GSAT-19

Why in news?

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- June 6th launch of GSAT-19, is perhaps ISRO's most important mission in the last three decades.
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- This is bigger in technological significance than even the hugely popular Chandrayaan or Mangalyaan space missions.
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What is the background of the issue?

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- Behind the success of the launch is nearly three decades of hard work in taming cryogenic technology and an interesting history of this technology was denied to ISRO by the United States in the early 1990s, forcing it develop it on its own.
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- ISRO had planned the development of a cryogenic engine way back in the mid-1980s when just a handful of countries the United States, the erstwhile USSR, France and Japan had this technology.
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- In 1991, ISRO and the Russian space agency, Glavkosmos, had signed an agreement for supply of two of these engines along with transfer of technology.
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- However, the United States, which had lost out on the engine contract,

objected to the Russian sale, citing provisions of Missile Technology Control Regime (MTCR) that neither India nor Russia was a member of.
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- In an alternative arrangement, Russia was allowed to sell seven, instead of original two, cryogenic engines but could not transfer the technology to India.
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- But ever since the cancellation of the original Russian deal, ISRO got down to develop the cryogenic technology on its own at the Liquid Propulsion Systems Centre at Thiruvananthapuram.
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- It took more than a decade to build the engines and success did not come easily.
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What is a Cryogenic engine?

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- Cryogenics is the science that addresses the production and effects of very low temperatures.
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- A cryogenic rocket engine is a rocket engine that uses a cryogenic fuel or oxidizer.
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- That is, its fuel or oxidizer (or both) are gases liquefied and stored at very low temperatures.
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- Notably, these engines were one of the main factors of NASA's success in reaching the Moon.
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- Amongst all rocket fuels, hydrogen is known to provide the maximum thrust.
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- But hydrogen, in its natural gaseous form, is difficult to handle, and, therefore, not used in normal engines in rockets like PSLV. However, hydrogen can be used in liquid form.
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- The problem is hydrogen liquefies at very low temperature, nearly 250 degrees Celsius below zero.
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- To burn this fuel, oxygen also needs to be in liquid form, and that happens

at about 90 degrees Celsius below zero.
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- Creating such a low-temperature atmosphere in the rocket is a difficult proposition, because it creates problems for other material used in the rocket.
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- That’s why cryogenic upper stage engines are used.
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What are the specifications of the project?

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- The launch is a giant leap for ISRO because of the rocket it is using.
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- The mission happens to be the first “developmental” flight of the next generation Geosynchronous Satellite Launch Vehicle, called GSLV-MkIII with an entirely indigenous cryogenic upper stage.
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- This cryogenic stage, that involves handling fuel at very low temperatures, is crucial to providing the extra thrust required by the rocket to carry heavier satellites deeper into space.
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- GSLV-MkIII is meant to carry payloads up to four to five tons and that was not possible with conventional propellants used by ISRO’s main launch vehicle, called PSLV.
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- PSLV can take satellites only up to 2 tons to orbits and that too until orbits of 600-km altitude from the earth’s surface.

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- It will not just help ISRO probe deeper into space but will also bring it extra revenue, enabling it to make commercial launches of heavier satellites.
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- By it successive successful launches ISRO once again proved India’s Space Exploration capability to the world.
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Source: Indian Express

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