Science & Technology

Space Shuttle flight tests new medicines

by Marsha Freeman

The current maiden flight of the Space Shuttle orbiter Discovery carries a potentially life-saving payload. The continuous flow electrophoresis experiment (CFES) module making its fourth flight this mission will produce a biological hormone difficult to manufacture on Earth. The hormone will be tested over the next year in the treatment of chronic disease.

Although the industry partners engaged in the CFES experiment, McDonnel Douglas Astronautics and Johnson and Johnson, will not divulge the exact content of the CFES biological materials for proprietary reasons, the federal Food and Drug Administration plans to begin testing the material on animals and humans over the next year. Candidate biologicals that have been mentioned include insulin-producing beta cells to cure diabetes, and kidney cortex cells which produce urokinase, which dissolves life-threatening blood clots.

In previous flights, the CFES module has demonstrated that it can separate these substances with a four-fold increase in purity compared to Earth systems, and at a rate 500 times faster than gravity-inhibited ground technology. The much larger volume of such materials that will result will bring the cost of using these biologicals down to a level at which their administration in the treatment of chronic diseases could become medically routine.

More broadly, the feasibility of entire new processing industries based in space will be established by the successful demonstration of the electrophoresis technology on the Shuttle.

Why launches are delayed

The importance of flying this particular payload underlines the need to ensure that the entire Shuttle orbiter fleet is in good health. But as things now stand, the underfunding of the Space Shuttle program from its inception has led to a situation in which the slightest problem can result in interminably long delays and even cancellation of flights.

This twelfth Shuttle mission, for example, has suffered three launch delays. The U.S. space agency has been forced to combine two flights into one to avoid disruption of the schedule for the rest of the year. The length of delay was partially caused by the fact that the National Aeronautics and Space Administration has never had enough money to buy spare parts for the Shuttle orbiters.

Discovery's first flight was originally scheduled for early June. The launch was delayed due to problems with one of its engines. Rather than being able to go to a warehouse and "unpack" a new one, an engine had to be pulled from the Space Shuttle Challenger and installed in Discovery.

On June 25, nine minutes before blast-off, problems with one of Discovery's on-board computers resulted in a one-day postponement. Once again, engineers had to cannibalize the Challenger for a part.

The next day, the abort on the launch pad caused because of a valve problem in an engine forced NASA to borrow yet another engine from another orbiter.

The orbiter Challenger, from which parts have been taken, is scheduled to fly in October. Now NASA will have to re-fit Challenger with the missing parts, because they do not have a supply of spares from which to replace problem components.

Throughout the development and construction of the orbiter fleet, cost-cutting has led to reduced engine testing and the unavailability of spares for easy recycling. While the news media continue to complain about delays in the Shuttle schedule, NASA has still not secured funding for an extra orbiter or a supply of spare parts, about which the news media have notably *not* complained.

Large structure to be tested

Next-generation space technology, from the space station to advanced communications satellite systems, will depend upon the ability to use and deploy large structures in space. The current Shuttle mission will do crucial dynamics and control tests on a 102-foot solar panel which will be a first step forward in this new capability.

The Solar Array Experiment, built by Lockheed, is a prototype for future solar panel designs that could deliver from 300 kilowatts to a megawatt of electrical power to space systems. During launch, the folded solar panels are stored in a small box, wrapped around a retractable mast which is stowed in a cylindrical cannister.

During the experiment, Mission Specialist Judith Resnik will deploy the array. The extension or retraction rate of the mast is about 1.5 inches per second, requiring about 14 minutes for full extension. NASA has predicted the motions that should be seen in the array from orbiter thruster firings. The on-board experiments will verfiy these vibrations, and lay the basis for designing large space structures for the Shuttle and space station.