimate civilisational aspiration.

The views expressed are personal

GS 3: ECONOMY THE HINDU

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India's shipbuilding ambitions can set sail with Korea

In April this year, South Korean President Lee Jae Myung met Prime Minister Narendra Modi in India, his first visit to India and the first by a Korean leader in eight years. The meeting was remarkable in many ways, as it revived high-level political interaction at the leaders' level, resulting in the expansion of partnership in strategic sectors. However, the visit was special for another reason: it paved the way for strong collaboration between India and South Korea in the shipbuilding industry, a strategic sector that India is seeking to revive.

Seoul plugs into India's shipbuilding drive

Mr. Lee's visit has given positive momentum to the slowly progressing India-South Korea shipbuilding partnership, as seen in the slew of memoranda of understanding (MoU) and agreements signed during his trip. While the big three of the South Korean shipbuilding industry – Samsung Heavy Industries (SHI), HD Korea Shipbuilding & Offshore Engineering, and Hanwha Ocean – had already announced their investment plans, partnerships, or interests in India, Mr. Lee's support reiterates the South Korean government's strategic commitment to shipbuilding collaboration with India. Last year, a subsidiary of Hyundai signed an MoU with Cochin Shipyard Limited and has since announced plans to invest \$4 billion in Thoothukudi, Tamil Nadu, to construct a green shipyard. Similarly, SHI has signed a partnership with Swan Defence and Heavy Industries to build ships in India. These developments showcase India's attractiveness as a shipbuilding destination for global giants.

South Korea is also interested in developing a complementary supply chain that includes ancillary industries. For instance, the Korea Marine Equipment Association (KOMEA), which comprises 304 enterprises across ship design, shipbuilding, marine equipment, and ship repair, has opened an office in Mumbai. This is expected to pave the way for the development of a robust shipbuilding ecosystem in India. Such steps will help foster a shipbuilding cluster encompassing ancillary industries and other critical facilities



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South Korean partnerships could help accelerate India's ambitions to become a shipbuilding powerhouse

required for scaling up the sector. Further, these partnerships are expected to provide the Indian shipbuilding industry with much-needed support, including design and engineering expertise as well as production know-how. This will help India develop human capital and adopt technology at scale, making its shipyards more competitive internationally. In addition, the various MoUs signed between India and South Korea – at both the government-to-government and business-to-business levels – on workforce development, maritime education, research, and innovation will further strengthen the shipbuilding ecosystem. Together, these efforts could help establish a holistic, cluster-led development model inspired by the success of the city of Ulsan in South Korea.

What has been accomplished in such a short time is commendable, but the task is far from complete. To emerge as a leading shipbuilding nation, India will have to pursue multiple objectives simultaneously. It must support the industry through proactive policy and fiscal measures while also responding effectively to external crises that could disrupt supply chains and affect demand. The sector will require sustained hand-holding until it becomes self-sufficient and capable of competing globally, particularly with established giants such as China.

Fill the gaps

There must be a focus on human capital development, policy and fiscal support, and bringing in ancillary industries. India's Maritime Vision 2030 and Maritime Amrit Kaal Vision 2047 clearly state the objective of being among the top 10 shipbuilding nations by 2030 and in the top five by 2047.

Complementing initiatives such as the Maritime Development Fund, Shipbuilding Development Scheme, and Shipbuilding Financial Assistance Policy make it clearer that India is serious about attracting foreign investment in the shipping and shipbuilding sector.

However, policy and operational gaps persist.

To rectify these gaps, India will have to focus on implementing a series of reforms related to regulatory consistency and legal predictability and also providing access to low-cost and long-term capital. Steps such as the creation of the Sagarmala Finance Corporation Limited (SFCL), India's first non-banking financial company for the maritime sector, are a positive and welcome development.

However, the greater challenge will be establishing a comprehensive industrial ecosystem for shipbuilding. To achieve this, India will need to move quickly on workforce development, supplier localisation, and the creation of dedicated maritime institutions. In addition, Indian academia and research institutions will have to play a larger role in this developmental partnership to support the country's shipbuilding ambitions.

India must continue to focus on three key priorities: providing sustained policy and fiscal support, developing the capacity to absorb transferred technologies, and formulating a sectoral strategy with clearly defined goals and targets. The in-principle approval of the greenfield project in Tamil Nadu is a welcome development, signalling that approval and implementation bottlenecks need not be insurmountable. To capitalise on this opportunity, however, State governments, alongside the central government, must ensure timely follow-through at every stage, facilitate the entry of foreign investors, and provide continuous support throughout the investment process.

