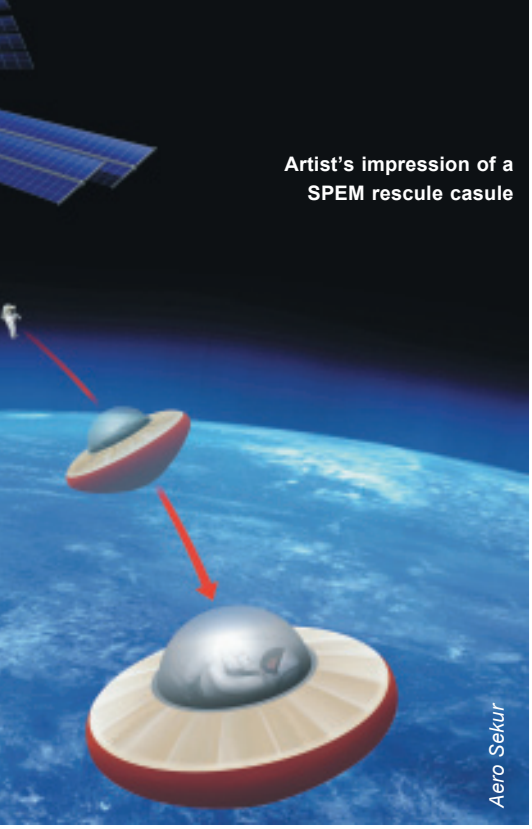

Artist's impression of a SPEM rescule casule

considerable space and are extremely expensive to transport.

"With the Aero Sekur SPEM, a flexible, inflatable heatshield is deployed at an altitude of 100 km. This allows the capsule to slow down significantly as it crosses the upper layers of the atmosphere.

"The primary requirement is managing the extremely high temperatures generated at the leading surfaces — typically 1400C whilst maintaining temperatures of no more than 80C close to the crew/payload. As the module descends through the lower atmosphere, a parachute and deceleration system is operated to further reduce the landing speed to 10 m/s. The inherent buoyancy of the module provides support during sea landings without additional flotation equipment. This means significant volume and operational cost savings."

The test at the Scirocco Plasma high-enthalpy wind tunnel at CIRA, the Italian Aerospace Research Centre, confirmed that Aero Sekur's module will withstand the extreme temperatures of around 1,250C generated during atmospheric re-entry.

Aero Sekur is also supporting the Intermediate eXperimental Vehicle (IXV) project under contract to Thales Alenia Space in which it will provide a flotation bag recovery system for the ESA IXV project. It will aslo supply the system's parachute/vehicle interfaces.

The landmark programme is set to place Europe among the world's players in atmospheric re-entry and will result in the first space qualification and flight for the company's equipment. The recovery system comprises four spherical floats, each with a volume of 0.8 cubic meters.

The high cost of delay for NASA

NASA was well on the way to flying the final Space Shuttle mission on *Discovery* on 16 September 2010, squeaking by before the 30 September end of the Fiscal Year. The $600 million President Barack Obama budgeted in case the Shuttle had to fly into 2011 would not have been used — making it available to spend on other projects.

With little warning, disaster struck. Early this year, while being tested at Europe's CERN particle physics establishment in Geneva, Switzerland, a controversial international payload headed for the Space Station warmed a little too fast.

The Alpha Magnetic Spectrometer had been scheduled to launch on 29 July but will now be delayed until mid-November or later. The almost seven metric ton experiment will use powerful magnets to bend the paths of cosmic rays coming from the far corners of the universe.

The amount of bend corresponds to the sum of the particles' charge and momentum, giving clues to what they are, where they came from, and how they were generated. Ultimately, the scientists behind the project hope to detect naturally occurring antimatter.

According to many theories of the beginning of the cosmos, antimatter should make up half of the normal 'baryonic' matter in the universe — but has yet to be found in quantity.

The scientists also hope to achieve the far more difficult feat of finding direct evidence for 'dark matter'. Galaxies spin in a way that indicates they must be surrounded by huge halos of invisible mass. Dark matter is believed to make up most of the mass of the universe, yet so far no one has been able to find any, or even convincingly suggest what it is made of.

These would be dramatic discoveries, but the experiment is controversial. Many physicists are upset that so much money is being spent on a project they think may have a low chance of success and that avoided the standard peer review process required of most experiments before approval.

A Solid Rocket Booster segment at KSC that will be used for Atlantis on what is currently planned as the 'launch on need' rescue mission for Endeavour's STS-134 mission.

NASA/Cory Huston

The Alpha Magnetic Spectrometer was tested with conventional magnets on a Space Shuttle flight to Mir in June 1998, where it worked well but failed to detect antihydrogen, let alone dark matter. After a period of indecision, NASA decided to modify the experiment to be mounted on the International Space Station (ISS), this time using the Station's much greater power supplies and a new set of super-cooled cryogenic magnets to increase sensitivity.

After the loss of *Columbia*, the mission was cancelled but under pressure from Congress it was reinstated in 2008.

The warming discovered during testing in Europe means the cryogenic magnets would lose their superfluid liquid helium coolant too quickly. The experiment would not stay 1.8 degrees above absolute zero long enough to complete the experiment.

Forced back to the drawing board, scientists decided to reinstall an improved version of the weaker conventional magnets.

Sensitivity will be increased by running the experiment for a longer time — now possible since the Space Station will be supported to at least 2020 and the conventional magnets do not require cryogenic cooling.

Carefully warming up the already supercooled hardware, replacing the magnets and re-testing means the spectrometer will not be ready to fly before mid-November, and possibly well into 2011.

So the Shuttle programme will not end with a final launch in September and will eat through most or all of the $600 million the administration provided for that contingency — and possibly more.

That will cost the human space programme money it cannot afford — and it will not improve the mood of physicists whose experiments went through normal channels and did not make it to space.

Nonetheless, if the spectrometer answers even one of its two major questions, it will revolutionise cosmology — and all would be forgiven.

Donald F. Robertson