

Explained: Why are Air Independent Propulsion submarines significant for India?

The DRDO on Wednesday tested a land-based prototype of an Air Independent Propulsion (AIP) submarine

New Delhi: The DRDO on Wednesday tested a land-based prototype of an Air Independent Propulsion (AIP) submarine. The prototype operation at the Naval Materials Research Laboratory in Ambernath, Maharashtra, is considered to give a boost to the DRDO's plan to build AIP systems for Indian naval submarines. The land-based prototype was engineered to the form-and-fit of a submarine.

What is the Air Independent Propulsion (AIP) technology used in submarines?

Submarines are essentially of two types: conventional and nuclear. Conventional submarines use a diesel-electric engine, and must surface daily for oxygen for fuel combustion. If fitted with an Air Independent Propulsion (AIP) system, the sub needs to take in oxygen only once a week.

While many naval powers, including India, have acquired nuclear-powered submarines for deep-sea operations, conventional diesel-electric variants are considered useful for coastal defence. The latter are optimised for stealth, and their weapons and sensors provide for effective operations close to the shore.

Because diesel-electric submarines require to come to the surface frequently to charge their batteries, their underwater endurance time is less. 'Air-independent' propulsion technology helps to make the diesel generator less dependent on surface air.

In a fuel cell AIP, an electrolytic fuel cell releases energy by combining hydrogen and oxygen, with only water as the waste product. The cells are highly efficient, and do not have moving parts, thus ensuring that the submarine has a low acoustic signature. Older submarines can be adapted to the AIP system by retrofitting.

A fuel cell-based AIP, like the one developed by DRDO, is known to deliver better performance compared to other technologies. According to the Defence Ministry press release, the AIP system enhances the submerged endurance of diesel-electric submarines several times, thus having a multiplier effect on its lethality.

<https://indianexpress.com/article/explained/explained-why-are-air-independent-propulsion-submarines-significant-for-india-6098049/>

DRDO to review research for defence applications at IITs and NITs

A meeting is scheduled to take place in New Delhi with the directors and officials of Ministry of Human Resource Development, will take stock of things and will plan the way ahead on research with defence applications

By Eram Agha

New Delhi: the Defence Research and Developmental Organisation will take stock of research in select Indian Institute of Technology (IITs) and National Institute of Technology (NITs) that can have defence application on November 13.

The meeting, which is scheduled to take place in New Delhi with the directors and officials of Ministry of Human Resource Development (MHRD), will take stock of things and will plan the way ahead on research with defence applications.

“The DRDO would take stock of defense related research in IITs and NITs and also chart the future course of action in encouraging research on national security. The DRDO interest in IITs is not new there have been earlier collaborations but now it is more coordinated.” sources in MHRD said.

The letter marked to some IIT directors has asked them to present new research ideas which have defense applications. “We just know that we have to present new ideas on research that can be used in defense. I don’t see there is any problem here – We need to come together to develop defense technology that even the world becomes our audience. Our different departments have produced interesting products that have defense application, and will be reviewed in the meeting,” said one of the directors at IIT said on the condition of anonymity.

Unlike in the past, the collaboration with the DRDO, which was more on the line of blue sky projects (no real world applications), is more focused on deliverables and looking for collaboration beyond five years.

Some offerings from IITs

As reported in the past IIT Ropar has designed helmets for surgical strikes and Artificial Intelligence in Defense.

Joint Advanced Technology Centre has been set up by DRDO at IIT Delhi. News18.com has learnt that DRDO has committed Rs 300 crore for research to the institute.

The IIT Delhi website reads, “It is for making pivotal investments in breakthrough technologies for national security using capabilities of potential researchers amongst IIT Delhi academia. It will generate an innovation ecosystem that includes academia, industry and DRDO partners, with a constant focus on the Nation’s military futuristic requirements.”

The verticals in IIT Delhi are neatly marked under different categories. On the industry day IIT Delhi showcased some of the defence related research. The work in IIT Delhi is afoot in collaboration DRDO on making lighter bullet proof jackets, and boots that can absorb shock in harsh terrain.

Under the “Advanced Electromagnetic Devices and Terahertz (EMDTERA)” the research would address the needs for advanced imaging, sensing and communication technologies using THz and RF MEMS based higher bandwidth communication technologies and subsystems relevant to defence and security.

The vertical Advanced Ballistics, Special Structure and Protection Technologies’ (ABSSP), major objective is the development of lightweight body armor system for high threat level protection.

The research of Smart and Intelligent Textile (SITEX) shall mainly focus upon the creation of technologies and products for specified defence applications which are based primarily on textiles as the major component.

The remaining two verticals on Photonics and Brain Computer Interface & Brain Machine Intelligence are in the process of research articulation and approval.

In IIT Madras the researchers refused to delve in the specific projects but shred the areas in which defence related research in collaboration with DRDO is taking place – There will be Artificial Intelligence, Robotics, Augmented and Virtual Reality, Advanced and Nano-material. The IIT Madras is also working on building start-ups for defense need.