A proven pathway

While India's shipbuilding ambitions are ambitious, they are not impractical. South Korea's shipbuilding journey, from a minor player to a global leader in just 15 years, beginning in the 1970s, demonstrates what is possible. India can replicate that success by focusing on three priorities: sustained policy and financial support, competitive shipbuilding and industrial capacity, and a skilled workforce.

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Should Indian seafarers stop serving on sanctioned ships?



Ajith Sukumaran
Retd. Additional Director, General of Shipping



Biswanath Gupta
Associate Professor, Jindal Global Law School

PARLEY

While merchant ships across the world have been manned by Indian seafarers, officers, engineers and crew for years, recent conflicts have suddenly brought Indian seafarers into focus. A recent flashpoint was when the U.S. attacked three ships allegedly carrying Iranian cargo, on the grounds that they were sanctioned vessels. Three Indian seafarers were killed in those attacks. More recently, when the British detained a Russian-linked vessel that was supposedly under Western sanctions in the English Channel, the Indian captain was arrested. This raises an important question: should Indian seafarers continue serving on these so-called sanctioned ships? Ajith Sukumaran and Biswanath Gupta discuss this question in a conversation moderated by M. Kalyanaraman. Edited excerpts:

Could you give us some background on Indian seafarers in general?

Ajith Sukumaran: Only recently has society started realising the importance of shipping, but unfortunately from a negative point of view. Whether it was the Titanic, the Exxon Valdez incident, or more recent maritime accidents, shipping has often been in the news for the wrong reasons. But the fact is that shipping carries around 90% of global trade by volume. It is the lifeline of modern society.

The Ever Given incident in 2021 showed this clearly. A 20,000-TEU container ship blocked the Suez Canal for six days, affecting around 20% of seaborne trade. Hundreds of ships were delayed, and loss to world trade was enormous.

The Strait of Hormuz is equally important. It carries around 11-12% of global seaborne trade, but it is strategically significant because of energy transportation. Nearly 25% of fossil fuels and around 20% of LNG move through this route. For India, this is critical because more than 85% of our energy requirements are imported, and almost all of it comes via ships.

But we often talk only about ships and cargo. Ships do not move on their own. They are operated by people. Seafarers take these vessels through difficult and risky situations, and society needs to recognise their contribution. These are high-value and high-risk assets, and they need competent professionals.

Modern cargoes also involve huge risks. LNG carriers, for example, carry enormous energy potential, yet they may be operated by only around 20-21 seafarers. Indian seafarers have been among the most respected in international shipping. They have built a reputation for their discipline and technical competence. Globally,



Vessels at the Strait of Hormuz as seen from Oman on June 18. REUTERS

there are around 1.8 million seafarers. India has more than five lakh registered seafarers, of whom around 3.2 lakh are active. This means one in five seafarers in global shipping is Indian. The foreign exchange contribution from Indian seafarers is estimated at between \$6 billion and \$9 billion annually. Their importance to India is much greater than many people realise.

What is India's position on the sanctions imposed by countries such as the U.S., the U.K. and the European Union?

AS: There is a legal and a practical aspect. There are two broad categories of sanctions. One is UN sanctions, which are binding. The other is unilateral sanctions imposed by individual countries or groups such as the U.S., the U.K., the EU or the G-7. The challenge is that each country has its own list. It is not always easy to draw a line between sanctioned and non-sanctioned vessels. From the government's perspective, the issue is also practical. India has to protect its trade and its seafarers while dealing with international realities.

Should the government track these vessels and advise Indian seafarers not to join them?

AS: Whether India should impose a blanket ban is a political decision. Such a move would have consequences because India imports energy from different countries and employment is also important. The Directorate General of Shipping has issued guidelines that seafarers should be aware of the type of vessel they are joining and the risks involved. But every sanctioned vessel is not necessarily unsafe. If it is not operating in regions enforcing those sanctions, the situation changes. Therefore, it is not easy to identify every vessel and prohibit Indians from joining it.

What is the legal position on these sanctions



The Directorate General of Shipping has issued guidelines that seafarers should be aware of the type of vessel they are joining and the risks involved. But every sanctioned vessel is not necessarily unsafe

AJITH SUKUMARAN

and on the arrest of the captain in the U.K.?

Biswanath Gupta: There are two kinds of sanctions. UN Security Council sanctions passed under Chapter VII of the UN Charter are binding under international law. Unilateral sanctions are more contested. They are technically limited to the jurisdiction of the country imposing them, but powerful states often try to enforce them beyond their territory. In international law, this is highly contested – whether those sanctions are binding or non-binding. If a strong country is applying sanctions, they are binding by nature.

