NASA's Magnetospheric Multiscale Mission to provide first 3-D view of Earth's magnetic reconnection process

May 15 2014, by Ken Kremer

NASA Administrator Charles Bolden poses with the agency's Magnetospheric Multiscale (MMS) spacecraft, mission personnel, Goddard Center Director Chris Scolese and NASA Associate Administrator John Grunsfeld, during visit to the cleanroom at NASA's Goddard Space Flight Center in Greenbelt, Md., on May 12, 2014. Credit: Ken Kremer- kenkremer.com

NASA's upcoming Magnetospheric Multiscale (MMS) mission is comprised of a quartet of identically instrumented observatories aimed at providing the first three-dimensional views of a fundamental process in nature known as magnetic reconnection. They were unveiled to greet NASA Administrator Charles Bolden on Monday, May 12, in a rare fully stacked arrangement inside the Goddard clean room.

Universe Today was on hand with NASA Administrator Bolden, Science Mission Chief John Grunsfeld and the MMS mission team at Goddard for a first hand inspection and up close look at the 20 foot tall, four spacecraft stacked configuration in the cleanroom and for briefings about the projects fundamental science goals.

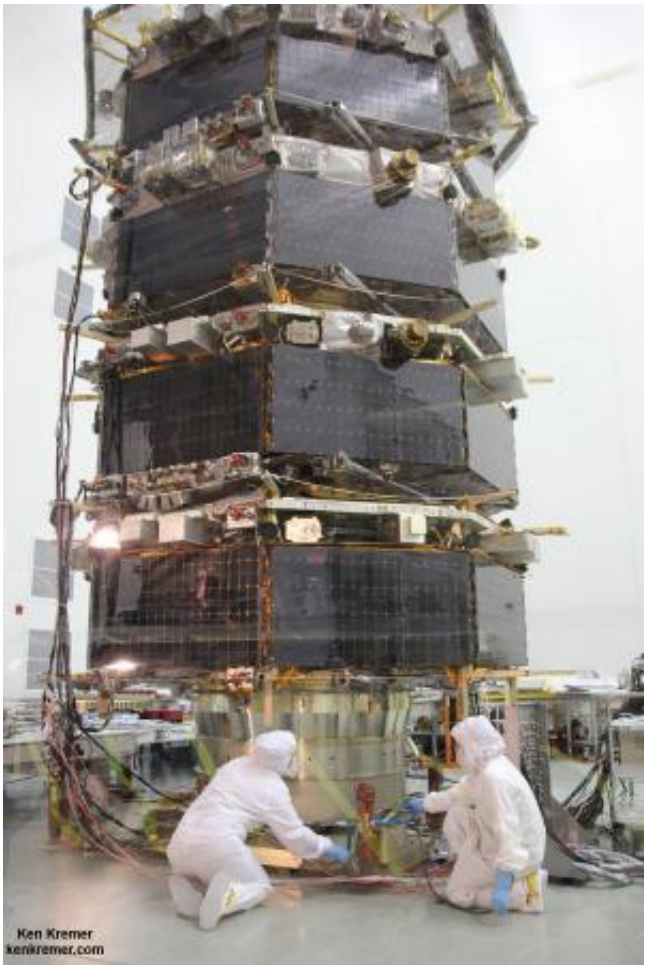
"I'm visiting with the MMS team today to find out the status of this mission scheduled to launch early in 2015. It's one of many projects here at Goddard," NASA Administrator Bolden told me in an exclusive one-on-one interview at the MMS cleanroom.

"MMS will help us study the phenomena known as magnetic reconnection and help us understand how energy from the sun – magnetic and otherwise – affects our own life here on Earth. MMS will study what effects that process … and how the magnetosphere protects Earth."

Magnetic reconnection is the process whereby magnetic fields around Earth connect and disconnect while explosively releasing vast amounts of energy.

MMS measurements should lead to significant improvements in models for yielding better predictions of space weather and thereby the resulting impacts on life of Earth as well as satellite explorers in orbit and the heavens beyond.

The four identical spacecraft – which are still undergoing testing – were stacked in a rarely seen launch arrangement known affectionately as the "IHOP configuration" because they look like a stack of luscious pancakes.



Technicians work on NASA's 20-foot-tall Magnetospheric Multiscale (MMS) mated quartet of stacked observatories in the cleanroom at NASA's Goddard Space Flight Center in Greenbelt, Md., on May 12, 2014. Credit: Ken Kremer-kenkremer.com

"They were built in-house here at Goddard and just completed vibration

testing," Craig Tooley told me at the MMS cleanroom. Tooley is MMS project manager at NASA Goddard.

MMS will launch atop an Atlas V rocket in March 2015 from Space launch Complex 41, Cape Canaveral Air Force Station, Florida.

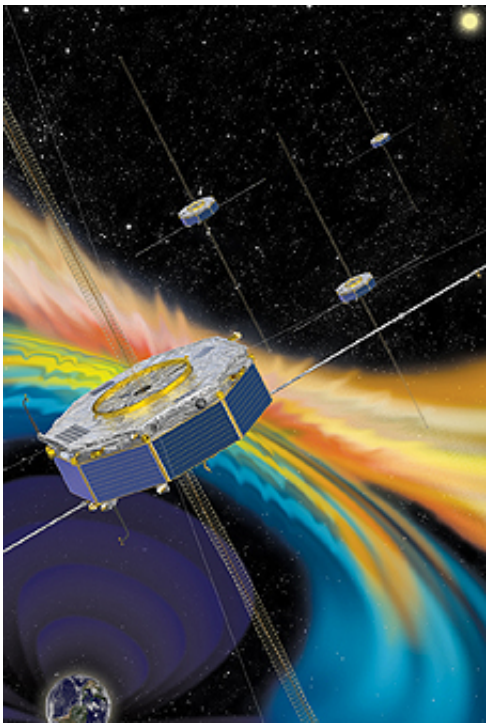
The vibration testing is a major milestone and is conducted to ensure the spacecraft can withstand the most extreme vibration and dynamic loads they will experience and which occurs during liftoff inside the fairing of the Atlas V booster.

MMS is also another highly valuable NASA science mission (along with MAVEN, LADEE and others) which suffered launch delays and increased costs as a result of the US shutdown last October 2013, Bolden confirmed to Universe Today.

Each of the Earth orbiting spacecraft is outfitted with 25 science sensors to study the microphysics of three fundamental plasma processes: magnetic reconnection, energetic particle acceleration, and turbulence.

Magnetic reconnection occurs throughout our universe

"The primary mission will last two years," Tooley told me.



Artist rendition of the four MMS spacecraft in orbit in Earth's magnetic field. Credit: NASA

"Each spacecraft carries about 400 kilograms of fuel. There is a possibility to extend the mission by about a year based on fuel consumption."

The spacecraft will use the Earth itself as a laboratory to unlock the mysteries of magnetic reconnection – the primary process that transfers energy from the solar wind into Earth's magnetosphere and is responsible for geomagnetic storms.

"They will fly in a pyramid-like formation. They will fly in an elliptical orbit and initially be spaced apart by 10 to 30 miles.

The best place to study magnetic reconnection is in situ in Earth's

magnetosphere. This will lead to better predictions of space weather phenomena.

Magnetic reconnection is also believed to help trigger the spectacular aurora known as the Northern or Southern lights.

Source: Universe Today