screw would be the main seating valve element.

The relationships among the components of the valve are best understood by reference to the figure, which presents meridional cross sections of the valve in the fully closed and fully open positions. The motor would be supported by a bracket bolted to the valve body. By means of gears or pulleys and a timing belt, motor drive would be transmitted to a sleeve that would rotate on bearings in the valve body. A ball nut inside the sleeve would be made to rotate with the sleeve by use of a key.

The ball screw would pass through and engage the ball nut. A key would prevent rotation of the ball screw in the valve body while allowing the ball screw to translate axially when driven by the ball nut. The outer surface of the ball screw would be threaded only in a mid-length region: the end regions of the outer surface of the ball screw would be polished so that they could act as dynamic sealing surfaces. The inlet end (the right end as depicted in the figure) of the ball screw would be the main seating valve element: in the fully closed position, it would be pressed against the valve seat, as depicted in the upper part of the figure.

A retainer would hold the valve seat in an inlet fitting. In addition, the retainer would be contoured to obtain a specified flow rate as a function of axial position of the ball screw.

In the fully closed position, little force would be needed to press the ball screw against the seat because the push bore area upon which the upstream pressure would act would be small. The motor would position and hold the ball screw against the seat, providing the force necessary for sealing.

To open the valve to a particular position, the motor would be commanded to rotate to a particular angular position (equivalently, a particular number of revolutions) at a particular rate of rotation within its torque limitations. Once the valve was open, fluid would flow through the inlet fitting and the chamber in the inlet housing, past the seat and its retainer, along the hollow core of the ball screw, and through the outlet housing and outlet fitting. The net force generated from fluid pressure in the open position would be small because the pressure exposed to the push bore areas at the inlet and outlet are nearly equal and the forces generated would be in opposing directions.

This work was done by Paul Patterson of Marshall Space Flight Center. Further information is contained in a TSP (see page 1).

This invention has been patented by NASA (U.S. Patent No. 6,802,488). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. Refer to MFS-31761-1.

Plumbing Fixture for a Microfluidic Cartridge

Lyndon B. Johnson Space Center, Houston, Texas

A fixture has been devised for making the plumbing connections between a microfluidic device in a replaceable cartridge and an external fluidic system. The fixture includes a 0.25-in. (6.35-mm) thick steel plate, to which the cartridge is fastened by two 10-32 thumb screws. The plate holds one plumbing fitting for the inlet and one for the outlet of the microfluidic device. Each fitting includes a fused-silica tube of 0.006-in. (≈0.15-mm) inside diameter within a fluorinated ethylene-propylene (FEP) tube of 0.0155-in. (≈0.39-mm) inside diameter and 0.062-in. (≈1.57-mm) outside diameter. The FEP tube is press-fit through the steel plate so that its exposed end is flush with the surface of the plate, and the silica tube protrudes 0.03 in. (≈0.76 mm) from the plate/FEP-tube-end surface. The cartridge includes a glass cover plate that contains 0.06-mm-wide access ports. When the cartridge is fastened to the steel plate, the silica tubes become inserted through the access ports and into the body of the cartridge, while the ends of the FEP tubes become butted against the glass cover plate. An extremely tight seal is thereby made.

This work was done by Kevin Francis of Johnson Space Center. For further information, contact the Johnson Innovative Partnerships Office at (281) 483-3809. MSC-23335

Camera Mount for a Head-Up Display

Langley Research Center, Hampton, Virginia

A mounting mechanism was designed and built to satisfy requirements specific to a developmental head-up display (HUD) to be used by pilots in a Boeing 757 airplane. This development was necessitated by the fact that although such mounting mechanisms were commercially available for other airplanes, there were none for the 757. The mounting mechanism supports a miniature electronic camera that provides a forward view. The mechanism was designed to be integrated with the other HUD instrumentation and to position the camera so that what is presented to the pilot is the image acquired by the camera, overlaid with alphanumeric and/or graphical symbols, from a close approximation of the pilot's natural forward perspective. The mounting mechanism includes an L-shaped mounting arm that can be adjusted easily to the pilot's perspective, without prior experience. The mounting mechanism is lightweight and flexible and presents little hazard to the pilot.

This work was done by Wayne Geouge, Monica Barnes, Larry Johnson, and Kevin Shelton of Langley Research Center. Further information is contained in a TSP (see page 1).

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Langley Research Center, at (757) 864-3521. Refer to LAR-16380-1.