NASA Office of Technology Transfer

John C. Stennis Space Center

NASA Dual-Use Partnership Delivers Improved Linear Actuator

A high thrust, high performance electro-hydraulic actuator now being manufactured quicker at a reduced price.

Developed by BAFCO Inc., under a Dual-Use Cooperative Agreement with the Office of Technology Transfer at Stennis Space Center, the Model 773 is a next generation linear actuator displaying increased accuracy, precision and operating speeds. Primarily designed to operate in systems that contain gases, liquids, or cryogenic materials the Model 773 has application in the aerospace or petro-chemical industries.

A Dual-Use Cooperative Agreement between the Office of Technology Transfer at Stennis Space Center (SSC) and BAFCO Inc., of Warminister, Pennsylvania, produced an improved linear actuator for use on the rocket engine test stands at Stennis. A linear actuator is the servomechanism that supplies or transmits a measured amount of energy for the operation of another mechanical system; accuracy, reliability and speed of the actuator are critical to proper performance of the entire system. The BAFCO Model 773 is a next generation, high thrust, high response electro-hydraulic actuator designed to meet identified performance standards in aerospace, industrial and petro-chemical applications. "This actuator is the result of a focused partnership between NASA and our company to resolve production problems as well as high unit costs," said Jim Hamtil, President of BAFCO Inc.

HOT Points

- **High thrust, high performance linear actuator.**
- **Increased accuracy and precision, operating speed and life expectancy.**
- **Application areas include aerospace, petro-chemical and industrial.**
- **Makes use of commercial off the shelf (COTS) components.**
- **Reduced manufacturing and delivery time.**
- **Reduced unit costs.**

"The Model 773 meets National Fluid Power Association (NFPA) standards for cylinder performance along with U.S. and European standards for electrical component functions. It is a unique piece of equipment, which meets or exceeds established performance standards at a mid-range pricing levels."

THE PROJECT AND RESULTS

Stennis Space Center provides testing of Space Shuttle Main Engines, rocket propulsion systems and related rocket components. Stennis maintains several test facilities with a number of cells, or positions, to perform propulsion testing. As the testing facilities continue to age, maintenance costs have increased. In an attempt to control component replacement costs, NASA partnered with BAFCO to resolve questions regarding manufacturing processes, delivery lead-time and high unit costs.

BAFCO identified four suppliers that manufactured components meeting the performance standards required by NASA. "We no longer have to individually engineer each component," said Hamtil. "Our company has been able to purchase commercial off the shelf (COTS) components then modify them using BAFCO technology and expertise. Subsequently, production and delivery lead-time have been reduced. Production to delivery, the entire process has been reduced from 14 weeks to between four and eight weeks. Correspondingly, the unit price has been lowered."

NASA purchased 30 of BAFCO's Model 773 at a savings of more than **$250,000.** Prior to the project, purchase costs per unit ran between **$20,000 and $22,000**; upon completion, the cost per unit was reduced to between **$11,000 and $13,000**. According to Nickey Raines, E-1 stand director, the results of this project provided NASA with maximum benefit; an improved product, delivered quicker at a reduced cost.

To date, all 30 of the actuators have been installed in the E-Complex at Stennis; performance levels have met or exceeded those of all previously used actuators. "Performance and costs are always elements of concern to the Stennis Test Directorate," said Haynes Haselmaier, a Mississippi Space Services support contractor. "Performance of test articles is dependent on the support systems surrounding them. We must have quality components to support rocket engine testing, but the delays we experienced in receiving units were constant and the costs involved seemed to be continually mounting. The successful completion of this project has provided NASA with a high performance actuator at a lower cost, significantly faster."

COMMERCIALIZATION

Primarily designed to operate in systems that contain gases, liquids or cryogenic materials, the BAFCO Model 773 offers several advantages over previously produced linear actuators. These advantages include increased accuracy and precision, increased operating speeds and increased life expectancy. These advantages combined with the reduction in production and delivery lead-time and lower unit pricing will allow broader application of BAFCO's Model 773.

BAFCO's Model 773 sales, mostly to aerospace and petro-chemical customers who have installed the units in testing and production facilities, total almost $500,000. "Being mid-range in price with high-end performance, the BAFCO Model 773 has seen increased interest from aerospace, industrial and petro-chemical companies," said Hamtil. "We are seeing increased interest and activity from domestic companies as well as international corporations. Domestically, several companies have requested specifications and price quotes on the Model 773 for installation in their facilities. Internationally, we have sold 4 actuators to a petroleum company in Yugoslavia and have quoted numerous other companies. Even other government agencies have shown interest; for example the United States Air Force has requested a quote on this particular actuator for application within a test facility presently under construction at Edwards Air Force Base in California."

WHY DUAL-USE WAS IMPORTANT

"This agreement allowed our company to not only address a government need, but also to enhance our commercial product at the same time. As a result, the Model 773 is receiving increased interest from companies outside the traditional applications areas," says Hamtil. "This Dual-Use project is an excellent example of how NASA and industry can partner to develop a NASA needed technology while at the same time help fulfill a commercial market place need," said John Bailey, NASA Office of Technology Transfer Dual-Use manager. The Dual-Use concept of product development is based on the sharing of costs, risks and successes between the government and a commercial partner. In these projects, NASA can contribute technology development, unique facilities and know-how, engineering resources and funding. In turn, the commercial partner contributes unique expertise, facilities, manufacturing, marketing capabilities and potential cash resources. The result is an approach that provides flexibility and draws upon the capabilities of both parties.

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