ICF Target Support Highlights

GA-C22688
August 1998

General Atomics, with our partner Schaefer Corporation, serves as the ICF Target Support Contractor, providing target development and fabrication and target system engineering development to support the ICF program at five ICF Labs—LLNL, LANL, NRL, SNL, and UR/LLE. This informal newsletter contains highlights of that support for August 1998.

GA/Schafer onsite staff at LLNL, LANL, and SNL fabricated, machined, assembled and characterized more than 180 targets of various kinds for experiments on Nova, Omega, Trident, and Z. We fabricated, characterized, and delivered about 290 targets and target components, including micromachined hohlraums, witness plates, and foams to LLNL, LANL, and SNL for shots on Nova, Omega, and Z, plastic and glass microballoon capsules to LLNL, LANL, and UR/LLE for shots on Nova and Omega, and flat foil targets of various materials and configurations to NRL and UR/LLE for experiments on Nike and Omega.

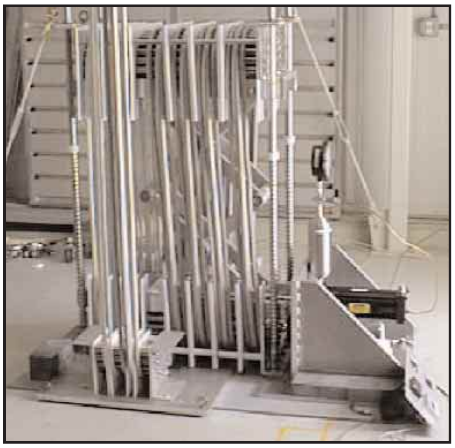

Fig. 1: Spooler front view

As part of the Omega Cryogenic Target System, a mobile cryostat carrying the cryogenic target is deployed into and extracted from the Omega target chamber. During this process, the cryostat is elevated 6 m (20 feet) from its starting position to the target chamber center.

While in transit, the cryostat must continue to receive electric power, control signals, and pneumatic services from a control cart that remains outside the target chamber. The utility “umbilical” that provides these services consists of three electrical cables (with 130 conductors), and 5 gas lines. Three of the gas lines have reinforcing metal braid on their exteriors, and are visible in Figures 1 and 2. When the mobile cryostat returns to its home position, the umbilical must be recoiled and stored in the smallest possible volume due to space considerations in the Moving Cryostat Transfer Cart. The entire process occurs in vacuum at 10^{-6} Torr. This operating environment dictated low leakage rates from the gas lines, and precluded the use of rotary seals at the hose termination points.

To accomplish this task, Lloyd Brown and Karl Boline at GA designed and built an umbilical spooling device. Figures 1 and 2 show the unit mounted in a test stand during recent operational tests. The spooler consists of upper and lower carriages, which contain banks of ball bearings, a linkage similar to a large scissor jack, a pneumatic spring, metal springs, and the umbilical hoses and cables. The lower carriage is stationary, and the upper is mounted on top of the scissor jack. The pneumatic spring is the primary driver and, via the scissor, pushes the upper carriage to its home position. The hoses and cables are wound over the carriages’ ball bearing banks, and span vertically between the two carriages, as can be seen in Fig. 1.

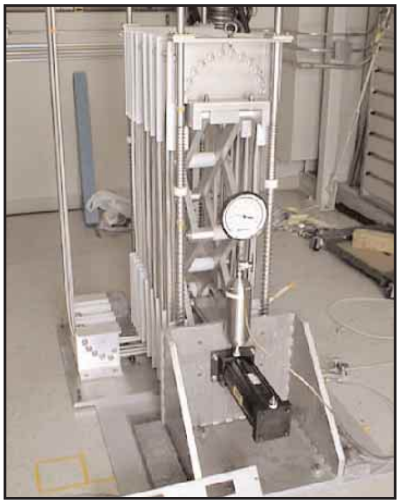

Fig. 2: Spooler end view

The umbilical is deployed by simply pulling on the hose/cable bundle with about 750 N (170 lb.) of force. As this force is applied, it begins to close the scissor linkage, allowing the upper carriage to descend, and the umbilical to unspool as required. The system was designed so that this force is nearly constant throughout the spooling process. If less force is applied, the scissor starts to open, and the umbilical automatically recoils.

The total volume envelope for the scissor / carriage assembly is only 38 cm x 86 cm x 150 cm (15 in. x 34 in. x 59 in.). It is located within the Moving Cryostat Transfer Cart that carries cryogenic targets from the Fill/Transfer Station in the Tritium Lab to the Omega Target Chamber. Deploying 6 m of umbilical requires 76 cm (30 in.) of scissor displacement. Karl recently successfully completed operational tests of the spooler at GA equivalent to 1 year of normal usage on Omega.

Work supported by the U.S. Department of Energy under Contract No. DE-AC03-95SF20732

For more information, contact Ken Schultz at GA: 619-455-4304; fax: 619-455-2399; e-mail: ken.schultz@gat.com.

Schafer GENERAL ATOMICS