**LAUNCH VEHICLE :** part of presentation

Ganaganyaan is going to be indias first human spaceflight mission. The task at hand is heavy likewise it needs a heavy launch vehicle. ISRO will be using the preexisting LVM 3 Rocket which is well proven and reliable heavy lift launcher. Previously LVM3 was used for unmaned missions which is vastly different from a manned mission , for this all systems in LVM3 launch vehicle were re-configured to meet human rating requirements and is termed HLVM3 or Human Rated LVM3.s

**Now what makes HLVM 3 the preferred rocket for this mission.**

Some Key reasons are that

LVM3 stands at approximately 43 metesr and is India's heaviest and most powerful rocket. It has the capacity to carry heavier payloads, which is crucial for transporting the crewed spacecraft and life support systems required for the Gaganyaan mission.

LVM 3 has the capability to carry payloads of up to 4000 kg to GTO (Geosynchronus Transfer Orbit) 37000 km and payload 10 tonnes to the LEO (Lower Earth Orbit) which is at a distance of 2000 km from earth.

Another reason is that LVM3 has shown high reliability in its previous missions, including chandrayaan 2 and mangalyaan. Also ISRO has extensive experience in launching and managing space missions in LVM 3.

Launch vehicle Engine

LVM3 is a combination of 2 solid rocket boosters and a liquid engine. The engine will be fired in 3 stages of the launch.

In the first stage LVM 3 is powered by 2 solid rocket booster known as S200. These provide the initial thrust during liftoff to overcome earths gravity. It is capable of launching 640 tonnes of weight at liftof of which 207 tonnes will be of the propellant.

The S200 engines burn for approximately 140 seconds. During this time, they contribute significantly to the rocket's ascent. By the end of the S200 burn, the GSLV Mk III is typically at an altitude of around 45 to 50 kilometers (28 to 31 miles) above Earth's surface.

After the S200 engines complete their burn, they are jettisoned to reduce the overall weight of the rocket. So, while the S200 engines provide the initial thrust, they do not carry the rocket all the way to its final orbit.

The second stage aka L110 core liquid stage, It provides thrust during the initial phase of the rocket's ascent into space. The engine used in the L110 stage are the vikas engine . which uses liquid propellants unsymmetrical dimethylhydrazine (UDMH) as fuel and nitrogen tetroxide (N2O4) as oxidizer. This engine is known for its efficiency and reliability. The burn time for the vikas engine is 150 seconds which helps the rocket achive the necessary velocity to escape earths gravity to space. After the L110 stage has completed its burn, it is separated from the rest of the rocket to reduce weight and allow for the next stage

The third stage or C25 stage

The C25 stage is powered by the CE-20 cryogenic engine. It uses liquid hydrogen (LH2) as fuel and liquid oxygen (LOX) as oxidizer. The C25 stage takes over after the lower stages (solid rocket boosters and liquid core stage) have completed their burns. It provides the final thrust needed to place the payload into its intended orbit. Once the C25 stage has completed its burn of 640 seconds and achieved the desired orbit, the engine will be shut down and the satellite module will be separated from the engine.

Since the gaganyaan is still under development there might be further variants of these engines. The data for this is still not available, so we will have to stay tuned for any further developments