The institute will host a defense tech summit - Shaastra in 2020. The students have adopted defense as the theme for their flagship summit since the "national discourse is being dominated by Defense and Defense Technology."

The collaboration of IITs and Defence was very close to the late Minister of Defence Manohar Parriker who wanted DRDO to more closely interact with IITs especially Bombay, Madras and Jadhavpur among other.

Past and Present

Prof V Kamakoti, professor in Department of Computer Science and Engineering at IIT Madras said, "The memorandum of collaboration signed in 2001 with IIT Madras was on blue sky research. That kind of research is still on but there is lot of emphasis on clear cut deliverable, there is more work on on real world application.

"The most important thing is to have indigenous defence technology – we should know what is in the inside of the thing we have made. The confluence of academia and defence is one way of building on research for defence," he added.

<https://www.news18.com/news/india/drdo-to-review-research-for-defence-applications-at-iits-and-nits-2370829.html>



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What if India's missile defense system caused a nuclear war with Pakistan?

The opposite of what it was meant to do

By Michael Peck

- ***Key point: If one side is immune from attack, it raises the risk of conflict because mutually-assured-destruction no longer holds***

India says it has successfully tested an interceptor capable of shooting down ballistic missiles.

But could this trigger a nuclear war with Pakistan?

On August 2, the Defense Research Development Organization (DRDO) -- India's equivalent of the Pentagon's DARPA research agency -- launched an Advanced Area Defense (AAD) missile from Abdul Kalam island off India's eastern coast.

"The endo-atmospheric missile, capable of intercepting incoming targets at an altitude of 15 to 25 kilometers [9 to 16 miles] was launched against multiple simulated targets of 1,500 kilometer [932 mile]-class ballistic missiles," according to the DRDO announcement.

"One target among simultaneously incoming multiple targets was selected on real time, the weapon system radars tracked the target and the missile locked on to it and intercepted the target with a high degree of accuracy. The complete event including the engagement and interception was tracked by a number of electro-optical tracking systems, radars and telemetry stations. All the mission objectives were successfully met."

India's missile defense program is a two-tiered system: the Prithvi missile (derived from the Prithvi tactical ballistic missile) for exo-atmospheric intercepts in outer space, before they near the target, and the Advanced Area Defense missile for endo-atmospheric intercepts within the Earth's atmosphere, in the terminal phase when the target warhead is making its final descent.

In that sense, it is similar to the 1960s U.S. Anti-Ballistic Missile System, which used Safeguard and Sprint missiles, or any integrated air defense system. A long-range interceptor to take out the incoming missile far from the target, and a short-range point defense weapon to destroy any missile that penetrates the long-range screen.

Previous tests of Indian interceptors targeted short-range Prithvi ballistic missiles on a trajectory that mimicked medium-range missiles. The Diplomat magazine suggests that the dummy target this time could have been an Agni, an intermediate-range missile capable of carrying nuclear warheads.

Indian press trumpeted that India's missile defense is a homegrown program developed by India, rather than imported from Russia and America as are so many Indian weapons such as jet fighters and tanks. That's no small point of pride for the world's second most-populous nation, once the poster child for poverty, and now the world's sixth-largest economy.

Interestingly, while India boasts of developing its own missile defense system, it is also buying Russian S-400 air defense missiles capable of intercepting missiles as well as aircraft.

"The S-400 acquisition, which has some utility for missile defense, suggests that India is interested in the capability and not merely letting DRDO have a science project," Christopher Clary, a professor of international relations at State University of New York Albany, told *The National Interest*.

But there is another danger with Indian missile defense, as history shows. When America and the Soviet Union developed anti-missile systems in the 1960s, the opposing superpower either built more missiles, or increased the number of warheads on existing missiles, to saturate enemy defenses.

So what will Pakistan do?

India and Pakistan "are already in an arms race for all intents and purposes and have been so for some time," Georgetown University professor C. Christine Fair, who has written on the Pakistani military, told *The National Interest*.

"There is, of course more nuance: Pakistan has the world's fast growing nuclear weapons program. India has chosen not to reciprocate in growing its stockpiles. Pakistan has and is trying to acquire tactical nuclear weapons while India has demurred."

"Pakistan will field more warheads on more delivery vehicles than it would in the absence of BMD [ballistic missile defense], Clary says.

"Pakistan could develop multiple warheads for its current ballistic missiles, or develop short-range tactical nuclear weapons and cruise missiles that are harder to intercept."

In turn, a Pakistani buildup might prompt an India buildup, sparking a vicious cycle reminiscent of the Cold War. Ironically, India is notorious for developing home-grown weapons, such as aircraft and tanks, that take much longer to develop than expected, and are plagued with problems when they are fielded. But as always with nuclear weapons and missile defense, perception is everything.

"The biggest problem from India's side is that it all too frequently announced that it has a capability which mobilizes Pakistan to innovate when in fact India is a long way from achieving the stated capability but Pakistan has already developed a counter measure," Fair warns.

<https://nationalinterest.org/blog/buzz/what-if-indias-missile-defense-system-caused-nuclear-war-pakistan-93021>