Regarding the Indian captain, international law raises the question of jurisdiction. India can question whether the British court has jurisdiction, especially if the incident occurred on the high seas. Another option is diplomatic protection. If an Indian citizen is affected by a violation of international law abroad, India can intervene. Regarding missile attacks on ships, the issue comes under the law of armed conflict in the United Nations Charter. Questions arise about necessity, proportionality and whether proper warnings were given. If sufficient warning was not given, India can take the issue to the international court.

International maritime law has always been important because many principles of international law developed through the law of the sea. Existing maritime frameworks can be useful in protecting seafarers.

Has India signed such maritime agreements?

BG: Yes, India is part of important international maritime frameworks. Since India has a large number of seafarers working globally, these agreements are significant. Some reports suggest that seafarers killed in conflict zones were pressured to enter dangerous areas with threats relating to wages, employment. These issues can be examined through international mechanisms.

What is the difference between dark fleet vessels and sanctioned vessels?

AS: Dark fleet vessels are identified through certain criteria. These may include fraudulent registration, false insurance documents, illegal

ship-to-ship transfers, or switching of identification systems. The case of the Indian captain arrested in the English Channel was different. The issue was related to the vessel's registry and whether it was considered stateless. The ship apparently had Cameroon registration but midway through the voyage, before entering the English Channel, the ship seems to have lost the registration. We don't know how that happened. A ship must have a proper flag state. So the legal cover was that the ship was stateless. But whether the master should be held responsible is a separate question, because a captain may not always know about administrative issues.

Given this situation, what should India do?

BG: India should focus on diplomatic engagement. International platforms such as UNCLOS [United Nations Convention on the Law of the Sea] provide a space where countries can negotiate and raise concerns. The International Labour Organization is also important because seafarer welfare and rights are discussed there.

But should the government tell Indian seafarers not to join these ships?

BG: That cannot be the approach for a country like India. Much of our trade happens through the sea, and shipping is also an important source of employment. These global platforms remain important for protecting our interests.

AS: Yes, it can be done. Recruitment in India happens through agencies licensed by the Directorate General of Shipping, and any directions issued by the DG Shipping are binding on them. The government could maintain a dynamic list of sanctioned or high-risk vessels and require recruitment agencies to exercise caution while placing seafarers on them.

In many cases, vulnerable seafarers – those struggling to find employment or facing certification and documentation issues – are being targeted by agents and drawn into risky jobs. These seafarers often become innocent scapegoats in larger geopolitical conflicts.

The government has already taken an important first step by requiring seafarers to be informed. But awareness alone is not enough. The vulnerability remains, and in such circumstances, I believe the government has a responsibility to step in.



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GS 2: INTERNATIONAL RELATIONS THE HINDU PAGE: 10

My absence is not silence. I will return through the strength of the people

JUNE 23 is deeply intertwined with the Bengali nation's long struggle for its rights. On this day in 1949, the Bangladesh Awami League (AL) was founded through a struggle against exploitation and deprivation to advance the people's demands, uphold human dignity, and secure democratic rights. This week marked 77 years of that journey.

AL's sacrifices, leadership, and struggle are woven into every milestone of our nation: The 1952 Language Movement, the 1954 United Front elections, the Six-point Movement of 1966, the 1969 Mass Uprising, the 1970 elections, the historic March 7 speech of the Father of the Nation, Bangabandhu Sheikh Mujibur Rahman, the Great War of Liberation, and the establishment of an independent, sovereign Bangladesh. Bangabandhu dreamt of independence for the Bengali nation. He organised the people for that dream, and under his leadership, Bangladesh achieved freedom. He even gave the country its name, "Bangladesh". Thus, the history of Bangladesh is the history of the Awami League.

After independence, Bangabandhu dedicated himself to rebuilding a war-torn country. He envisioned a hunger-free, poverty-free, secular, democratic, and dignified "Sonar Bangla" (Golden Bengal). However, the assassination of the Father of the Nation and his family on August 15, 1975 was an assault on the spirit of Bangladesh's independence, democracy, the constitution, and the very identity of the Bengalis. For a long time thereafter, attempts were made to drag Bangladesh backwards — through military rule, conspiracies, coups, the distortion of history and the rehabilitation of fundamentalist forces. Yet, the AL never stopped. Imprisonment, disappearances, killings, tor-

ture, fabricated cases, and bans could not steer it away from the people.

