ASC MSRC Assists NASA with Safety for Discovery Mission

By Dinah Luneke and Gary Sivak

The ASC MSRC continues in its quest of protecting national resources through utilizing critical technologies and expertise in high performance computing. Recently, the ASC MSRC hosted a High Priority Project led by Dr. Kueichien Hill of the Air Force Research Laboratory Sensors Directorate that helped to ensure the safety of the seven astronauts aboard the Space Shuttle Discovery's historical "Return to Flight."

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NASA needed to track the shuttle on radar to record debris that separated from the space craft during the first few critical minutes of turbulent flight through the Earth's atmosphere. Simulated radar data was used to train NASA radar operators to accomplish this important task.

"We had to use HPC resources due to the enormous size of the shuttle target and sheer volume of radar data," research team member Dr. Charles Macon explained. "Due to the tight time schedule of this mission, you can only tackle these types of projects if you have HPC resources available."

"Also, running in high-priority status allowed us to achieve this high throughput in a limited amount of time. We had the right expertise, the right HPC resources, and the right tools to run," according to Dr. Macon.

During the flight, NASA used three strategically positioned debris radar sites to track the shuttle Discovery. The sites scanned the shuttle, including the main external fuel tank and the two solid rocket boosters on either side. Each radar site had a different view of the shuttle, as it was scanned, from the moment of launch, until it achieved earth orbit.

"Although the debris that separated from the Space Shuttle Discovery during lift-off was tracked visually, the research that was done at NASA involved an examination of the radar signature of the debris," explained research team member Dr. Brian Kent of AFRL's Sensors Directorate. "This project's data helped to determine the baseline signature of the shuttle so that dynamic differences between calculated and measured shuttle signatures could be used to spot faint debris separating from the moving shuttle."

Dr. Hill and her team used Xpatch®, a high frequency asymptotic computational electromagnetics code. Known as a "ray tracing" program, Xpatch® simulates electromagnetic radar rays or waves, striking the shuttle. By adding up the

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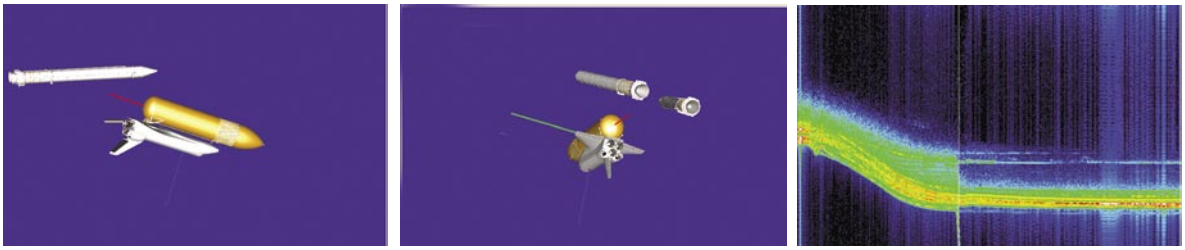
ASC MSRC Team Shares Spotlight

This high priority project required the efforts of the entire ASC MSRC Team.

Systems and network administrators ensured daily operational readiness of the HPC environment; Operations staff continually monitored the environment, handling after-hour calls, and initiated any immediate corrective action procedures; Database administration staff ensured accurate project allocation and utilization reporting; Web staff ensured technical information and Message of the Day notifications were available and posted; Contracts administration staff ensured non-interruption of service maintenance contracts for key HPC systems; Application managers provided application and direct user support; Accounts Center staff ensured timely processing of project and user accounts; Help Desk staff delivered first call resolutions and service ticket routing and monitoring; Care Coordinator ensured that project-specific needs were being addressed; Outreach staff provided appropriate publicity and exposure of this success story; and the ASC MSRC management provided daily business decisions.

The contributions of each member of the ASC MSRC Team helped to ensure the safety of the crew during the launch of the Space Shuttle Discovery.

rays, the radar scatter field can be determined. Using the scatter field information, the radar cross section or the amount of view available to an observer is obtained. From the radar cross section, the radar signature or distinctively recognizable radar character of the space shuttle, can be calculated. Although approximate, Xpatch® is more than adequate, due to the large electrical size of the shuttle target.



Pictured from left: The first and second photos show the solid rocket booster separation from the shuttle's external tank from two different angles. The range-time-intensity plot with separation phase from NCAR radar is shown in the third photo.

"Part of our mission is to support the vital research of scientists and engineers whose work utilizes the critical technologies and expertise of high performance computing," stated Steve Wourms, director for ASC's Advanced Computational Analysis Directorate. "We, at the ASC MSRC, take special pride in the fact that our organization played a part in helping to provide additional safety measures for the Discovery shuttle - the first successful shuttle flight since 2003's Columbia tragedy."

For more information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.