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PARAFFIN-FUEL ROCKET MOTOR TESTED

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RELEASE

HANCOCK COUNTY, Miss. – NASA Stennis Space Center (SSC) recently tested a rocket motor powered by fuel most people have in their homes: paraffin, the waxy material used in common candles.

In the past, paraffin was thought to be too weak and unstable to use as rocket fuel, but a research team at Stanford University in Palo Alto, Calif., found it to be twice as strong as conventional solid propellants. It also burns at a higher combustion rate, is safer, cheaper and very friendly to the environment, producing water vapor and carbon dioxide.

Lockheed Martin – Michoud Operations designed and fabricated the hybrid motor in collaboration with Space Propulsion Group Inc., which was formed by the Stanford team. The motor tested at SSC fired for the full planned duration and produced more than 5,000 pounds of thrust.

"The testing demonstrated that paraffin has a much higher regression rate when compared with HTPB (hydroxyl terminated polybutadiene). If the paraffin technology can be scaled up to even larger sizes this higher regression rate has the potential for improved hybrid

propulsion performance. We will be looking at paraffin fueled hybrids for future applications," said Tim Knowles, Lockheed Martin's principal investigator for hybrid rocket motors.

The paraffin motor test at SSC was the last of four tests conducted as part of the Hybrid Technology Test Project. The other three tests used HTPB.

Hybrid motors combine solid and liquid materials. An oxidizer such as oxygen is generally used with all rocket fuels to aid burning. Conventional rocket fuels are either solids, like what is used in the Space Shuttle boosters, or liquids, like what is used in the Space Shuttle Main Engine.

Hybrid motors are not new – they have been in development for about 50 years – but have not produced enough thrust to power heavy space launch vehicles. Paraffin shows promise because tests at Stanford and at NASA Ames Research Center have shown it burns at a rate three times greater than other hybrid fuels. In hybrid motors, liquid oxygen is gasified before injection into the motor's combustion chamber containing the solid fuel. When the oxygen ignites, it flows over the fuel surface to produce sustained combustion.

The Stanford researchers found that paraffin burns faster because as the oxygen gas blows across the melted surface, waves form and are pulled off as a spray of droplets. That spray burns very rapidly, increasing the fuel's combustion rate.

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