During the League's tenure in office, Bangladesh became self-sufficient in food, poverty decreased, we moved toward 100 per cent electrification, and new horizons of infrastructure development were opened. Bangladesh became a safe haven for its people, freed from the grasp of terrorism and militancy. However, today, Bangladesh is in deep crisis once again. The path of hatred, division, vengeance, mob violence, the use of the judiciary as a political weapon, fabricated cases, and state repression initiated by the unelected and unconstitutional interim government led by Muhammad Yunus continues under the current BNP government. It was formed through the force of an election held on February 12, which kept the country's largest political party and the organisation that led the struggle for independence away from the ballot. The polls did not reflect the people's mandate.

Today, the illegal ban on the activities of the Awami League remains in place. Leaders and activists are being charged with false cases. Through house raids, arrests, torture, harassment of families, seizure of property, and intimidation, attempts are being made to silence the AL. Even peaceful tributes on our founding anniversary, the hoisting of flags, or the expression of political views are being treated as crimes. It must be stated clearly: Paying respect to Bangabandhu is not a crime. Saying "Joy Bangla" is not a crime. Loving the Awami League is not a crime. Speaking of voting rights and democracy is not a crime.

Law enforcement agencies, administration, and responsible offi-



SHEIKH HASINA WAZED

cial of the state must remember that they are not a party force. Arresting innocent people under political directives, filing false cases, suppressing peaceful political activities, and criminalising citizens for their political identity is an abuse of power. No government is permanent; no power is permanent; the people are permanent. Therefore, the obstruction of people's democratic rights must end.

I know that the leaders and activists of the AL are going through a difficult time. Some are in prison, some are homeless due to false cases, some are injured, some are crippled, and many have lost loved ones. Yet they have not bowed their heads. I feel their pain. My absence is not silence. Even though I am away, I am with the people of Bangladesh. The struggle to restore democracy in Bangladesh continues through diplomatic, political, and legal channels, and by building international public opinion. The AL's activities may be banned, but it cannot be erased from the hearts of the people.

In its 77-year journey, the AL has been attacked many times. But every time, it has stood up with the strength of the people. It will do so again, *Inshallah*. The people's rights will be restored. The political rights of the AL will be recovered. Democracy will be restored. The rule of law will be established. Bangladesh will move forward on the path of the spirit of the liberation war.

During this time, we must remain united and stand by the people. We must deepen our connection with the people in every village, every neighbourhood, every ward, and every union. We must stand by the oppressed. We must be

uncompromising on the issues of security and dignity for the minority communities, women, children, labourers, the poor, and the marginalised. The politics of the Awami League is not the politics of revenge; it is the politics of establishing human rights, security, and dignity.

In 1981, I returned to the country with a commitment to restore democracy. I have lost almost everyone in my family — my parents and my brothers — but I have never abandoned the people of Bangladesh. I will return to the struggle to establish the rights of the people of Bangladesh. I will return with the commitment to restore democracy, the rule of law, the people's voting rights, and the spirit of the liberation war. I will return through the strength of the people.

On our founding anniversary, I pay my respects to Bangabandhu; the four national leaders; the 3 million martyrs and 200,000 oppressed mothers and sisters of the Great Liberation War; the martyrs of August 15; the Awami League leaders and activists who were martyred in the struggle for democracy; and all my fellow fighters who have been killed, injured, crippled, imprisoned, or displaced in the recent wave of repression.

The Bangladesh Awami League was with the people, is with the people, and will remain with the people. Through the strength of the people, it will rise again, restore democracy, lead Bangladesh back onto the path of the spirit of the liberation war, and build the prosperous "Sonar Bangla" dreamt of by the Father of the Nation.

The writer is the president of the Awami League and former prime minister of Bangladesh, from 1996 to 2001 and 2009 to 2024. A longer version of this article is available on [indianexpress.com](https://www.indianexpress.com)

In its 77-year journey, the Awami League has been attacked many times, has shed blood many times, and has faced conspiracies many times. But every time, it has stood up with the strength of the people. It will do so again, *Inshallah*

GS 01: GEOGRAPHY

INDIAN EXPRESS PAGE: 12

GLOBAL

Behind Venezuela's quake devastation: Rare 'seismic doublet', vulnerable location

Anagha Jayakumar
New Delhi, June 25

THE TWIN earthquakes near Venezuela capital Caracas are feared to have killed tens of thousands. The first quake, with a magnitude of 7.2, hit about 160 km west of Caracas late on Wednesday night. Just 39 seconds later, it was followed by a magnitude 7.5 quake. The US Geological Survey (USGS) described the disaster as a "seismic doublet". The second quake was the largest to strike Venezuela or just off its coast since 1900, according to the USGS.

The agency's preliminary death toll estimate ranges from 10,000 to 100,000. Officials warned this could become one of the country's deadliest natural disasters.

What do we know about the quakes?
The first earthquake struck about 24 km from San Felipe in Yaracuy state. The second hit near Morón in neighbouring Carabobo state, about 168 km west of Caracas, according to the USGS.

The shocks from the disaster were felt as far away as neighbouring Colombia, with residents in the capital, Bogotá, reporting

feeling the tremors. Associated Press also reported that buildings were evacuated in Manaus, Belem and Macapa in Brazil's Amazon region. Venezuela President Delcy Rodríguez said the worst-affected areas included Caracas and the north-central states of Miranda, La Guaira, Aragua, Carabobo and Falcón. Despite the widespread damage, Venezuela's oil infrastructure did not appear to be affected, according to Reuters.

Why was it called a doublet?

Given that both earthquakes occurred within a short time and distance from each other, the USGS classified the event as a doublet. In a typical sequence, the larger quake is followed by a series of smaller aftershocks. Doublets, however, are generally defined as earthquakes of similar magnitude that originate from distinct but closely related ruptures and occur in quick succession.

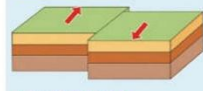
What caused the earthquakes?

Venezuela sits in one of the most seismically active regions in northern South America, along the boundary between the Caribbean and South American tectonic

What is a fault?

A fault is a fracture or zone of fractures between two blocks of rock. When these blocks move rapidly, they cause quakes.

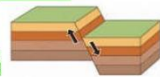
WHAT HAPPENED IN VENEZUELA?



STRIKE-SLIP FAULT: Two blocks slide past one another

Some other types of faults

Normal fault: The block above the fault moves downward relative to the block below.



Reverse fault: Upper block, above the fault plane, moves up and over the lower block

plates. These two plates can slide horizontally past each other along faults, in a phenomenon called a strike-slip fault, causing earthquakes.

The country has witnessed about a thousand earthquakes of magnitude 4.0 and higher over the past decade.

According to the USGS, Wednesday night's second, stronger earthquake re-

sulted from shallow strike-slip faulting near the boundary between the two plates.

The USGS classified the magnitude 7.2 earthquake as a foreshock, or a smaller earthquake that occurs before a larger one, and the magnitude 7.5 event as the mainshock, the largest earthquake in a sequence.

The agency said the sequence "likely indicates a complex rupture interaction pro-

cess" that formed a seismic doublet. The USGS said quakes of this size should not be viewed as a single point on a map but as the rupture of a much larger section of fault.

Why were they so destructive?

The mainshock occurred at a relatively shallow depth of about 10 km. This meant that the shockwaves reached the surface with high intensity. Worsening the situation was the fact that this was a doublet, distinct from routine aftershocks.

"Aftershocks are largely a result of disturbances or ruptures caused by the main earthquake. Some stress is already present, and it is then amplified by the main earthquake, resulting in another quake. Aftershocks are usually one or more magnitude smaller than the main earthquake, although these are not very tight definitions, and have to be assessed on a case-by-case basis," Vineet Gehlot, director of Dehradun-based Wadia Institute of Himalayan Geology, told *The Indian Express*.

"Doublets are two independent events happening within a very short span of time, a few seconds or a few minutes, or maybe a couple of hours. They are roughly of the

same magnitude and happen in close proximity to each other," he said.

Doublets can also be especially destructive because they prolong the strong ground shaking. A 2016 study in *Nature Geoscience* analysing Pakistan's 1997 Hamal earthquake found that a second major shock, which struck 19 seconds after the first, doubled both the duration of ground shaking and the area affected by the strongest shaking. Thus, buildings weakened by the first quake remain exposed to another major shock almost immediately, increasing the risk of collapse and complicating rescue efforts.

Have doublets occurred in the past?

● **IN 2023**, a doublet quake struck Turkey and Syria, measuring at magnitudes of 7.8 and 7.7. These happened just 95 km and nine hours apart, affecting 14 million people and causing widespread damage.

● **IN 2021**, a major doublet-like event occurred when quakes of magnitudes 8.6 and 8.2 struck the Indian Ocean, near Malaysia.

● **IN 1988**, a "triplet" — a series of three earthquakes just half an hour apart from each other — occurred in Australia.

— WITH INPUTS FROM AMITABH SINHA